

**SAFETY, OCCUPATIONAL HEALTH AND ENVIRONMENTAL
MANAGEMENT SYSTEM MODEL FOR SMALL AND
MEDIUM-SIZED ENTERPRISES**

Thepporn Jaroenroy

**A Dissertation Submitted in Partial
Fulfillment of the Requirements for the Degree of
Doctor of Philosophy (Environmental Management)
The Graduate School of Environmental Development Administration
2019**

**SAFETY, OCCUPATIONAL HEALTH AND ENVIRONMENTAL
MANAGEMENT SYSTEM MODEL FOR SMALL AND
MEDIUM-SIZED ENTERPRISES**

Thepporn Jaroenroy

The Graduate School of Environmental Development Administration

Assistant Professor Chutarat Ch Major Advisor
(Chutarat Chompunth, Ph.D.)

The Examining Committee Approved This Dissertation Submitted in Partial
Fulfillment of the Requirements for the Degree of Doctor of Philosophy
(Environmental Management).

Associate Professor Sarik Soontornchai Committee Chairman
(Sarisak Soontornchai, D.Sc.)

Keson Theppeang Committee
(Keson Theppeang, Ph.D.)

Assistant Professor Chutarat Ch Committee
(Chutarat Chompunth, Ph.D.)

Professor Wisakha Poochinda Dean
(Wisakha Poochinda, Ph.D.)

October 2019

ABSTRACT

Title of Dissertation	Safety, Occupational Health and Environmental Management System Model for Small and Medium-Sized Enterprises
Author	Mr. Thepporn Jaroenroy
Degree	Doctor of Philosophy (Environmental Management)
Year	2019

The objectives of this study are: 1) to identify the occupational health risks, environmental aspects, motivators, and barriers to adopting the integrated safety, occupational health and environmental management system in small and medium-sized manufacturing enterprises of metal products in Thailand; 2) to identify the factors that related the adoption of the integrated safety, occupational health and environmental management system in SMEs; 3) to design an integrated safety, occupational health and environmental management system from the integration of ISO 14001: 2015, OHSAS 18001: 2007 and ISO 45001: 2018 for small and medium-sized manufacturing enterprises of metal products in Thailand; and 4) to trial an integrated safety, occupational health and environmental management system in pilot SMEs and evaluate the implementing results.

Qualitative and Quantitative were used to answer the objectives of the study. For the qualitative study, the literature review on the safety and environmental management in SMEs was conducted to understand how SMEs manage their risks and environmental aspects. Existing international standards for occupational health and safety, environmental management system, motivators and barriers for SMEs in the implementation of occupational health and safety, environmental management system were also studied. Expert in-depth interviews were conducted to provide points of view of professionals. The content analysis was used to analyze data obtained from the expert in-depth interviews. All data were gathered to develop the new integrated management system. Focus group discussion was conducted to verify the integrated management system. The new integrated

management system was implemented in pilot SMEs and evaluated by using the balanced scorecard. Meanwhile, the quantitative method was used to collect the data by questionnaire. The quantitative analysis included descriptive statistics, Pearson chi-square, and Pearson correlation coefficients. These methods were used to examine the relationship between variables of the interest of SMEs in the adoption of the integrated safety, occupational health and environmental management system.

The concept of the Plan-Do-Check-Act (PDCA) cycle is strongly recommended for the new integrated management system for SMEs in consideration of the limitations of SMEs. The implementing result with the evaluation by using the balanced scorecard shows that the integrated safety, occupational health and environmental management system can elevate the safety, occupational health and environmental performance of the three voluntary SMEs. All three SMEs are satisfied with the results of the implementation.

The unsafe machine, physical hazard and chemical hazard are major causes of occupational health problem in SMEs. Additionally, waste, noise and wastewater are the significant aspects that most SMEs could face. The limitations in term of human resources, budget, time and lack of information related to health, safety and environment management system are the main barriers to the management system adoption in SMEs. On the other hand, the rapid decision making by the owner-manager, the good relationship between employer and employees, flat organization and the quick communication, as well as the characteristics of SMEs, are good motivators that drive them to implement the safety, occupational health and environmental management system. The only factor that relates to the interest of the integrated safety, occupational health and environmental management system implementing in SMEs is Safety, Health and Environmental (SHE) policy.

The research suggested that the commitment of the top management is the success factor for the integrated management system implementation in SMEs with the essential budget. The consultant who works with SMEs should consider the limitation of SMEs and propose the appropriate implementation timeline. The government sector should encourage SMEs by providing financial support, consultancy program and surveillance audit program to ensure the success of the management system implementation of SMEs that can help reduce the injury, illness and accident rates and prevent the environmental problems of SMEs in Thailand.

ACKNOWLEDGEMENTS

I am grateful to Assistant Professor Dr. Chutarat Chompunth, my major advisor for all her guidance, support and the useful suggestion for all process of this research. Professor Dr. Wisakha Poochinda served as the expert consultant on statistical analysis and survey design during the entire course of this research. Additionally, I would like to extend thanks and appreciation to all of the dissertation committee members, Associate professor Dr. Sarisak Soontornchai, committee chairperson and Dr. Keson Theppeang, committee member for their thoughtful comments and suggestions to complete my dissertation. I would like to give a special thanks to all the Ph.D. Program staff members at the NIDA Environment School for their encouragement and support during my study.

The research would not have been successful without the participation of all the respondents and all safety and environmental experts. My gratitude goes to all those who took the time to provide their responses.

Finally, I would like to say that it is a big challenge to study the Ph.D. program while I am working full time. I would like to thank my family for their continuous support, especially my wife for constantly encouraging and motivating me to keep fighting and not giving up.

Thepporn Jaroenroy

August 2019

TABLE OF CONTENTS

	Page
ABSTRACT	iii
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	xii
CHAPTER 1 INTRODUCTION	1
1.1 Statement and Significance of the Study	1
1.2 Research Question	4
1.3 Objectives of the Study	5
1.4 Expected Benefits of the Study	7
1.5 Definitions	8
CHAPTER 2 LITERATURE REVIEW	9
2.1 Small and Medium Enterprises Act in Thailand	9
2.2 Small and Medium Enterprises in Thailand	11
2.3 Occupational Health and Safety Management System and Environmental Management System in SMEs	14
2.4 Motivators and Barriers to EMS and OH&S MS adoption by Small and Medium Enterprises	19
2.5 Analysis of Occupational Health and Safety Management System, Environmental Management System	27
2.6 Thai Regulation in Safety and Occupational Health Management System	39
2.7 Constructing a Conceptual Framework	40
2.8 A need of Small and Medium Enterprises for the introduction of an Integrated Management System	42

2.9 The Balanced Scorecard	43
CHAPTER 3 RESEARCH METHODOLOGY	50
3.1 Research Procedure	51
3.2 Target Population and Sampling	53
3.3 Data Collection	60
3.4 Data Collecting Tool	66
3.5 Data Analysis	67
CHAPTER 4 RESULT OF ANALYSIS	72
4.1 Objectives of the Study	72
4.2 Descriptive Data	73
4.3 Findings from an expert interview	88
4.4 Findings from Focus Group Discussion	97
4.5 Safety, Occupational health and Environmental Management System for Small and Medium Enterprise	98
4.6 Reliability and Validity	113
CHAPTER 5 RESULT OF IMPLEMENTING INTEGRATED SAFETY, OCCUPATIONAL HEALTH AND ENVIRONMENTAL MANAGEMENT SYSTEM MODEL FOR SMALL AND MEDIUM ENTERPRISE IN PILOT ENTERPRISE: CASE STUDY 1	114
5.1 Company Background	114
5.2 Integrated Safety, Occupational Health and Environmental Management System for SMEs Implementation	119
5.3 Evaluating the Implementation of Integrated Safety, Occupational Health and Environmental Management System for SMEs by Using the Balance Scorecard	131
CHAPTER 6 RESULT OF IMPLEMENTING INTEGRATED SAFETY, OCCUPATIONAL HEALTH AND ENVIRONMENTAL MANAGEMENT SYSTEM MODEL FOR SMALL AND MEDIUM ENTERPRISE IN PILOT ENTERPRISE: CASE STUDY 2	144
6.1 Company Background	144

6.2	Integrated Safety, Occupational Health and Environmental Management System for SMEs Implementation	147
6.3	Evaluating the Implementation of Integrated Safety, Occupational Health and Environmental Management System for SMEs by Using the Balanced Scorecard	163
CHAPTER 7	RESULT OF IMPLEMENTING INTEGRATED SAFETY, OCCUPATIONAL HEALTH AND ENVIRONMENTAL MANAGEMENT SYSTEM MODEL FOR SMALL AND MEDIUM ENTERPRISE IN PILOT ENTERPRISE: CASE STUDY 3	177
7.1	Company Background	177
7.2	Integrated Environmental, Occupational Health and Safety Management System for SMEs Implementation	180
7.3	Evaluating the Implementation of Integrated Safety, Occupational Health and Environmental Management System for Smes by Using the Balanced Scorecard	198
CHAPTER 8	CONCLUSION AND RECOMMENDATIONS	213
8.1	Summary and Conclusion	213
8.2	Discussion and Implication of Findings	236
8.3	Recommendations	239
8.4	Directions for Future Research	244
	BIBLIOGRAPHY	246
	APPENDICES	254
Appendix A	Questionnaire	255
Appendix B	Semi-structured interview form for Safety, Occupational Health and Environmental expert	265
Appendix C	Summaries of Expert Interviews	268
Appendix D	A manual for implementing an Integrated Safety, Occupational health and Environmental Management System for Small and Medium	304
	BIOGRAPHY	348

LIST OF TABLES

Tables	Page
2.1 Number of total enterprises depending on size of enterprise in 2016-2017	11
2.2 Total employment classified by enterprise size in 2016-2017	12
2.3 GDP of SMEs in 2017	13
2.4 Work-Related Injury and Illness Statistic	14
2.5 List of Barriers and Motivators by World Region	20
2.6 List of Barriers and Motivators to EMS Adoption in SMEs	22
2.7 ISO 45001: 2018 Development Timeline	32
2.8 The Correspondence among those Management Systems	34
2.9 The Integration of Management System	38
3.1 The List of all Experts Who were Interviewed	55
3.2 The List of Key Informants Who Implement the Alternative Safety, Occupational Health and Environmental Management System and are Relevant to the Management System	57
3.3 The List of all Experts Who Attended the Group Discussion	58
3.4 Balanced Scorecard (BSC) Criteria for Integrated Safety, Occupational Health and Environmental Management System for SMEs Evaluation	63
3.5 Summary of Data Collection and Data Analysis for Each Objective of the Study	70
4.1 Size of SMEs	73
4.2 How Long of Business Operation	74
4.3 Safety Award/ Certification of Occupational Health and Safety Management System	74
4.4 Environmental Award/Certification of Environmental Management System	75
4.5 Policy Establishment	75

4.6	Safety Problems in SMEs	76
4.7	Environmental Problems in SMEs	76
4.8	The Interest of SMEs in Adopting Safety, Occupational Health and Environmental Management System within their Organization	77
4.9	The Relationship between Business Size SHE Policy, Safety Problems, Environmental Problems and the Interest in the Management System Adoption	78
4.10	The Correlation between Barriers to Implementing Safety and Occupational Health Management System and Motivators to Implementing Safety and Occupational Health Management System	80
4.11	The Correlation between Barriers to Implementing Environmental Management System and Motivators to Implementing Environmental Management System	80
4.12	The Correlation between Barriers to Implementing Integrated Management System and Motivators to Implementing an Integrated Management System	81
4.13	The Definition of 5 Likert Scales	81
4.14	Ranks of Internal and External Barriers to Implementing Occupational Health and Safety Management System	82
4.15	Ranks of Internal and External Motivators to Implementing Occupational Health and Safety Management System	83
4.16	Ranks of Internal and External Barriers to implementing Environmental Management System	84
4.17	Ranks of Internal and External Motivators to Implementing Environmental Management System	85
4.18	Ranks of Internal and External Barriers to Implementing Integrated Safety, Occupational Health, and Environmental Management System	86
4.19	Ranks of Internal and External Motivators to Implementing Integrated Safety, Occupational Health, and Environmental Management System	87
4.20	The Integration of ISO 14001: 2015, OHSAS 18001: 2007, and ISO 45001: 2018	106
5.1	List of Machines of Case Study 1 Enterprise	116

5.2	The Score of the Balanced Scorecard from the Implementation Results of Case Study 1 Enterprise by the Author	140
5.3	The Score of the Balanced Scorecard from the Implementation Results of Case Study 1 Enterprise by the Management Representative	142
6.1	The Score of the Balanced Scorecard From the Implementation Results of Case Study 2 Enterprise by the Author	174
6.2	The Score of the Balanced Scorecard from the Implementation Results of Case Study 2 Enterprise by the Management Representative	175
7.1	The Score of the Balanced Scorecard from the Implementation Results of Case Study 3 Enterprise by the Author	209
7.2	The Score of the Balanced Scorecard from the Implementation Results of Case Study 3 Enterprise by the Management Representative	211
8.1	Summary of Factors that Related to Adoption of the Integrated Safety, Occupational Health, and Environmental Management System by SMEs	216
8.2	The Evaluation Results of the Integrated Safety, Occupational Health and Environmental Management System	233
8.3	Consultancy Program for Implementing the Integrated Safety, Occupational Health, and Environmental Management System in SMEs (As of 2018)	243

LIST OF FIGURES

Figures	Page
2.1 Conceptual Framework of Safety, Occupational Health and Environmental Management System	42
2.2 Basic design of a Balanced Scorecard Performance System	44
2.3 Integration of Environmental and Social Aspects in 4 Perspectives of BSC	47
2.4 Modified BSC for Evaluation of Energy Management and Global Warming Mitigation	48
3.1 Research Procedure	51
4.1 Safety, Occupational Health and Environmental Management System Framework	99
5.1 Map of Case Study 1 Enterprise	115
5.2 Automotive Part Products	115
5.3 Stamping Automation	117
5.4 Robot Arc Welding	117
5.5 Spot Welding	118
5.6 Process Flow Diagram	119
5.7 Safety, Occupational Health, and Environmental Policy	122
6.1 Map of Case Study 2 Enterprise	144
6.2 Copper and Brass Strips	145
6.3 Process Flow Diagram of Case Study 2 Enterprise	147
6.4 Safety Policy	150
6.5 Environmental Policy	151
7.1 Map of Case Study 3 Enterprise	178
7.2 Hose Clamp, Insert Collar and Wire Spring	179
7.3 Business Flow Diagram	180
7.4 Safety and Environmental Policy	185

8.1 The Design Integrated Safety, Occupational Health and Environmental Management System for Metal Product Manufacturer SMEs.	221
8.2 The Integrated Safety, Occupational Health, and Environmental Management System for SMEs Implementation Flowchart	241

CHAPTER 1

INTRODUCTION

1.1 Statement and Significance of the Study

Small and medium-sized enterprises (SMEs) are a significant sector of Thailand's economy. According to the Office of SMEs Promotion (OSMEP) report in 2017, Thailand has total 3,046,793 firms of SMEs and represent 99.78% of all firms in Thailand and account for 82.22% of jobs in all sectors. Moreover, SMEs contribute 42.4% to total GDP in Thailand (SME Annual report, 2017) with the 5.1% growth rate from 2016. The economic growth of SMEs and high rate of employment have an impact on injury and illness rate in the SMEs sector. The report of Social Security Office during 2011-2015 shows that injury and illness rate per 1,000 workers of SMEs is higher than large firms as shown in the following data. In 2011 the firms with 20-49 employees have the highest injury and illness rate per 1,000 workers at 20.73 cases per 1,000 employees, 19.32 cases in firms with 50-99 employees and 18.69 cases in firms with 100-199 employees respectively. In 2012 the report shows that the firms with highest injury and illness rate are firms with 20-49 employees at 18.43 cases, following by firms with 50-99 employees at 17 cases and small firms with 10-19 employees at 13.73 cases. In 2013-2014 the firms with employees between 20-49 employees have the highest injury and illness rate at 14.62 cases and 12.17 cases respectively. In 2015 the highest injury and illness rate was found in firms with 20-49 employees at 11.45 cases, while the lowest injury and illness rate is shown in large firms with employees more than 500. In 2016 the occupational accident and injury in SMEs represents 50.4% of total occupational accidents and injuries, the

firms with 51-100 employees have the highest injury and illness rate per 1,000 workers at 10.51 cases per 1,000 employees, Additionally, in 2017 the occupational accident and injury in SMEs represents 51% of total occupational accidents and injuries. The accident statistic in Thailand is consistent with the study of Sørensen *et al.* 2007 who mentioned that occupational accident in SMEs was higher than in large enterprises.

Although SMEs are important for the world economy and represent a large number of employees, in the past occupational health and safety researchers in most country paid little attention to occupational health and safety for SMEs (Pingqing, L., Fang, L., & Chunjing, G., 2006). Especially the literature review of methods and tools for prevention in occupational health and safety is found only around 30% of all literature reviews on occupational health and safety prevention activities (Peter HASLE and Hans Jorgen LIMGORG, 2005). Many scholars indicate that SMEs have difficulty operating occupational health and safety management in their firms. Mudavanhu, Zhou and Dzombal (2014: 407-418) describe that small and medium enterprises in Zimbabwe have insufficient safety and occupational health program, and most employees feel unsatisfied with occupational health and management system in their workplaces. Kheni, Dainty and Gibb (2005: 105-114) reveal that finances, access to technology and management expertise are the constraints on establishing health and safety management plan in small subcontractors. SMEs are still facing the problem in limited access to economic, human and technology resources. Moreover, the specific method is necessary for SME to promote their OHS awareness and management within their organization (Pingqing, L., Fang, L., & Chunjing, G., 2006).

On environmental issues, SMEs generate about 70% of global pollution (Burke & Gaughran, 2007 as cited in Jamian, Rahman, Deros and Ismail, 2012), while SMEs in EU account for approximately 64% of industrial pollution (Calogirou C. *et al.*, 2010 as cited in European Union, 2015) and SMEs in the UK account for around 60% of carbon dioxide emissions (Stokes/Rutherford, 2000 as cited in Michael Bist, 2007) and the environmental damages that have taken place can cause adverse effects on the sustainability of the environment and human life (Yuliani, 2015). Unfortunately, no data is provided about the amount of pollution that was generated by SMEs in Thailand. Thailand State of Pollution Report 2016 indicates that Thailand is still facing air quality problem and the increasing amount of hazardous wastes from industries. With a large

number of SMEs in Thailand, it has been realized that SMEs are significant sources of pollution. SMEs have a limitation in resources, time and expertise to implement environmental requirements and low level of awareness on solving their environmental issues (European Union, 2015). With the limitation of resources, the implementation of an environmental management system in SMEs will decrease if compared with larger enterprises (B.M. Granly, T. Welo, 2014)

Recently many companies have implemented quality, environmental and occupational health and safety management system and expect the result in term of profit and reliability (Sanz-Calcedo, González, Lopéz, Salgado and Cambero, 2015). However, the complexity of internal activities and external challenge should be considered to fulfill the requirements for management system and with this goal many organizations select to implement an integrated management system (IMS) (Raisiene, 2011). SMEs can obtain many benefits from adopting integrated management system that can be grouped into two categories: internal benefits and external benefits. Organizational, financial and people benefits are the internal benefits while the external benefits are commercial, communication and quality/environmental/safety (Rajković, Miličević and Malbasić, 2007). On the other hand, SMEs are facing many barriers to implementing IMS. Rajkovic, Alesksic, Milicevic, and Cudic (2008) reveal that the barriers for SMEs are defined into two categories: internal barriers and external barriers. Lack of resources, attitudes, and implementation problem are the main issues for internal barriers, while lack of support and guidance, economic problem and higher cost of certification are the important issues of external barriers.

Due to many barriers to IMS implementation and difficulty in implementing IMS when compared with large firms, Stamou (2003) states that SMEs need assistance and specific guidance on how to implement an integrated management system.

This study explores the motivators and barriers for SMEs in Thailand to implementation of occupational health, safety, and environmental management system and creates new integrated occupational health, safety and environmental management system that is suitable for SMEs as it takes fewer resources than existing management systems. SMEs can improve occupational health, safety and environmental performance in their organizations from implementing this newly integrated management system.

This study will focus on metal product manufacturing SMEs in Thailand as metal product manufacturers have the highest injury and illness rate per 1000 employees (Social security, 2015) and the iron and steel industry has significant impact on global environment. Steel production generates significant amount of air pollutants, solid by-products and residues, as well as wastewater sludge (South East Asia Iron and Steel Institute, 2008). Additionally, the study can support the Eastern Economic Corridor (EEC) project at Chonburi, Rayong and Chachoengsao provinces, so metal product manufacturing SMEs are the target business of this study. The result of this study provides the model of Integrated safety, occupational health, and environmental management system for small and medium enterprises to improve their environmental performance, prevention of injury and illness, and increase their competitiveness as well. Moreover, SMEs' good performance will strengthen the economic growth in this region. Finally, this study also supports the twelfth national economic and social development plan of Thailand (2017-2021) (Office of the National Economic and Social Development Board, 2017) that recognizes global change, especially in economic competition, the rapid technology development which has a significant impact on social life and economic. While Thailand faces the limitation of basic strategy which obstructs the country's development, the sufficiency economy is the main direction of Thailand development plan. It focuses on human development, strengthening economic growth, natural resources conservation and connects Thailand with other countries. Especially in economic strengthening, Thailand will support SMEs to apply innovation and technology to produce goods and provide services which are environmental-friendly.

Finally, the appropriate integrated safety, occupational health and environmental management system will enhance metal product manufacturing SMEs to have a potential in global competition and support the green supply chain in Thailand. Moreover, the new alternative management system will enhance the safety performance and sustainable safety culture in SMEs too.

1.2 Research Question

What is the appropriate model of integrated safety, occupational health and environmental management system for the small and medium-sized enterprises of metal product manufacturers in Thailand?

1.3 Objectives of the Study

1) To identify the occupational health risks, environmental aspects, motivators, and barriers to adopting the integrated safety, occupational health and environmental management system in small and medium enterprises of metal product manufacturers in Thailand.

2) To identify the factors related to the adoption of the integrated safety, occupational health and environmental management system by SMEs.

3) To design integrated safety, occupational health and environmental management system from the integration of ISO 14001: 2015, OHSAS 18001: 2007 and ISO 45001: 2018 for small and medium enterprises of metal product manufacturers in Thailand.

4) To trial an integrated safety, occupational health and environmental management system in pilot SMEs and evaluate the implementing results.

To accomplish the above objectives, the following tasks were planned.

1) Review and analyze the requirements of ISO 14001: 2015, OHSAS 18001: 2007 and ISO 45001: 2018 as well as alternative safety and occupational health and environmental management system for the small and medium enterprise.

2) Review and analyze the motivators and barriers for SMEs to adopt an environmental management system and occupational health and safety management system from the literature review.

3) Interview experts on how to develop integrated safety, health and environmental management system to fit the characteristics of SMEs, including the motivators and barriers to implementing the integrated safety, occupational health and environmental management system by SMEs.

4) Collect data from questionnaires to identify the occupational health risks, environmental aspects, motivators and barriers to adopting the integrated safety, occupational health and environmental management system in small and medium

enterprises of metal product manufacturers in Thailand. The relationship between SME size, SHE policy, safety problems, environmental problems and the interest in adopting safety, occupational health and environmental management system has been analyzed by Pearson Chi-square to identify which factors are correlated with the interest of such management system adoption, based on the following hypotheses.

Hypothesis 1: Business size has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 2: SHE policy has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 3: Safety problem - machine hazard has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 4: Safety problem - biological hazard has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 5: Safety problem - physical hazard has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 6: Safety problem - ergonomics hazard has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 7: Safety problem - chemical hazard has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 8: Safety problem - stress hazard has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 9: Environmental problem - waste has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 10: Environmental problem – wastewater has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 11: Environmental problem - noise has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 12: Environmental problem - air emission has a relationship with the interest in the safety, occupational health, and environmental management system adoption

5) Develop a new alternative model of integrated safety and occupational health and environmental management system, which integrates ISO 14001: 2015, OHSAS 18001: 2007 and ISO 45001: 2018.

6) Trial an integrated safety, occupational health and environmental management system in pilot SMEs and evaluate the implementing results by using the balanced scorecard.

1.4 Expected Benefits of the Study

1) Exploring the occupational health risks and environmental aspects in SMEs of metal product manufacturers in Thailand.

2) Exploring the motivators and barriers which are related to the adoption of the safety management system and occupational health and environmental management system in SMEs.

3) A new alternative model of integrated safety and occupational health and environmental management system for metal product manufacturing SMEs has been developed and it can minimize the resources by integrated management system implementation.

4) SMEs have guidelines for managing environmental aspects and preventing injury and illness in their organizations as basic safety and occupational health and environmental management system and can improve them to meet international standards in the future.

5) The government sector can promote this new alternative management system of safety, occupational health and environmental to steel manufacturing SMEs.

1.5 Definitions

1.5.1 Medium Enterprises

Means manufacturing or service enterprise with fewer than 200 employees or fixed assets more than 50 million baht but not exceeding 200 million baht, wholesale enterprise with more than 25 employees but not more than 50 employees or enterprise with fixed assets more than 50 million baht but not exceeding 100 million baht, retail enterprises with more than 15 employees but not more than 30 employees or enterprise with fixed assets more than 30 million baht but not exceeding 60 million baht (Royal Thai Government Gazette, 2002).

1.5.2 Small Enterprises

Mean manufacturing or service enterprise with not more than 50 employees or fixed assets not exceeding 50 million baht, wholesale enterprise with more than 25 employees but not more than 50 employees or enterprise with fixed assets not exceeding 50 million baht, retail enterprises with not more than 15 employees or enterprise with fixed asset not more than 30 million baht (Royal Thai Government Gazette, 2002).

1.5.3 Integrated Safety, Occupational Health and Environmental Management System for SMEs

Means part of the management system for the organization which is used to determine and implement safety, occupational health, and environmental policy and to cope with the business risks.

1.5.4 Integrated Safety, Occupational Health and Environmental Management System Model for Smes

Means the management system or part of the management system used to achieve the safety, occupational health, and environmental policy for SMEs.

CHAPTER 2

LITERATURE REVIEW

2.1 Small and Medium Enterprises Act in Thailand

According to the Small and Medium Enterprises Promotion Act B.E. 2543 Section 3 “Enterprise means manufacturer, service, wholesale, retailer or other enterprises that was defined by the Minister in the regulation”

Section 4 “Small and Medium Enterprise means manufacturing sector, service sector, wholesale sector and retail sector or other enterprises with employment, fixed asset value or registered capital comply with the defined condition of the committee.

According to Ministerial regulation on the prescribing of employment standard and fixed asset value of small and medium enterprises B.E. 2545, small and medium enterprises have been identified with the following terms and conditions.

2.1.1 Small enterprises are defined as follows

2.1.1.1 A manufacturer with 50 employees or fewer or has total fixed assets of no more than fifty million baht.

2.1.1.2 Commercial service with 50 employees or fewer or has total fixed assets of no more than fifty million baht.

2.1.1.3 Wholesale with 20 employees or fewer or has total fixed assets of no more than fifty million baht.

2.1.1.4 Retail with 15 employees or fewer or has total fixed assets of no more than thirty million baht.

2.1.2 Medium Enterprises are Defined as Follows

2.1.2.1 A manufacturer with more than 50 employees but fewer than 200 employees or has fixed assets more than fifty million baht but fewer than two hundred million baht.

2.1.2.2 Commercial service with more than 50 employees but fewer than 200 employees or has fixed assets more than fifty million baht but fewer than two hundred million baht.

2.1.2.3 Wholesale with more than 25 employees but fewer than 50 employees or has fixed assets more than fifty million baht but fewer than one hundred million baht.

2.1.2.4 Retail with more than 15 employees but fewer than 30 employees or has fixed assets more than thirty million baht but fewer than sixty million baht

2.1.3 In case of the number of employees meets the criteria of small enterprise but fixed asset value meets the criteria of medium enterprise, or the number of employees meets the criteria of medium enterprise but fixed asset value meets the criteria of small enterprise, the lower number of employees or fixed asset value will be the main criteria used to define the enterprise.

2.1.4 For the Number of Employees or Fixed Asset Value According to 2.1.1 and 2.1.2, the Following Criteria must be Considered.

2.1.4.1 Number of employees must be considered based on employment contract according to the law.

2.1.4.2 Fixed asset value must be considered with following criteria

1) Net fixed asset excluding land with the evidence of the latest financial statement by a bookkeeper or the latest financial statement of enterprise which was audited by the certified auditor and must comply with financial law.

2) Net fixed asset excluding land according to the revaluation result of the financial institution or trusted financial advisor.

In case the fixed asset values from 1) and 2) are different, the lower value must be the fixed asset value.

2.2 Small and Medium Enterprises in Thailand

In 2017, Thailand has a total of 3,053,471 enterprises and 3,046,793 enterprises are small and medium enterprises (SMEs), SMEs represent 99.78% of all enterprises in Thailand with the expansion rate of 1.30% from 2016. The largest number of enterprises is small enterprise, accounted for 99.40% of all enterprises, and small enterprise represents 99.18% of all SMEs in Thailand. Most enterprises are Trade sector, Service sector and Manufacturing sector that represent 98.49% of the total SME in Thailand.

Table 2.1 below lists the number of Thai SMEs by business sector. The largest number of SME was found in the Trade sector with 1,268,202 enterprises that represent a year-on-year growth of 1.26% and 41.62% of the nationwide SME total. Next enterprise density was in the Services sector with 1,206,763 operators, representing 39.61% of the nation's SME population. 525,975 SMEs were found in the Manufacturing sector and making up 17.26% of the nationwide total. The Agri-business represents 1.50% of the SME population with 45,853 operators.

Table 2.1 Number of total enterprises depending on size of enterprise in 2016-2017

Size of enterprises	2016			2017		
	Number of enterprises	Percentage per all enterprises	Percentage per SMEs	Number of enterprises	Percentage per all enterprises	Percentage per SMEs
Small and Medium enterprises (SMEs)	3,007,620	99.80	100.00	3,046,793	99.78	100.00
Small enterprises	2,990,604	99.23	99.43	3,028,495	99.18	99.40
Medium enterprises	17,016	0.56	0.57	18,298	0.60	0.60
Large enterprises	6,084	0.20	0.20	6,662	0.22	0.22
Unidentified size	18	0.00	0.00	16	0.00	0.00
Total	3,013,722	100.00	-	3,053,471	100.00	-

Source: Office of Small and medium enterprise promotion, 2017

In 2017, all enterprises in Thailand employed 14,785,172 jobs. The number of 2,629,525 jobs was employed in the large enterprise, and there were 12,155,647 jobs in small and medium enterprises representing 82.22% of the nationwide hiring total. The small enterprises (SE) have the largest share of employment at 72.57% and represents the highest proportion of SMEs at 88.26%. Most of the employees in SMEs are in the SME service sector representing 86.70%, which was 4.14% higher than the previous year as shown in Table 2.2

Table 2.2 Total employment classified by enterprise size in 2016-2017

Size of enterprises	2016			2017		
	Employment	Portion per total enterprises	Portion per SMEs	Employment	Portion per total enterprises	Portion per SMEs
Small and medium enterprises (SMEs)	11,762,963	82.97	-	12,155,647	82.22	-
Small enterprises (SE)	10,446,482	73.68	88.81	10,729,124	72.57	88.26
Medium enterprises (ME)	1,316,481	9.29	11.19	1,426,523	9.65	11.74
Large enterprises (LE)	2,414,898	17.03	-	2,629,525	17.78	-
Total enterprises	14,177,861	100.00	-	14,785,172	100.00	-

Source: Office of Small and medium enterprise promotion, 2017

Considering the employment of small and medium enterprises as defined by enterprise size in 2017, it is found that the manufacturing sector employed only 21.51 % of all SMEs employment while the service sector had the highest proportion of employment 47.68% of all SMEs employment. In addition, Trade sector employed

30.26 % of total SMEs employment and the Agri-business sector employed 66,205 jobs that represents 0.54% of total SMEs employment.

SMEs are important for the Thai economy. They represent 42.4% of total GDP in 2017 with 6,551,718 million baht, with small enterprises representing 30.0% and medium enterprises representing 12.4%. According to GDP of SMEs in 2017 classified by economic activity, 40.4% of SMEs GDP was generated by the service sector, followed by manufacturing sector and trade and maintenance sector at 27.1% and 15.9% respectively as shown in Table 2.3

Table 2.3 GDP of SMEs in 2017

Economic activity	Domestic GDP		SMEs GDP	
	Portion per total GDP (Percentage)	Expansion rate (Percentage)	Portion per SMEs GDP (Percentage)	Expansion rate (Percentage)
Agriculture sector	8.7	+6.2	N/A	N/A
Manufacturing	27.1	+2.6	22.9	+2.5
Trade and maintenance	15.9	+6.3	29.9	+6.3
Service sector	40.4	+5.6	40.9	+6.6
Other	7.9	-1.5	6.3	-2.5

Source: Office of Small and medium enterprise promotion, 2017.

SMEs are significant driver for Thailand's development, however the growth of SMEs can also increase the rates of injury and illness (Social security, 2017). In 2017, SMEs generated 43,576 cases of work-related injury and illness from total cases and represent 50.51% of total injury and illness cases in Thailand as shown in Table 2.4

Table 2.4 Work-Related Injury and Illness Statistic

Size of enterprise (Total employee)	Injury and illness (person)	Percentage of injury and illness
1-10 employees	8,139	9.43
11-20 employees	6,024	6.98
21-50 employees	10,573	12.25
51-100 employees	9,139	10.59
101-200 employees	9,701	11.24
201-500 employees	14,046	16.28
501-1,000 employees	8,602	9.97
>1,000 employees	20,054	23.24
Total	86,278	100.00

Source: Social security office, 2017.

2.3 Occupational Health and Safety Management System and Environmental Management System in SMEs

2.3.1 Occupational Health and Safety Performance in SMEs

Research on occupational health and safety for SMEs is rarely found in both developed and developing countries. In this regard, the researcher must focus on SMEs, because many pieces of evidence show that the occupational accidents in SMEs are higher than in larger enterprises (Health and safety executive, 2007). Managing safety in SMEs is different from large enterprises. Poor safety management and performances are related to the particular characteristics of SMEs (Legg, Olsen, Laird and Hasle, 2015). The general factors affecting on a low safety performance of SMEs are: (1) lack of financial resources; (2) lack of occupational health and safety management skill; (3) no employee's representative in occupational health and safety; (4) low commitment of manager to occupational health and safety management; (5) non-permanent workforce; (6) non-compliance with OHS legislation; (7) informal prevention approach to OHS management; (8) low skills in management and training; (9) bad relationship with legislation agency; (10) dependency on the requirements of large enterprises; (11)

difficult to understand and implement the safety and occupational health practices (Mayhew, 1997, Mayhew and Quinlan, 1997; Rigby and Lawlor, 2001; Champoux and Brun, 2003; Walters and Lamm, 2003; Walters, 2004 as cited in Arocena and Nunez, 2010; S.J Legg et al., 2015).

SMEs prefer to use oral communication rather than written communication. They have limited knowledge of safety and occupational health legislation. They have a tendency to place the responsibility on safety and accident prevention to workers. They are not aware of hazards from chemicals in workplace. They lack knowledge on health effects especially in long-term health effects. Moreover, hazard controls are not generated from the process of risk assessment but dependent on practice.

SME owners pay their attention to urgent issues and spend less time in safety management (S.J Legg et al., 2015). Most of SMEs mainly focus on their business. According to Duijm, Fiévez, Gerbec, Hauptmanns and Konstandinidou (2008), the industry's objective is mainly focused on competitive production and maximizing the benefits. They also consider that the management of safety and environment is the management of constraints and not a main objective of the business.

Moreover, companies consider that HSE management system is more complicated and formal and the simple Health, Safety and Environment management system is needed for the organizations. Especially in SMEs, as discussed by Hasle and Limborg (2006); Micheli and Gagno (2010), there is strong evidence for high accident risks in small enterprises. Similarly, Arewa and Farrell (2012) stated that the risk of occupational accident in SMEs is higher than large enterprises. With reference to the European Union SME sector information, there are more than 4,100 three days accident absences, while in large enterprises only 3088 accidents (Arewa and Farrell, 2012).

The analysis of characteristics and effectiveness of OHS management system in 193 Spanish manufacturing SMEs show that all functions in the organization were carried out by owner or manager including OHS. A large number of firms pay less attention to executing hazardous tasks and lack of review process for an emergency procedure. Moreover, a significant number of SMEs do not comply with legal requirements and poor participation of worker in risk prevention activities. Finally, there is a lack of coordination between SMEs and subcontractors in OHS activities (Arocena and Núñez, 2010).

Regarding the cost of compliance with health and safety regulations, SMEs spend more on remedial health care and safety systems that affect their financial performance. Moreover, the ability to control the risk of SMEs is lower due to the limitation of human and economic resources (Hasle and Limborg, 2006). Similarly, small enterprises have difficulties in implementing legal requirements related to occupational health and safety. In addition, the cost to implement the control measures to comply with legal requirements for small enterprises are higher than large enterprises (Hasle and Limborg, 2006). The main reasons of SMEs for non-compliance with safety legislations are lack of knowledge about legal requirements including how to implement those safety requirements, and the financial and poor management issues (Health and Safety Executive, 2003 as cited in Arewa and Farrell, 2012). Department for Business, Enterprise and Regulatory Reform (2008) indicates that in compliance with health and safety prevention requirements, SMEs spend six times more per one employee compared to large enterprises. Similarly, the study of Health and Safety Executive (2003) defines as “it costs SMEs on average £341 per employee, per year to comply with health and safety compared to £37 per employee, per year for large organisations”. Additionally, Federation of Small Business (2006) reveals that average cost for SMEs to rectify non-conformity of health and safety legislation is £598 per employee per year, and that cost has a great effect on their financial performance.

SMEs get the great impact from non-compliance with health and safety regulations and this problem seriously affect their financial performance (Arewa and Farrell, 2012). However, SMEs need to comply with occupational health and safety regulations to reduce all costs related to the regulations as well as improve the availability of necessary resources and raise up the effectiveness of their performance (Dorman, 2000; Smallman and John, 2001; BERR, 2008 and Arocena and Nunez (2010). Although, SMEs need a consultant to advise them how to implement the safety requirements, SMEs still have a problem with the cost of occupational health and safety consultants (S.J. Legg et al., 2015).

With reference to the specific characteristics of SMEs, they make SMEs face difficulty in managing occupational health and safety in their organization. The following advice can explain how to improve OHS within SMEs; (1) Provide risk prevention methods to all employees and sub-contractors that need support from third-

party organization, (2) Provide clear and specific implementation manual, (3) Increase participation of worker in occupational health and safety management, (4) Periodically revise emergency response procedure, (5) Provide documents of preventive activities and keep record of incident investigation, (6) Provide effective OHS training, (7) Improve work environment to fit employee's requirements, (8) Conduct health check for employees related to occupational risks, and (9) Encourage OHS with outsourcing and sub-contractors to promote the best OHS practice (Arocena and Nunez, 2010; Lansdown et al., 2007)

2.3.2 SMEs and Environmental Management System

An environmental management system (EMS) is a part of an organization's management system which ensures that environmental policy will be developed and implemented to manage their environmental aspects for better environmental performance and sustainability (ISO, 2015). Many benefits from EMS implementation including:

- waste defect reduction,
- regulatory and industry compliance,
- protecting the business,
- reducing business risk,
- environmental improvements,
- increasing the competitive edge,
- resources efficiency improvement,
- cost savings,
- image improvement,
- increase motivation and awareness of company staff
- correct the problem that obstructs sustainable environments.

(Biondi et al., 1998; Heras and Arana, 2010; Hillary, 1999; McKeiver and Gadenne, 2005 as cited in Granly and Welo 2013; Zorpas, 2010)

EMS can help to improve relations with customers because larger purchasers require their suppliers to implement EMS to ensure the environmental improvements (Commission for Environmental Cooperation, 2005). Especially benefits for SMEs, Zorpas (2010) indicate that four significant benefits are the answer that why SMEs need

EMS, (1) Financial benefit : An effective EMS can reduce waste and save money, (2) Markets benefit : Customer requirement in “Green consumerism” is the key of environmentally friendly products and services, (3) Legislation benefit: EMS can reduce the risk of non-compliance with the law and create good image for the regulator, (4) Benefit of community and employee relations: EMS can enhance a better relationship with the communities. Moreover, EMS can be the robust foundation for a further step of international standards implementation such as ISO 14001 for SMEs.

The most widely implemented international environmental management system in organization is ISO 14001 standard. According to the latest available official data from ISO, the number of ISO 14001 certificates exceeds 300,000 in over 171 countries around the world (ISO, 2017). However, “EMS are often implemented in larger enterprises, but the likelihood of having an EMS implemented decreases with reduced company size” (Granly and Welo, 2014). Additionally, there is a negative perception of SME managers towards environmental investment (Nkoli Augustina 2013 as cited in Jaiswal 2014). However, the external pressure from their customers force SMEs to implement ISO 14001 which is the standard demanded by the customers with no choice to consider other standards (Bist, 2007), while regulation from the government is one of major pressures to engage environmental management in SMEs (Zarpas, 2010)

For EMS implementation in SMEs, Granly and Welo (2014) indicated that EMS was likely implemented by larger companies and decrease to implement EMS with small-sized company. Hitchens, Clausen, Trainor, Keil and Thankappan (2003) revealed the result of a survey in SMEs of UK, Ireland, Germany and Italy that only small percentage of SMEs had implemented an EMS and mainly focused only on waste reduction and efficiency of energy. SMEs always have difficulty identifying the environmental impact of operation processes, because their small size makes them underestimate their pollution. In addition, micro to small-sized enterprises prefer to implement informal management system. (Bist, 2007). To support this idea, alternative EMSs have been developed such as Ekoscan and Eco-Lighthouse that still maintain basic framework of formal EMS but less bureaucratic and/or provide more stages of implementation (B.M. Granly and T. Welo, 2014)

However, SMEs still face many challenges in implementing environmental management system. According to Jaiswal (2014), the study of Indian SMEs context

shows that SMEs' lack of innovation and practice guidance as well as poor understanding of environmental and energy issues of their business lead to ineffective productivity and a high consequence of environmental impact.

To understand how challenging for SMEs to implement environmental management system and safety management system, a review of the existing literature has been conducted to find motivators and barriers for adopting such management system in SMEs that is summarized in Section 2.4

2.4 Motivators and Barriers to EMS and OH&S MS adoption by Small and Medium Enterprises

2.4.1 EMS Motivators and Barriers

2.4.1.1 Motivator to EMS adoption in SMEs

The motivator is “a factor that causes a particular phenomenon to occur or develop” (B.M. Granly, T. Welo, 2014). According to Bansal and Roth (2000 as cited in B.M. Granly and T. Welo, 2014), motivators for environmental practices can be categorized into three types; competitiveness, legal compliance and environmental responsibility.

Commission for Environmental Cooperation (2005) stated that the drivers of EMS adoption by small and medium enterprises in Canada, Mexico and the United States are economic factors, customer requirements, trade association requirements. On the other hand, lack of awareness and knowledge about environmental management are important barriers to EMS adoption in SMEs. And the National Environmental Education and Training Foundation (NEETF) of United States (2001 as cited in Commission for Environmental Cooperation, 2005) state that there are 3 categories of barriers to EMS implementation in SMEs as follows; motivation, resources issue and implementation concerns.

Natarajan & Wyrick (2012) indicate that motivators and barriers to adopting environmentally sustainable practices are the same in most regions of the world. However, in developing country some factors are different, i.e. political leadership and political stability. List of barriers and motivators are shown in Table 2.5

Table 2.5 List of Barriers and Motivators by World Region

Region	Barriers	Motivators
United States	Lack of technical expertise	Need for networks
	Lack of information	
Canada	Lack of information	Internal drive
	Lack of training	Risk reduction
	Lack of experience	Cost reduction
	Lack of finance	Government regulation
Europe	Lack of finance	Local interests
	Lack of time	Legislation
	Lack of expertise	Public awareness
	Lack of information	Owner's Environmental perspective
South America	Lack of finance	Legal compliance
	Lack of other resources	Cost reduction
	Rigid legal framework	
Asia	Lack of finance	Reputation
	Lax environmental enforcement	Educating the public (Iran)
Oceania	Lack of finance	Customer demands
		Competitor performance
		Legislation

Source: Natarajan & Wyrick, 2012

Another motivator which can drive EMS for SMEs is SME managers with higher academic degrees that tend to implement EMS within the organization (Hudson and Orviska, 2013; Mckeiver and Gadenne, 2005). The parent organization can be a motivator of EMS adoption by providing EMS template to support subsidiary company which can reduce EMS implementation cost (Darnall and Edwards, 2006).

And the previous experience of management system implementation can assist a company for EMS adoption in term of cost-effective (Biondi, Frei and Iraldo, 1998).

2.4.1.2 Barriers to EMS Adoption in SMEs

SMEs usually have a limitation in human resources and financial resources (European Commission, 2003). Due to these limitations, SMEs hardly decide to invest in EMS when considering a diseconomy of scale (Heras and Arana, 2010). Furthermore, due to the company's small size, there is a shortage of human resources and the increased job duties of the employees make them have no time to do any tasks outside the scope of daily works (Biondi et al., 1998). Hillary 1999; CFIB 2001; Coglianese and Nash 2002 as cited in Commission for Environmental Cooperation (2005) reveal that "SMEs are less likely to implement EMSs, because they are largely occupied with the day-to-day concerns of keeping their businesses viable and retaining existing customers. When compared with larger businesses that are not a subsidiary of multinational companies, SMEs generally do not have dominant market positions; they have less well-defined management structures; they have no support from a parent company; they generate less environmental data; they have less environmental expertise and fewer financial and technical resources available to pursue environmental management; and they tend to have less interaction with regulatory agencies." In the Indian context, SMEs have also faced with other barriers of implementing EMS, e.g. problem of expertise training, lack of innovative ideas and initiative tailored for SMEs, poor understanding of the business case for environmental and energy issues, human resources skill, human resources shortage. (Jaiswal, 2014)

Bist, M. (2007) reveals that barriers to implementation of EMS in SMEs are lack of commitment, aversion to formalized systems, high costs of certification, lack of information about EMS, lack of financial resources as implementation of EMS incur high costs to a company, lack of necessary skills and other resources. And the last barrier is risk aversion that makes SMEs invest less due to their uncertainty about the future.

SMEs always have human and financial resources limitation (European Commission, 2003). With the limitation of resources, staff have little time for other tasks outside their scope of daily work and also lack of expertise and sustainable knowledge within the organization (Biondi et al.1998). Moreover, SMEs consider that

environmental responsibility results in additional cost and cannot make a profit for the organization (McKeiver and Gadenne, 2005). Hillary (1999 as cited in Michael Bist, 2007) state that external motivator for EMS implementation in SMEs are insurance costs, reducing the opportunity for financial backing, waste disposal cost, a few landfill sites and supply chain pressure. However, internal drivers are the aim of employees and stakeholders, e.g. waste reduction, boost customer satisfaction, opportunity to produce better products, new market opportunities. There is also an internal driver from employee understanding in the EMS standard and its benefit for the organization.

For many researchers, barriers to EMS adoption can be separated as internal and external barriers. Internal factors are the obstacles inside the organization while external factors affect the company from the outside. Furthermore, motivators are separated into internal and external in Table 2.6

Table 2.6 List of Barriers and Motivators to EMS Adoption in SMEs

Factors	Internal	External
Barriers	<ul style="list-style-type: none"> - Lack of finance - Lack of expertise - Lack of time - Lack of resources - Company culture - Lack of commitment - Human resource shortage - Lack of innovative ideas - Poor understanding of the business case for environmental and energy issues - Generate less environmental data - Less well-defined management structures - Environmental responsibility perception - Risk aversion 	<ul style="list-style-type: none"> - Lack of information - Government stability - The high cost of certification - Formalized systems - Lack of initiative tailored for SMEs - No support from the parent company

Table 2.6 (Continued)

Factors	Internal	External
Motivators	<ul style="list-style-type: none"> - Competitor performance - Environmental responsibility - Cost reduction - Benefit of employee relation - Internal drive - Lower liability - Need for networks - Previous experience of management system implementation - Increase customer satisfaction - Ability to produce better products - EMS is an opportunity (Understand the standard) 	<ul style="list-style-type: none"> - Customer demands - Legislation - Environmental responsibility - Trade association requirement - Benefit of community relation - Reputation - Support from parent company - Stakeholder pressure

Source: Thepporn Jaroenroy, 2018

2.4.2 Barriers and Motivators in Safety Management System

Implementation in SMEs

2.4.2.1 Barriers to implementing a safety management system in SMEs

Managing safety in SMEs differs from large enterprises and the characteristic of SMEs resulting in poor management and performance in OHS. These characteristics make it difficult for SMEs to implement and maintain safe and healthy workplace as well as exposed more frequently to hazards that result in higher frequency of injuries and illnesses than large enterprises (S.J.Legg et al., 2015). Walters (2001), Champoux and Brun (2003) and Jingdong and Han (2012) state that SMEs have a constraint of resources resulting in difficulty to implement OH&S effectively. Kheni, Gibb and Dainty (2010) reveal that the key barriers to effectively implement OH&S

management system in Ghanaian SMEs are “ineffective prevention services, low socio-economics status of workers, size-related constraints and owner/manager’s commitment to extended family goals”. The study of S.Unnikrishnan et al. (2015) in Estonia indicate that international company that implements OHSAS 18001 get 4-10 times of score in safety level higher than SMEs. Research has been carried out into the difficulties SMEs face regarding Occupational, Safety and Health (OSH) management. Sorensen, Hasle and Bach (2007, as cited in Floyde, Lawson, Shalloe, Eastgate and Cruz, 2013) state that SMEs face difficulty to comply with regulation when making efforts to implement OSH Management system. Arocena and Nunez (2010) demonstrate that SMEs must face with limited financial resource, manager’s lack of management skills, no commitment in OSH from the manager, no OSH representative from the workforce, credence on outsourcing and larger firms, rare experience of OHS inspection and non-standard approaches to preventive action. Moreover, Champoux and Brun (2003 as cited in Floyde et al., 2013) indicate that SMEs lack financial resources and management skill and low commitment from management, while Mudavanhu, Zhou and Dzomba (2014) reveal that SME manager has many responsibilities and set health and safety issues like a low priority that results from a lack of knowledge on how to obtain the benefits of OHS management. Many SMEs’ owners/managers consider that health and safety should be an employee responsibility (Hasle, P., & Limborg, H. J., 2006).

Lammin (2003) defines as the main barrier of safety management of SMEs in Leicestershire is the lack of accessible, reliable and competent advice source for small businesses. In addition, safety skills deficiency and lack of training opportunities are shown on the poor safety performance of the small business. Health and safety executive (2007) study to quantify prevalence of health and safety activity in UK SMEs about their constraint to good health and safety, the findings show that SMEs in UK lack of time allocated to health and safety. It is consistent with the study of Vassie, Tomàs and Oliver (2000) reveal that SMEs in the UK and Spain spent only three and five hours per week on OHS management matters and did not hire a full-time professional health and safety officer of their site but OHS management is additional job. While the study of Legg, S. J., Olsen, K. B., Laird, I. S., & Hasle, P. (2015) indicate that key barriers which affect safety management in SMEs are low level of management

and training skill, difficulty of regulations and codes compliance, lack of resources, bad relationship with regulatory agencies, OHS consultation cost and trouble to implement good safety practices.

The most frequent barriers to OHS intervention for SMEs are identified in three main issues: regulation, resources and information (Masi & Cagno, 2015). Financial burden and safety terminology are the common barriers for small enterprises to promote health and safety activities (Hasle, P., & Limborg, H. J., 2006). Another barrier related to the characteristic of SMEs is the difficulty of formal structure establishment such as safety committee because SMEs prefer informal method (Hasle, P., & Limborg, H. J., 2006). In addition, the main barriers that affect good OHS practice are financial constraints, huge investment costs of the OHS management system, opposite to production work and lack of skilled employees (National Occupational Health and Safety Advisory Committee, 2009).

Moreover, there are some studies about difficulties associated with the certification process of integrated management system for SMEs (ISO 9001, ISO 14001 and OHSAS 18001) in Portuguese. One study indicates that main difficulties are insufficient integrability of the standards, higher cost to implement all systems when compared with sole system implementation, difficulty in training and culture changes and long time for implementing IMS (Santos, Mendes and Barbosa, 2011).

2.4.2.2 Motivators to implement a safety management system in SMEs

Regarding the main characteristics of OHS management systems in SMEs, they are as follows: they prefer an oral communication to written communications; the owners work hard and devote their time to the pressing issues and contribute less time to the non-core task, which OHS is considered to be (National Occupational Health and Safety Advisory Committee, 2009). With mentioned characteristic reflect to poor management in OHS, however, to ensure their business will survive, the company should adhere to the OHS management system. The main drivers for implementing OHS management system in the study of the New Zealand's small business are demands from their customers and clients, owner/manager's experience in OHS, notice from the inspectors of Department of Labour regarding the OHS improvement (National Occupational Health and Safety Advisory Committee, 2009).

Wright (1998 as cited in Kheni, Dainty and Gibb, 2005) reveals that self-fulfillment is a motivator for SME to manage Health and safety in their organization. Masi, Cagno and Micheli (2014) define as the main driver for safety implementation are the positive attitude of management and worker towards health and safety, available guidelines, management involvement in the production process, financial resources, good communication, support from associations and consultants. S.Unnikrishnan et al. (2015) stated that the most significant drivers for SMEs in India to adopt safe and clean technology were competition in the market, better productivity, low risk and stringent legislation as well as leadership of management.

Moreover, medical expenses related to workplace accidents, benefits of safe technology in term of productivity and care for the employees are the additional motivator emerging from this study. Entec UK on behalf of the Health and Safety Executive (2003) indicates that “The main motivators underlying the development of H&S systems were a legal obligation (particularly in larger organizations), H&S publicity (particularly in SMEs) and requirements from other existing internal systems and procedure”. The existing management of SMEs can be an internal driver for OHS management system implementation with the significant association between quality management system and OHS management system. The study of Vassie et al. (2000) indicate that enterprises that implement quality management system are more likely to be interested in the OHS management system.

Moreover, external support is the associated driver for the success of OHS implementation in SMEs, especially external support in terms of information, experience sharing, consulting and network services of the government (Surienty, L., 2012). Health and safety management system should be the simple system and avoid unnecessary complexity, focus on performance rather than on documentation, and finally SMEs can implement such management system with fewer resources (Duijm et al., 2008). Finally, to ensure the achievement of health and safety performance, the key factors must be composed of the following: the involvement of senior manager in managing health and safety management system and awareness among all employees in safety issues (Vassie et al., 2000).

2.5 Analysis of Occupational Health and Safety Management System, Environmental Management System

2.5.1 BS OHSAS 18001:2007 (British Standard Institute)

2.5.1.1 General

The OHSAS Standard is designed to enable the organization to control its Occupational Health and Safety (OH&S) risks and improve its OH&S performance by establishing their OH&S policy and objectives. The OHSAS standard can integrate with other management requirements and help organizations to achieve OH&S and economic objectives with the methodology known as Plan-Do-Check-Act (PDCA). This standard can apply to all types and sizes of organizations.

2.5.1.2 Analysis

1) Plan

The organization shall establish, implement and maintain a hazard identification, risk assessment and hazard controls to ensure that all hazards are identified and controlled with the control hierarchy. OH&S objectives must be established and consistent with OH&S policy, commitment to prevent injury and ill health as well as compliance with applicable legal and other requirements. OH&S programme(s) need to set up to ensure that the organization will achieve its OH&S objectives.

2) Do (Implementation and Operation for OHSAS 18001)

Top management takes ultimate responsibility for OH&S management system by ensuring that essential resources are provided and identifying the roles and responsibilities of the employees related to OH&S management system, as well as appointing one member of top management to implement and maintain OH&S management system. All employees under the organization's control that can have an impact on OH&S are competent with appropriate education, training or experience. Moreover, the organization needs to identify training needs consistent with OH&S risks and OH&S management system.

Communication, participation and consultation are important to ensure the adequate internal and external communications regarding its OH&S hazards and OH&S management system. The organization needs to promote the involvement

of workers in OH&S management systems such as hazard identification, risk assessment and hazard controls including consultation for workers and contractors in any changes that can affect their OH&S. In this stage, essential documentation is needed to support the management system and the organization shall establish the document control procedure to ensure all documents used within the organization are updated and controlled. Operational controls that are associated with OH&S risks must be determined to prevent the deviation from the OH&S policy and objectives including process control for purchasing, contractors and other visitors in the workplace must be implemented to ensure that objectives are achieved. Finally, emergency situations shall be identified with a response plan to handle such emergency situations.

3) Checking

The effectiveness of the OH&S management system needs monitoring and measurement both of qualitative and quantitative, while legal and other requirements evaluation of compliance must be done periodically. Incident and nonconformity can identify the effectiveness of the OH&S management system, however corrective and preventive actions must be generated from each incident and nonconformity to prevent the occurrence. Internal audit is the essential process to determine whether the OH&S management system conforms to OHSAS Standard, has been properly implemented and consistent to organization's policy and objectives. Internal audit must be conducted at planned intervals based on results of risk assessment and the results of previous audits. All records are necessary to demonstrate conformity to the requirements of its OH&S management system and of the OHSAS Standards.

4) Act

Management review for the input topics must be conducted at the planned intervals by top management to ensure the continuous improvement, adequacy and effectiveness of OH&S management system. Top management needs to make a decision on any changes related to OH&S performance, OH&S policy and objectives as well as resources. Actions to improve OH&S management system must be identified and implemented in the organization.

5) Comment

OHSAS 18001: 2007 is not the international standard but at present it is internationally recognized and implemented as the occupational health

management system. This standard was designed to support all sizes of enterprises, however a study shows that in China large enterprises can implement OHSAS 18001 better than SMEs. The limitation of SMEs in terms of human resources, financial and material resources are the main obstacles to the achievement of OHSAS 18001 adoption in their organization (Zhang Jindong and Zuo han, 2012). Though, “the most successful method for SMEs must be simple, low-cost approach and take fewer resources to ensure that SMEs can use their limited resources to implement a safety management system.

2.5.2 Environmental Management Systems (ISO 14001: 2015)

Introduction of High-Level Structure (HLS) can help the organization improve environmental performance including fulfilling its environmental responsibilities with a systematic approach that contribute to the environmental pillar of sustainability. The intended outcome of this international standard are: enhancement of environmental performance, fulfillment of compliance obligations and the achievement of environmental objectives. ISO 14001: 2015 can apply to any organization, regardless of size, type and nature, and manage the environmental aspects of the organization’s activities, product and services that were determined. Furthermore, the life-cycle perspective should be considered when developing products and services.

2.5.2.1 The context of the organization

The organization shall establish the context of the environmental management system (EMS), and need to identify and understand the factors and parties that can affect, either positively or negatively, the EMS. Firstly, the organization will need to determine external and internal issues that are relevant to its purpose i.e. what are the relevant issues, both inside and outside, that have an impact on or affect its ability to achieve the intended outcome(s) of the EMS. Secondly, an organization will also need to identify the “interested parties” relevant to their EMS, which could include customers, communities, suppliers and non-government organizations. Determining their relevant needs and expectations is part of establishing the context for the EMS. Finally, the last requirement is to establish, implement, maintain and continually improve the EMS in accordance with the requirements of the standard.

1) Plan

This clause focuses on how an organization plans actions to address both risks and opportunities which have been identified in Clause 4 (Context of the organization) including environmental aspects and compliance obligations. Environmental aspects of activities, products and services of the organization must be identified with considering a life cycle perspective and the clause notes highlights that significant aspects can give rise to risks that are both beneficial and adverse. The organization also needs to determine the applicable compliance obligations to its environmental aspect. Another key area is the need to establish measurable environmental objectives with planning actions to achieve its objectives.

2) Do

The organization needs to determine and provide all EMS resources needs that enable an organization to meet its EMS. Organizations will need to determine the necessary competence of persons doing work that, under its control, affects its environmental performance, its ability to fulfill its compliance obligations and ensure they receive the appropriate training. Internal and external communication relevant to environmental management system should be carried out as well.

In addition, organizations need to ensure that all people doing work under the organization's control are aware of the environmental policy, how their work may impact this and implications of not conforming with the EMS. Finally, there are the requirements for "documented information" which related to the creation, updating, and control of specific data.

The organization needs to establish, implement, control and maintain the process needed to meet its environmental objectives. There are specific requirements that relate to the control or influence exercised over outsourced processes. Life cycle perspective must adhere to the design and development process of the product and service along each life cycle stage. The procurement of products and services must be controlled to ensure that environmental requirements relating to design, delivery, use and end-of-life treatment of an organization's products and services are considered at an appropriate stage. Finally, the potential emergency situation must be identified and prepared to respond by planning actions to prevent or mitigate the negative environmental impacts.

3) Check

The organization needs to monitor, measure, analyze and evaluate its environmental performance by determining what needs to be monitored and measured, a method for monitoring and measurement, criteria for evaluating environmental performance including the frequency of monitoring and measurement performing. All monitoring and measuring equipment must be calibrated as deemed appropriate. Internal audits will need to be carried out, and there are certain “audit criteria” that are defined to ensure that the results of these audits are reported to relevant management. Finally, management reviews will need to be carried out and “documented information” must be kept as evidence.

4) Act

The organizations need to determine and identify opportunities for continual improvement of the EMS. The requirement for continual improvement has been extended to ensure that the suitability and adequacy of the EMS as well as its effectiveness are considered in the light of enhanced environmental performance. There are some actions required that cover the handling of corrective actions. Firstly, organizations need to react to nonconformities and take action. Secondly, they need to identify whether similar nonconformities exist or could potentially occur. There is a requirement to actively lookout for opportunities to improve processes, products or services; particularly with future customer requirements in mind.

5) Comments

The ISO 14001: 2015 is a widely used EMS approach to reflect environmental responsibility by the certified company but ISO 14001 standard is formal and requires much documentation. This characteristic of the standard is the obstacle for SMEs implementation due to SMEs especially micro and small enterprises prefer informal management system. The new version of ISO 14001 is more flexible to make documentation regarding the procedure. However, SMEs still face difficulties in implementing ISO 14001 with the fact that ISO 14001 is not specifically designed for SMEs but intended to serve a large variety of organizations. SMEs also lack knowledge or resources for the implementation of this standard.

2.5.3 The New Health And Safety Standard ISO 45001:2018

2.5.3.1 General

ISO 45001 is an International Standard that specifies requirements for an occupational health and safety (OH&S) management system, with guidance for its use, to enable an organization to proactively improve its OH&S performance in preventing injury and ill-health.

The standard is currently being developed by a committee of occupational health and safety experts and will follow other generic management system approaches (High-level structure approach) such as ISO 14001 and ISO 9001. It will take into account other international standards in this area such as OHSAS 18001, the International Labour Organization's ILO-OSH Guidelines, various national standards, and the ILO's international labor standards and conventions.

ISO 45001 is intended for use by any organization, regardless of its size or the nature of its work, and can be integrated into other health and safety programmes such as worker wellness and wellbeing. It can assist an organization to fulfill its legal requirements. The standard development timeline is shown in Table 2.7 as below;

Table 2.7 ISO 45001: 2018 Development Timeline

Proposal stage	Preparatory stage	Committee stage (CD)	2nd Committee stage (CD)	Enquiry stage (DIS)	2nd Enquiry stage (DIS)	Approval stage (FDIS)	Publication
Mar 2013	Nov 2013	Mar 2015	Jul 2015	Nov 2015	May 2017	Nov 2017	Mar 2018

Source: International Organization for Standardization, 2018

With the new standard in place, organizations will find it easier to incorporate their OH&S management system into core business processes and get more involvement from senior management

2.5.3.2 The context of the organization

The organization will need to determine external and internal issues that are relevant to its purpose i.e. what are the relevant issues, both inside and outside, that

have an impact on or affect its ability to achieve the intended outcome(s) of the Occupational Health and Safety (OH&S-MS). An organization will also need to identify the “interested parties” relevant to their OH&S-MS, which could include workers and other interested parties. Determining their relevant needs and expectations is part of establishing the context for the OH&S-MS.

2.5.3.3 Plan

The requirement focuses on how an organization plans actions to address both risks and opportunities which have been identified in Clause 4 (Context of the organization) including OH&S risks and compliance obligations. The organization needs to identify OH&S risks considering all routine and non-routine tasks, emergency situation, including any change in the organization with its own criteria of risk assessment. The organizations need to plan how to achieve OH&S objectives

2.5.3.4 Do

The organization must define significant operational controls which are consistent with OH&S risks. The hierarchy of controls must be applied to reduce OH&S risks. The operational control must cover Outsourcing, Procurement, and Contractors. For outsourcing, the organization shall ensure that outsourced processes affecting OH&S management are controlled. The procurement shall be controlled also to ensure that procurement of goods and services conform to its OH&S management system requirements. Finally, contractors must be communicated in OH&S risks and how to control and eliminate those risks.

2.5.3.5 Check

The organization shall establish, implement and maintain a process for monitoring, measurement, and evaluation as well as determine what needs to be monitored and measured including criteria against which the organization will evaluate OH&S performance. It shall determine the methods for monitoring, measurement, analysis and evaluation to ensure valid results, frequency to perform monitoring and measuring and define the period when the results from monitoring and measurement shall be analyzed, evaluated and communicated.

2.5.3.6 Act

Organizations need to react to the incident and nonconformities and take action. The organizations require to determine and identify opportunities for continual improvement of the OH&S management system.

2.5.3.7 Comment

ISO 45001 is a new occupational health and safety management system standard that has been designed in accordance with Appendix 1 of Annex SL and has High-Level Structure (HLS), so it has a common format with ISO 14001 version 2015. Although ISO 45001 can apply to any size of the organization, for SMEs with the limitation of resources, they may have difficulty with the adoption of ISO 45001 in their organization.

2.5.4 Correspondence among ISO 14001: 2015, ISO 45001 and OHSAS 18001: 2007

The correspondence among those management systems is shown in Table 2.8

Table 2.8 The Correspondence among those Management Systems

ISO 14001: 2015	ISO 45001: 2018	OHSAS 18001: 2007
1 Scope	1 Scope	1 Scope
2 Normative reference	2 Normative references	2 Reference publications
3 Term and condition	3 Terms and definitions	3 Terms and definitions
4 Context of the organization (title only)	4 Context of the organization (title only)	
4.1 Understanding the organizations and its context	4.1 Understanding the organizations and its context	
4.2 Understanding the needs and expectations of interested parties	4.2 Understanding the needs and expectations of workers and other interested parties	
4.3 Determining the scope of the environmental management system	4.3 Determining the scope of the OH&S management system	4 OH&S management system requirements (title only)
4.4 Environmental management system	4.4 OH&S management system	4.1 General requirements
5 Leadership (title only)	5 Leadership and worker participation (title only)	

Table 2.8 (Continued)

ISO 14001: 2015	ISO 45001: 2018	OHSAS 18001: 2007
5.1 Leadership and commitment	5.1 Leadership and commitment	
5.2 Environmental policy	5.2 OH&S policy	4.2 OH&S policy
5.3 Organizational roles, responsibilities and authorities	5.3 Organizational roles, responsibilities, accountabilities and authorities	4.4.1 Resources, roles, responsibility, accountability and authority
	5.4 Consultation and participation of workers	4.4.3.2 Participation and consultation
6 Planning (title only)	6 Planning (title only)	4.3 Planning (title only)
6.1 Actions to address risks and opportunities (title only)	6.1 Actions to address risks and opportunities (title only)	
6.1.1 General	6.1.1 General	
	6.1.2 Hazard identification and assessment of OH&S risks (title only)	
6.1.2 Environmental aspects	6.1.2.1 Hazard identification	4.3.1 Hazard identification, risk assessment and determining controls
	6.1.2.2 Assessment of OH&S risks and other risks to the OH&S management system	
	6.1.2.3 Assessment of OH&S opportunities and other opportunities for the OH&S management system	
6.1.3 Compliance obligations	6.1.3 Determination of legal requirements and other requirements	4.3.2 Legal and other requirements
6.1.4 Planning action	6.1.4 Planning action	
6.2 Environmental objectives and planning to achieve them (title only)	6.2 OH&S objectives and planning to achieve them (title only)	
6.2.1 Environmental objectives	6.2.1 OH&S objectives	4.3.3 Objectives and programmes

Table 2.8 (Continued)

ISO 14001: 2015	ISO 45001: 2018	OHSAS 18001: 2007
6.2.2 Planning actions to achieve environmental objectives	6.2.2 Planning to achieve OH&S objectives	
7 Support (title only)	7 Support (title only)	
7.1 Resources	7.1 Resources	4.4.1 Resources, roles, responsibility, accountability and authority
7.2 Competence	7.2 Competence	4.4.2 Competence, training and awareness
7.3 Awareness	7.3 Awareness	
7.4 Communication (title only)	7.4 Communication	4.4.3 Communication, participation and consultation (title only)
7.4.1 General	7.4.1 General	
7.4.2 Internal communication	7.4.2 Internal communication	
7.4.3 External communication	7.4.3 External communication	4.4.3.1 Communication
7.5 Documented information (title only)	7.5 Documented information (title only)	
7.5.1 General	7.5.1 General	4.4.4 Documentation
7.5.2 Creating and Updating	7.5.2 Creating and updating	4.4.5 Control of documents
7.5.3 Control of documented information	7.5.3 Control of documented information	4.5.4 Control of records
8 Operation (title only)	8 Operation (title only)	4.4 Implementation and operation (title only)
8.1 Operational planning and control	8.1 Operational planning and control	4.4.6 Operational control
	8.1.1 General	
	8.1.2 Eliminating hazards and reducing OH&S risks	
	8.1.3 Management of change	4.3.1 Hazard identification and operation (title only)
	8.1.4 Procurement	
	8.1.4.1 General	4.4.6 Operational control
	8.1.4.2 Contractors	
	8.1.4.3 Outsourcing	
8.2 Emergency preparedness and response	8.2 Emergency preparedness and response	4.4.7 Emergency preparedness and response

Table 2.8 (Continued)

ISO 14001: 2015	ISO 45001: 2018	OHSAS 18001: 2007
9 Performance evaluation (title only)	9 Performance evaluation (title only)	4.5 Checking (title only)
9.1 Monitoring, measurement, analysis and evaluation (title only)	9.1 Monitoring, measurement, analysis and evaluation (title only)	4.5.1 Performance measurement and monitoring
9.1.1 General	9.1.1 General	
9.1.2 Evaluation of compliance	9.1.2 Evaluation of compliance	4.5.2 Evaluation of compliance
9.2 Internal audit (title only)	9.2 Internal audit (title only)	4.5.5 Internal audit
9.2.1 General	9.2.1 General	
9.2.2 Internal audit programme	9.2.2 Internal audit programme	
9.3 Management review	9.3 Management review	4.6 Management review
10 Improvement (title only)	10 Improvement (title only)	4.5.3 Incident investigation, nonconformity, corrective action, and preventive action
10.1 General	10.1 General	4.5.3.1 Incident investigation
10.2 Nonconformity and corrective action	10.2 Incident, nonconformity and corrective action	4.5.3.2 Nonconformity, corrective action and preventive action
10.3 Continual improvement	10.3 Continual improvement	4.1 General requirements 4.2 OH&S policy 4.6 Management review

Source: Thepporn Jaroenroy, 2018

2.5.5 The Integration of Management System

Integration of management system is joining the systems together with consideration to the compatibility with management system requirement. As the cycle of PDCA “Plan-Do-Check-Act” is used as a core process of ISO 14001, OHSAS 18001 and ISO 45001, the compatibility among three management systems is defined in the phase of PDCA cycle is shown in Table 2.9

Table 2.9 The Integration of Management System

	OHSAS		
	ISO 14001	18001	ISO 45001
1.Context of the organization			
1.1 Identification of organization and its context	4.1	-	4.1
1.2 Identification of the needs and expectations of interested parties	4.2	-	4.2
2. Planning			
2.1 Actions to address risks and opportunities	6.1	-	6.1
2.2 Identification of environmental aspect, hazard, risk, and their assessment	6.1.2	4.3.1	6.1.2
2.3 Identification of legal requirement and other requirements	6.1.3	4.3.2	6.1.3
2.4 Define environmental, OH&S objectives and planning	6.2.1,6.2.2	4.3.3	6.2.1,6.2.2
3. Do- Support and Operation			
3.1 Resources, competence of person, awareness of person	7.1,7.2,7.3	4.4.1,4.4.2	7.1,7.2,7.3
3.2 Communication	7.4	4.4.3	7.4
3.3 Documented Information	7.5	4.4.4,4.4.5, 4.5.4	7.5
3.4 Operational planning and control	8.1	4.4.6	8.1
4. Check			
4.1 Monitoring, measurement, analysis and evaluation	9.1.1	4.5.1	9.1.1
4.2 Evaluation of compliance	9.1.2	4.5.2	9.1.2
4.3 Internal Audit	9.2	4.5.5	9.2
4.4 Management review	9.3	4.6	9.3
5. Act-Improvement			
5.1 Nonconformity, Incident and corrective action	10.2	4.5.3	10.2
5.2 Continual Improvement	10.3	4.1,4.2,4.6	10.3

Source: Thepporn Jaroenroy, 2018.

The organization needs to identify the internal and external issues which are relevant to its business purpose and affect the achievement of occupational health, safety, and environmental management system. Moreover, it should understand the needs and expectations of all interested parties including identify needs and expectations that become legal and other requirements related to the organization. In this part, the risks and opportunities from the context of the organization need to be addressed. Planning Phase: the organization needs to identify environmental aspects

and hazard as well as the assessment of OH&S risks and opportunities. Moreover, all environmental aspects, hazards, risks and opportunities need to be addressed by establishing objectives and planning how to achieve the objectives. Legal and other requirements related to environmental aspects, hazards and OH&S risks must be considered by the organization. Do phase: in this phase resources are provided for implementing and maintaining management system. The organization shall determine a necessary competence of person who affects to its OH&S and environmental performance including ensuring that they have awareness in OH&S and environmental issues related to them. It shall also determine internal and external communications to enable employees to contribute to continual improvement. Documented information must be provided to support the effectiveness of OH&S and environmental management system. Another requirement in Do phase is operational planning and control; the processes must be established and maintained to meet OH&S and environmental management system. Check phase or performance evaluation: the organization must monitor the OH&S and environmental performance with the process of 1) monitoring, measurement, analysis and evaluation 2) evaluation of compliance 3) internal audit and 4) management review. The last step to ensure the improvement of OH&S and Environmental management system is Act phase. All incidents and nonconformities need to be corrected to ensure continual improvement of the management system.

2.6 Thai Regulation in Safety and Occupational Health Management System

In Thailand, it is rare that the regulations in safety and occupational health management system have been enforced and applied to the enterprises, especially in OHS. Only one regulation from the Ministry of Labor was announced in 2010 with the main content as follows:

For enterprises with more than 50 employees, the employer must implement a safety management system within their enterprises, and requirements must cover the following:

- 1) Safety and Occupational health policy

- 2) Safety and Occupational health organizations
- 3) Safety and Occupational health programme
- 4) Safety and Occupational health performance evaluation and management review
- 5) Safety and Occupational health improvement

Safety and Occupational health management system for SMEs will be established by the Ministry of Labor later and the main content is that employers must improve safety and occupational health in their enterprises once a year. And to ensure that Safety and Occupational health management system will be effectively implemented, the employer must ensure that the management system is maintained and encourage all employees to participate in the management system. All documents and records related to the management system are kept at least 2 years and the employee can access essential documents related to their work to ensure that all activities are conducted in a safe manner.

Thus, the Ministerial regulation on the prescribing of standard for administration and management of occupational safety, health and environment B.E. 2553 (A.D. 2010) is the first step of Thailand to compel medium enterprises (more than 50 employees) to adopt occupational health and safety management system to improve safety performance and reduce the accident rate.

2.7 Constructing a Conceptual Framework

The integrated safety, occupational health and environmental management system of an organization is the systematic process to identify any risks and environmental aspects, and how to manage those risks and environmental aspects including embedding this system into the organization. Within the literature review, a conceptual framework of the integrated safety, occupational health, and environmental management system is constructed with the expectation of improving environmental and safety performance for SMEs. The limitation of resources in SMEs need to be considered to design the conceptual framework, so the simple Health, Safety, and Environment management system is needed for the SMEs to ensure that the alternative

management system will motivate SMEs to implement and embed it into their organization.

The first step, self-assessment is the important tool that can identify company's process, strengths and weaknesses for better understanding their organization (Rebelo, Santos and Silva, 2014), as well as considering internal and external issues. Moreover, stakeholder assessment must be done to define the demands of all stakeholders such as local authorities, employees, customers, contractors, communities, etc. The data on self-assessment and stakeholder assessment can be used by the organization to establish environmental, occupational health and safety policy. In addition, the data from both self-assessment and stakeholder assessment must be used to develop the action plan for the business growth and address significant requirements of the stakeholders. Environment, occupational health and safety targets must be determined to ensure that policy will be fulfilled, and these targets will be implemented in the operational level of the organization with the appropriate support of resources from top management of the organization. Indicators must be defined to monitor the effectiveness of environmental, occupational health and safety performance. The organization needs to periodically monitor the performance of management system via an internal audit process to ensure compliance with the alternative management system. The corrective actions must be taken to solve the problem in the case that the output cannot meet the targets. Root causes of the problem must be identified to prevent the recurrence of those non-compliance issues. Finally, management review should be conducted periodically to review the whole management system with all essential inputs and provide corrective actions if necessary. In this way, the organization will implement a management system and continual improvement to ensure that their environmental, safety and occupational health performance will improve and embed into their organization. The resulting conceptual framework of safety, occupational health and environmental is presented in Figure 2.1

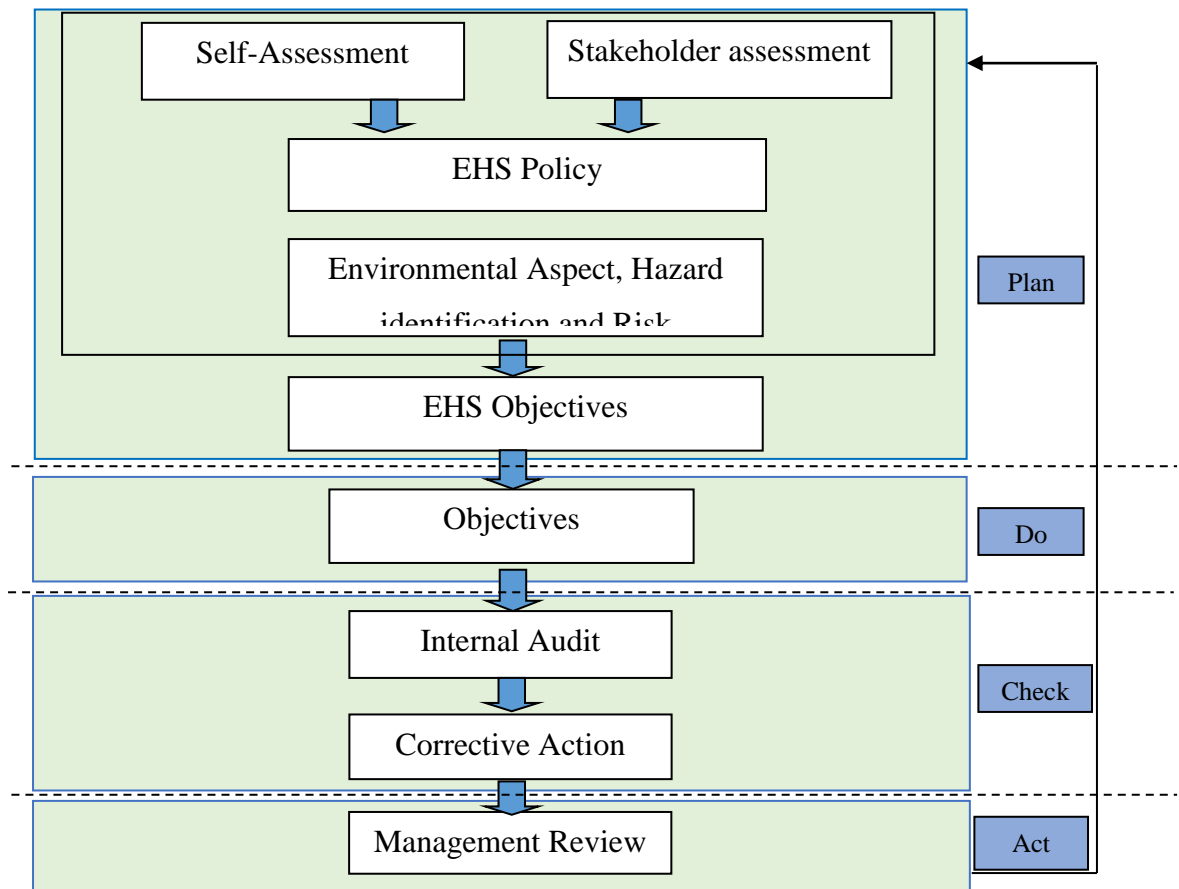


Figure 2.1 Conceptual Framework of Safety, Occupational Health and Environmental Management System

Source: Thepporn Jaroenroy, 2018

2.8 A need of Small and Medium Enterprises for the introduction of an Integrated Management System

There are many reasons why SMEs must develop an integrated management system (IMS). One of all reasons is that an enterprise needs to strengthen itself. IMS is the frameworks for international standards implementation by the enterprises, especially ISO 9001, ISO 14001 and OHSAS 18001 (Dejan Djordjevic and Srdjan Bogetic, 2008). As the study result of IMS implementation in SMEs in Portugal found that the first system that was certified is Quality management system, followed by Environmental management system (EMS) and Safety management system

respectively. The main benefits of QMS are that it can lead companies to improve their internal organization and information access and conduct internal evaluation of the management system by audit process. Meanwhile, EMS can help your company improve environmental protection and the company's reputation including the quality of life inside and outside the workplace as well as improve the marketing strategy. And the main benefits of EMS are that it can reduce work-related accidents, improve environmental performance and improve the company's image. Although company can gain many benefits from management system, there are very few Portuguese SMEs implementing and being certified with all three management systems, hence integrated management system with 3 systems is also very low (G. Santos et al. 2011). Rajkovic, Aleksic, Milicevic and Coudic, 2008 study about the reasons, benefits, and barriers of SMEs to implement IMS in their organization. The main reason for adopting IMS is external pressure especially laws and regulations. Pressure from public requirement for a safe working environment including cost and limitation of time and human resources can urge enterprises to implement a management system in their organization.

The benefits of IMS implementation can categorize into 3 groups: organizational benefits, financial and employee benefits. To ensure that IMS can give benefits to SME, the effectiveness of IMS implementation in SMEs should be evaluated by indicators. Olaru, Pirnea, Hohan and Maftei, 2013 stated that the major indicators that were used by SMEs in Romania related to financial results (quality cost, profit, sales volume, and turnover), client satisfaction and employee satisfaction. Moreover, some enterprises are using indicators related to social responsibility.

2.9 The Balanced Scorecard

The Balanced Scorecard was initiated by Kaplan and Norton from Harvard Business School and presented for the first time in an article "The Balanced Scorecard - Measures the Drive Performance", Harvard Business Review, January/February 1992. By 2000 the surveys stated that a large number of firms in the United States and Scandinavia used the balanced scorecards. The balanced scorecard has been used to measure the performance of an organization in four perspectives. The measures can be grouped as external measures for customers and shareholders, and internal measures

for business processes, innovation and learning and growth (Chavan, 2007). Boston and Grosu (2011) state that the balanced scorecard relates to the planning and objective of the organization. The success of the organization can be translated into the economic strategies that focus on the following questions:

- Economic-financial: To achieve our financial target, how can we show to our shareholder?

- Customers/Market: How can we satisfy our customers?

- Business processes: To meet our shareholders and customers satisfaction, what business processes must be carried out?

- Innovation, learning, and growth: To achieve the vision of the organization, how can we maintain our ability to improve our business?

The economic/financial perspective can be measured by return on capital, shareholder value improvement and asset utilization. Measures for customer/market perspective are product/service attributes, customer satisfaction score, and reputation. An internal business process can be measured by product and service development, after-sale services and product and service delivery. While learning and growth perspective can be measured by employee capabilities, information system capabilities and motivation of all employees (Chavan, 2007). The basic design of a balanced scorecard performance system can be shown in Figure 2.2

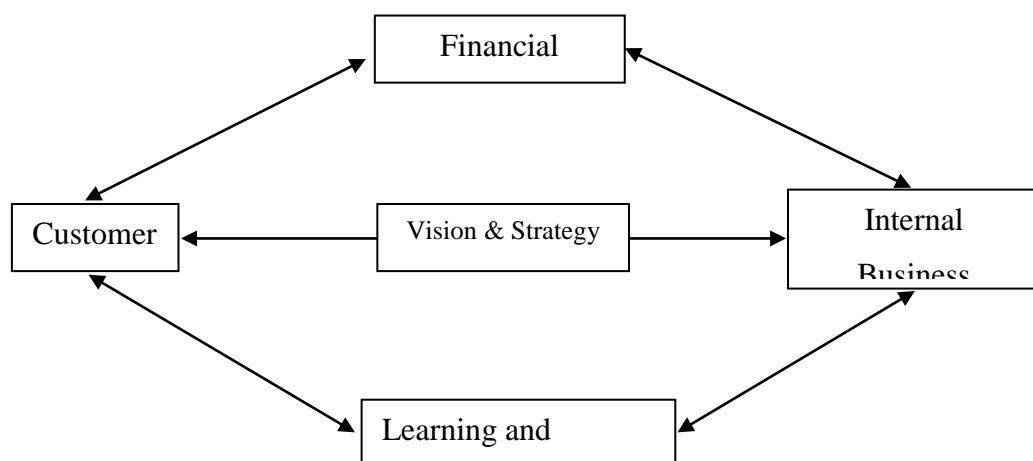


Figure 2.2 Basic design of a Balanced Scorecard Performance System

Source: Chavan, 2007.

The balanced scorecard is the tool of management to support the corporate strategies implementation by linking the operational processes with financial statements (Figge, Hahn, Schaltegger and Wagner, 2002).

The four processes of using the balanced scorecard for strategic management consist of:

- Translating vision and creating a strategy
- Communicating the strategic objectives and linking with the measures
- Providing business planning
- Strategic feedback and learning enhancement

Lagging and Leading indicators have been used to measure all four perspectives of the balanced scorecard. Kaplan and Norton define the difference between lagging and leading indicators as follows: (Kaplan and Norton, 1997)

Lagging indicators are identified for the core issues of long-term strategic objectives for each perspective. Lagging indicators will be used to measure the achievement of the strategic objectives in each perspective. Normally, lagging indicators are easy to measure and they are accurate. On the other hand, leading indicators are in-process measures and are predictive. Leading indicators can represent how the results can be achieved. The key performance drivers will be identified to measure the specific strategy for every perspective (Kaplan and Norton, 1997).

The balanced scorecard can be used as a tool for sustainability management to contribute to the sustainable development of the organization in all three dimensions of sustainability – economic, social and environmental, especially in the environmental management and social aspects. The organization can integrate the BSC with three dimensions of sustainability (economics, social and environmental) into the mainstream of business activities. The three integration steps for environmental and social aspect in the BSC can be explained as follows. First, the integration of environmental and social aspects into four perspectives of BSC. Second, provide additional perspective regarding environmental and social aspects, Third, create a scorecard for environmental and social aspects (Deegan, 2001; Epstein, 1996; Figge et al, 2001; Sturm, 2000 as cited in Figge et al, 2002).

The integration of environmental and social aspects in the four balanced scorecard perspectives will be carried out through strategy or lagging and leading

indicators, while the targets and measures will be formulated. With this planning process, the four perspectives of environmental and social aspects have been created within the organization. The additional perspective of environmental and social aspects normally will not be fully integrated into the market exchange process, because the environmental and social aspects come from the non-market system and the additional perspective can be called non-market perspective. The non-market perspective should be defined when the environmental and social aspects cannot reflect the success of the strategy that was developed from the existing balanced scorecard. The environmental and social aspects can be integrated into the four perspectives of the conventional balanced scorecard and parallel to the specific strategy in term of environmental and social aspects (Figge et al., 2002).

A balanced scorecard is a flexible tool that can adapt itself to the specific features of the safety and health management system (Beheshti, A. R., Kamali, K., Arghami, S., & Mohammadi, A., 2018). Moreover, BSC can be adopted to evaluate environmental performance by defining the vital environmental strategies and social objectives.

Many scholars focus on modification of a balanced scorecard model. Krivokapic, Z., & Jovanovic, J. (2009) state that environmental and social aspects can be integrated into the existing BSC perspective that is shown in Figure 2.3.

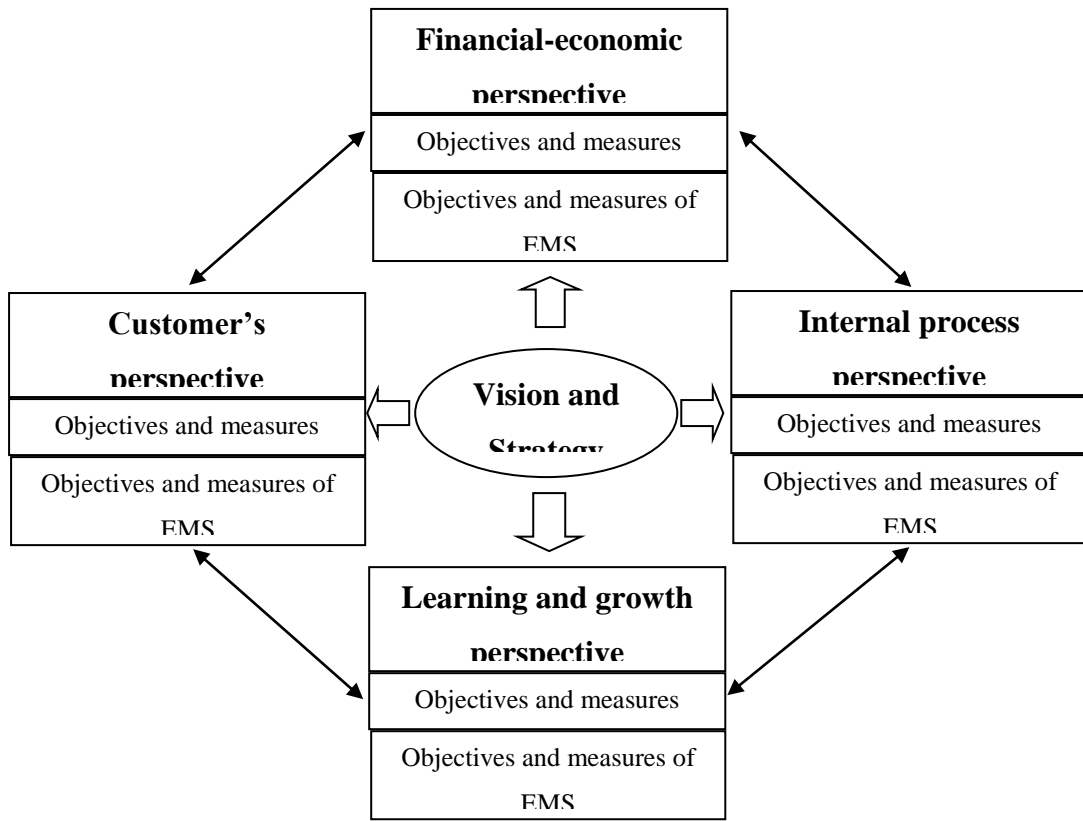


Figure 2.3 Integration of Environmental and Social Aspects in 4 Perspectives of BSC

Source: Krivokapic & Jovanovic, 2009.

Chamlong Poboon (2011) states that the Thai government has applied the BSC for performance evaluation in government offices nationwide. The BSC can be modified for environmental performance evaluation by changing financial perspective to “effectiveness perspective”, customer perspective to “target group perspective”, the existing internal process perspective to “management perspective”, and the learning and growth perspective to “learning and development perspective”. The modified BSC is shown in Figure 2.4

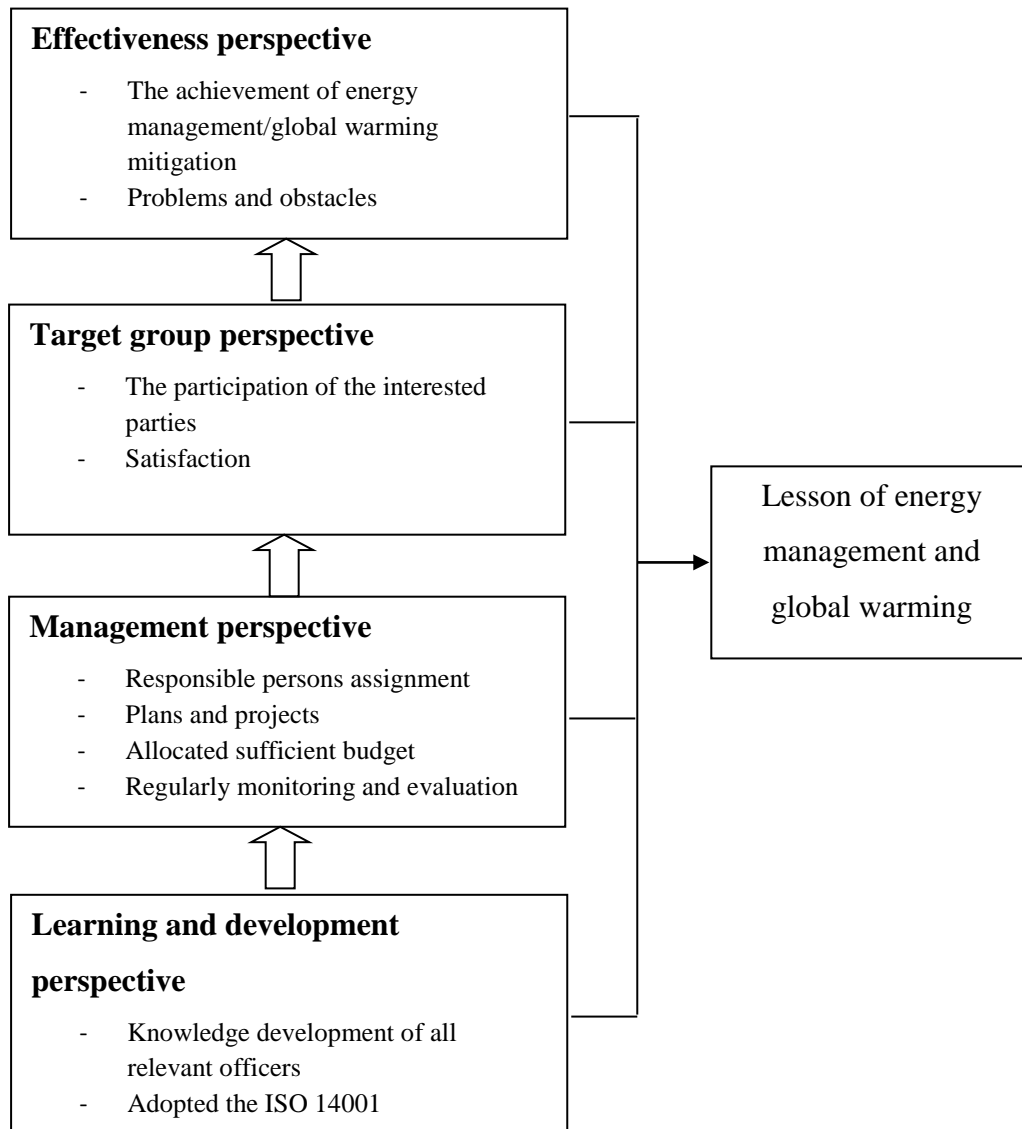


Figure 2.4 Modified BSC for Evaluation of Energy Management and Global Warming Mitigation

Source: Chamlong Poboan, 2011.

Additionally, Jutharat Hongchinda (2012) studied factors affecting the success of the Environmental Management System (ISO 14001) implementation of industries located in Map Ta Phut Industrial Estate, Thailand. The modified balanced scorecard has been used to evaluate the success factors of ISO 14001 implementation. According to this study, the classical BSC has been adapted by changing Financial perspective to

“Effectiveness perspective”, Customer perspective to “Stakeholder perspective”, Internal process to “Management perspective”, and maintaining the Learning and Growth perspective.

To ensure the suitability of the balanced scorecard used to evaluate an integrated safety, occupational health, and environmental management system for SMEs, the author modified the classical balance scorecard. Financial perspective has been changed to “Effectiveness perspective”, Customer perspective has been changed to “Stakeholder perspective”, but the original Internal process and Learning and Growth perspective have been maintained without any change.

CHAPTER 3

RESEARCH METHODOLOGY

The research question used for this study was “What is the appropriate model for integrated safety, occupational health and environmental management system for the small and medium enterprise of metal product manufacturer in Thailand?” In order to answer the question, qualitative and quantitative methods were used for data collection. For the qualitative study, the literature review on the safety and environmental management in SMEs was conducted to understand how SMEs manage their risks and environmental aspects. Existing international standards for occupational health and safety, environmental management system were studied to find out how they suit the characteristics of SMEs. Moreover, motivators and barriers for SMEs to implement occupational health and safety, environmental management system were also studied. Expert in-depth interviews were conducted to provide points of view of professionals who work in the field. Information from them had been gathered on how the new alternative management system would be developed and how it suited the characteristics of SMEs. In addition, group discussion had been conducted to get the ideas from experts on the alternative management system that was established. Finally, the new alternative management system had been implemented at pilot SME’s plant to ensure that it suits the characteristic of SMEs and the balanced scorecard had been used to evaluate the result of implementation. Meanwhile, the quantitative study collected the data by questionnaire to find general information, occupational health risks and environmental aspects of metal product manufacturing SMEs, motivators, and barriers to adopting environmental management system and occupational health and safety management system in metal product manufacturing SMEs. Finally, all information had been analyzed to provide

the recommendations for determining the suitable integrated safety, occupational health and environmental management system for SMEs of metal product manufacturer in Thailand.

3.1 Research Procedure

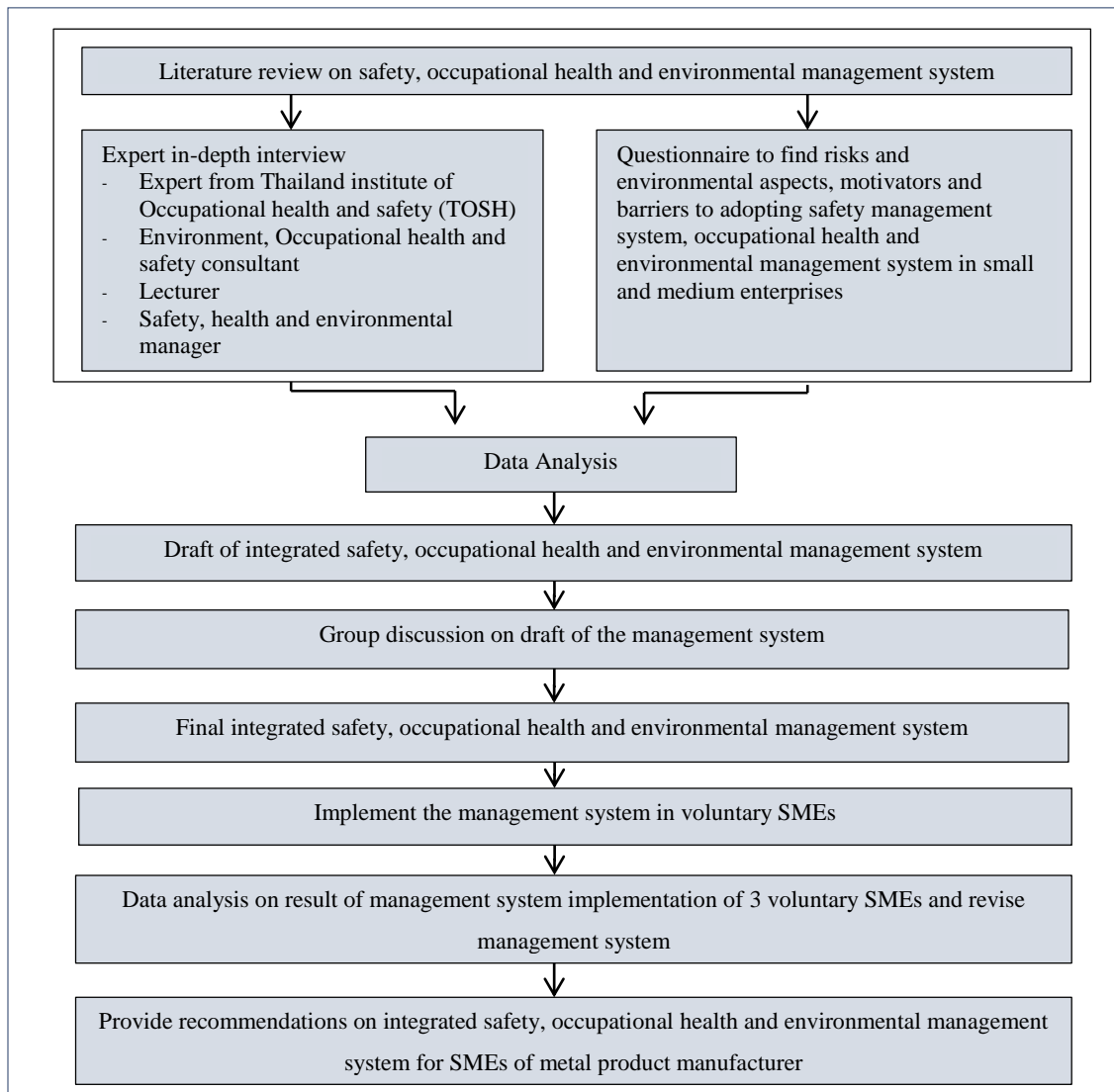


Figure 3.1 Research Procedure

Source: Thepporn Jaroenroy, 2018.

To obtain an integrated safety, occupational health and environmental management system for SMEs of metal product manufacturer in Thailand, the following steps of the study were carried out.

1) Conduct a literature review on safety, occupational health and environmental management system that consists of safety management system: ISO 45001 version 2018, OHSAS 18001 version 2007 and Environmental management system: ISO 14001 version 2015, motivators and barriers to implementing safety and environmental management system for SMEs and how SMEs implement occupational health, safety, and environmental management system within their organization. The literature reviews were analyzed and were used to create interview questions and questionnaires.

2) Conduct interviews with 14 experts to get points of view of professionals who work in the field of environmental, occupational health and safety. Information from them was gathered on how the new integrated management system had been developed and how it suits the characteristics of SMEs.

3) Questionnaires had been sent by post to small and medium-sized enterprises of metal product manufacturer in EEC area which consists of Chonburi, Rayong and Chachoengsao provinces to collect data mainly focusing on general information, risks and environmental aspects, barriers and motivators to implementing safety, occupational health and environment in their organizations.

4) Data from the experts and questionnaires were analyzed to develop a conceptual framework of integrated safety, occupational health and environmental management system for SMEs of the metal product manufacturer and create a draft of integrated safety, occupational health, and environmental management system's requirements.

5) Group discussion had been carried out by 10 experts to consider on the draft of integrated safety, occupational health and environmental management system for SMEs and give their ideas to improve the draft version to ensure that it will suit SMEs.

6) The final version of integrated safety, occupational health and environmental management system for SMEs was implemented in 3 SMEs to ensure that such an integrated management system can be implemented easily with fewer resources and fewer documents. The implementation time was determined for 5

months. During the implementation stage, the author visited the site and observed the implementation process and interviewed the working team including the relevant interested parties to collect the data to ensure that SME can implement it easily and elevate their performance in safety, occupational health, and environment. The recommendations from the SME working team of each site had been obtained to understand how to improve the management system to suit the SMEs characteristics.

7) The results of implementation from 3 SMEs were evaluated by the modified balanced scorecard in 4 perspectives which consist of the effectiveness of implementation perspective, stakeholder satisfaction perspective, internal process perspective and organization learning, and growth perspective.

8) Provide the recommendation to improve the integrated environmental, occupational health and safety management system to serve the limitations, needs, and expectations of SMEs.

3.2 Target Population and Sampling

3.2.1 Sample Size

The scope of this study was limited to small and medium-sized enterprises in the manufacturing sector that produce metal products in Chonburi, Rayong and Chachoengsao provinces which were defined as Eastern Economic Corridor project of Thailand. The sample size was calculated by using Krejcie and Morgan (1970)

$$n = \frac{\chi^2 * N * P * (1-P)}{(d^2 * (N-1) + \chi^2 * P * (1-P))}$$

n = Sample size

N = Population size

d = the degree of accuracy expressed as a proportion (0.05)

χ^2 = Chi-square for the specified confidence level at 1 degree of freedom ($\chi^2 = 3.841$)

P = Population proportion (assumed to be 0.50 since this would provide the maximum sample size)

The population of primary metal production firms in Chonburi, Rayong and Chachoengsao provinces has a total number of 887 firms, so the calculation can be explained as below;

$$n = \frac{3.841 * 887 * 0.5 * 0.5}{(.05)^2 * (887 - 1) + 3.841 * 0.5 * 0.5}$$

$$n = 268$$

The sample size that is required for data collection from metal production firms in Chonburi, Rayong and Chachoengsao provinces is 268 firms.

3.2.2 Key Informants

3.2.2.1 In-depth interviews were conducted with 14 experts who have experience in environmental, occupational health and safety management system and had implemented a management system. All experts have experience in occupational health, safety, and environment for more than 10 years. The key informants consist of two experts from Thailand Institute of Occupational Safety and Health (TOSH) and seven consultants in the field of environmental, occupational health and safety from NPC Safety and Environmental Service Company Limited, a local consultant company that has experience in providing a consultancy for SMEs in terms of environmental and occupational health and safety for several years, one university lecturer in occupational health and safety from Walailak University, two independent consultants in environmental, occupational health and safety and the last group is two Safety, health and environmental managers from the private sector. The following is the list of all experts who were interviewed as shown in Table 3.1

Table 3.1 The List of all Experts Who were Interviewed

No.	Name	Position	Company/Institute	Work Experience
1	Mr.Chaitana Chaimongkol	Director	Thailand Institute of Occupational Safety and Health (TOSH)	22 years
2	Ms.Jutapanit Boondekul	Deputy director	Thailand Institute of Occupational Safety and Health (TOSH)	35 years
3	Mr.Narutchai Chomputhep	Senior Safety and occupational health consultant	NPC Safety and Environmental Service Co., Ltd.	14 years
4	Mr.Wattana Promlai	Safety, occupational health and environmental consultant	NPC Safety and Environmental Service Co., Ltd	18 years
5	Ms.Pornthip Sarnchua	Safety, occupational and environmental consultant	NPC Safety and Environmental Service Co., Ltd	11 years
6	Ms.Piyawun Jaroenroy	Safety, occupational health and environmental consultant	Independent consultant	20 years
7	Mr.Surachai Sangkapong	Safety and occupational health consultant	NPC Safety and Environmental Service Co., Ltd	20 years

Table 3.1 (Continued)

No.	Name	Position	Company/Institute	Work Experience
8	Mr. Theerayoot Kiatthavornchai	Senior safety and occupational health consultant	NPC Safety and Environmental Service Co., Ltd	17 years
9	Ms.Mujalin Saikliang	Lecturer – Occupational health and safety	Walailak University	14 years
10	Ms.Kannika Kamsrikaew	Safety, health and environmental manager	Chemical company	18 years
11	Ms.Prakaiwan Jitsopakul	Senior safety and occupational health consultant	NPC Safety and Environmental Service Co., Ltd	14 years
12	Ms.Haruetai Thaiyatham	Senior environmental consultant	NPC Safety and Environmental Service Co., Ltd	15 years
13	Mr. Suchart Juntavimaluang	Senior occupational health and safety consultant	Independent consultant	23 years
14	Ms.Kulisara Kralam	Safety, health and environmental manager	Senior Aerospace Ltd.	14 years

Source: Thepporn Jaroenroy, 2018.

3.2.2.2 In-depth interviews with seventeen persons who implement the alternative safety, occupational health and environmental management system that was developed from the study in 3 voluntary firms that are interested in implementing integrated safety, occupational health and environmental management system within their organizations. Moreover, two industrial estate officers and one villager were interviewed as well.

Below is the list of all persons who were interviewed as shown in Table 3.2

Table 3.2 The List of Key Informants Who Implement the Alternative Safety, Occupational Health and Environmental Management System and are Relevant to the Management System

No	Position	Company		
		A	B	C
.				
1	Management representative	1	1	1
2	Safety Officer/ Safety Supervisor/ Safety Manager	1	1	1
3	Factory Manager	1	-	-
4	Document Controller	1	1	1
5	Production Supervisor	1	1	1
6	Environmental Officer	-	1	-
7	Production operator	1	1	1
8	Industrial estate officer	-	1	1
9	Villager	1	-	-

Source: Thepporn Jaroenroy, 2018.

3.2.2.3 Group discussion on the draft of integrated safety, occupational health and environmental management system with ten experts who have experience in safety, occupational health, and environmental management for more than ten years. The experts group consists of one expert from Thailand Institute of

Occupational Safety and Health (TOSH), one expert from Occupational Safety and Health Division : Ministry of Labour, one expert from Thailand Textile Institute, three professional safety and environmental managers from private sector and four environmental and occupational health and safety consultants from safety and environmental consultancy company to get their points of view on the draft of the integrated management system. The following is the list of all experts who attended the group discussion as shown in Table 3.3

Table 3.3 The List of all Experts Who Attended the Group Discussion

No.	Name	Position	Company/Institute	Work Experience
1	Ms. Peeraporn Palapleevalya	Director- Textile testing center	Thailand Textile Institute	34 years
2	Dr. Keson Theppang	Expert	Occupational Safety and Health Division, Ministry of Labour	23 years
3	Ms. Jutapanit Boondekul	Deputy director	Thailand Institute of Occupational Safety and Health (TOSH)	35 years
4	Dr. Jirawan Jampanil	Safety and Environmental Manager	BLCP Power Limited	20 years
5	Mr. Thanin Soila-ong	Safety and Environmental Manager	TPT Petrochemical Public company limited	20 years
6	Ms. Puttachat Khammak	Safety and Environmental Manager	FMC Co., Ltd	20 years

Table 3.3 (Continued)

No.	Name	Position	Company/Institute	Work Experience
7	Mr. Narutchai Chomputhep	Senior Safety and Occupational health consultant	NPC Safety and Environmental Service Co., Ltd.	14 years
8	Mr. Wattana Promlai	Safety, Occupational health and environmental consultant	NPC Safety and Environmental Service Co., Ltd	18 years
9	Ms.Pornthip Sarnchua	Safety, Occupational health and Environmental consultant	NPC Safety and Environmental Service Co., Ltd	11 years
10	Ms.Piyawun Jaroenroy	Safety, Occupational health and environmental consultant	Independent consultant	20 years

Source: Thepporn Jaroenroy, 2018.

3.3 Data Collection

In both quantitative and qualitative studies, different data collection and analysis techniques were used. The following sections discuss the different tools that were used to collect data.

3.3.1 Data Collection

Environmental, Occupational health and safety management system in SMEs, ISO 14001: 2015, OHSAS 18001:2007 and ISO 45001:2018 as well as barriers and motivators to adopting safety, occupational health and environmental management system in SMEs

Benefits and drawbacks of safety, occupational health and environmental management system adoption in SMEs were reviewed to identify motivators and barriers to safety, occupational health and environmental system implementation including the characteristic of SMEs to manage their risks and environmental aspects. The most well-known management system in Thailand i.e. ISO 14001 version 2015, OHSAS 18001 version 2007 and new occupational health and safety management standard ISO 45001 version 2018 were accessed to identify the key elements and how they suit the characteristics of SMEs. Three management systems were analyzed and implemented based on the Plan-Do-Check-Act cycle. Besides, all 3 management systems were analyzed to identify suitable approaches for SMEs. Finally, a conceptual framework was developed based on data gathered.

3.3.2 Data Collection: Expert Interviews

Expert interviews were conducted to provide the point of view of professionals who work in the field. In order to reach theoretical saturation that is a point when no new information is obtained from further data, semi-structured expert interviews were conducted with fourteen experts. Information was gathered from four groups of experts regarding how ISO 14001, OHSAS 18001 and ISO 45001 suit the characteristics of SMEs and how the design of these approaches could be improved for SMEs. The data were collected through open-ended interviews with structured questionnaires and the interviews were conducted by open conversations. The first group of interviewees is

two experts from TOSH, and the interview was used to gain a suitable management system for SMEs from the points of view of Thailand's authority in occupational health and safety. The second group of interviewees is nine consultants who have experience in management system adoption in the organization, and the interview was used to get a better understanding of management system implementation and the essential requirements for SMEs. The third group of interviewees is two experts from the private sector who have experience of implementing safety, occupational health and environmental management system within the organization. The interview was used to understand the points of view of the implementation team regarding the essential key requirements for such a management system and how to implement such a management system effectively. The last group of interviewees is the lecturer from the university who can share the idea to develop a new integrated management system in the point of view of the academic person.

3.3.3 Data Collection: Questionnaire

Questionnaires were used to collect the data on what are the risks and environmental aspects of metal product manufacturing SMEs and how they manage their risks and environmental aspects. Moreover, motivators and barriers to safety, occupational health, and environmental management system adoption in SMEs must be collected by the questionnaire. In addition, SMEs were asked about the essential requirements for integrated safety, occupational health, and environmental management system which fit for them. The questionnaires were distributed by post to all 887 SMEs of metal product manufacturer in Chonburi, Rayong and Chachoengsao provinces. The respondents were asked to return the survey within 45 days. The number of survey response received was 88 (9.92%). The response rate is quite lower than expected.

The main problem might involve the data of SMEs from the website of the Department of Industrial Works which is not updated because a lot of mails were returned to the researcher due to incorrect address. Moreover, some enterprises that were identified as small and medium sized-enterprise had already expanded to large sized enterprises with more than 200 employees. The response rate of Chonburi province is 8.47% from 40 enterprises of total 472 enterprises, for Rayong province the

response rate is 14.33% from 33 enterprises of total 230 enterprises, and the response rate of Chachoengsao province is 8.11% from 15 enterprises of total 185 enterprises.

The questionnaire, including both open and closed-ended questions, was developed for this study. A preliminary version of the questionnaire was submitted for review by an expert for content analysis to ascertain that the information to be gathered was of practical significance. Then, the revised questionnaire was pilot tested and improved by professional safety and environmental officers in Chonburi province, Thailand, which is not the target group of the study.

3.3.4 Data Collection: Group Discussion

The data from the literature review, expert interview and questionnaires from SMEs had been analyzed to create a draft of integrated safety, occupational health and environmental management system. However, to ensure that points of view of all related parties were considered, experts had been invited to discuss and give their ideas about what integrated management system is fit for SMEs. Group discussion was carried out to review the draft of the integrated management system, and there was a discussion involving the purpose of each requirement that was developed in the management system. Ten experts had been invited to attend the group discussion with the defined agenda and the researcher conducted the group discussion that open to the expert's opinion for all parts of the draft of integrated safety, occupational health and environmental management system. The main objective is to ensure that such a management system is suitable for SMEs from the points of view of all experts. The results from group discussion have been used to improve the integrated management system and create the final integrated management system prior to implementing such a management system in three SMEs.

3.3.5 Data Collection: Integrated Environmental, occupational health and safety management system implementation in pilot SMEs

The application letters were sent to the target SMEs interested in the integrated safety, occupational health and environmental management system for SMEs, and five SMEs accepted to attend the implementation program. The general information of all five SMEs was considered based on the criteria to ensure that all SMEs meet the criteria.

The acceptance criteria consist of 1) The size of the enterprise must be small and medium enterprises, 2) The enterprises have high occupational health and safety risk, and 3) The enterprises need to improve the environmental practice.

Fortunately, all of the five SMEs met the selection criteria. However, during the implementation period two enterprises left the implementation program by reason of the limitation of resources. Finally, only three enterprises could implement the integrated safety, occupational health and environmental management system completely, however, all of three enterprises are medium-sized enterprise.

The integrated management system had been implemented in 3 enterprises to evaluate how the management system fit with SMEs. The researcher had involved and observed at the site during their implementation and took a role as a consultant to guide them on how to implement the management system including interviewing persons who implement this management system. During the implementation phase the researcher had observed the process of implementing such a management system and collected all information that was essential to a full understanding of SMEs relating to adopting an integrated management system within their organization. The researcher took 5 man-days per site acting as a consultant. However, the management system must be implemented by the employees of voluntary sites. The balanced scorecard was used to evaluate the implementation results with the evaluation criteria as shown in Table 3.4

Table 3.4 Balanced Scorecard (BSC) Criteria for Integrated Safety, Occupational Health and Environmental Management System for SMEs Evaluation

Perspective	Criteria	Target	Method	Score
1. Effectiveness perspective	1. Environmental, occupational health and safety management system for SMEs implementation	All requirements have been implemented	- Management system audit - Observation	0 = Not fulfilled 1= Less than 50% of the requirements have been implemented 2= Equal or more than 50% of the requirements have been fulfilled 3= All requirements have been fulfilled

Table 3.4 (Continued)

Perspective	Criteria	Target	Method	Score
	2. The achievement of environmental, occupational health and safety objectives	All objectives have been achieved	- Management system audit - Observation	0 = Not achieved 1= Less than 50% of the objectives have been achieved 2= Equal or more than 50% of the objectives have been achieved 3= All objectives have been achieved
2. Stakeholder perspective	1. Employee participation	The employees participate in management system implementation	- Management system audit - Observation	0 = No participation 1= Low participation ($\leq 33\%$ of the target employee attend the training and workshop of management system implementation) 2= Moderate participation (34-67% of the target employees attend the training and workshop of management system implementation) 3= High participation ($\geq 68\%$ of the target employees attend the training and workshop of management system implementation)
	2. Interested party satisfaction	Interested party satisfied with the output from such a management system	- Management system audit - Observation	0 = Not satisfied 1= Low satisfied ($\leq 33\%$ of the interested parties are satisfied with the management system) 2= Moderate satisfied (34-67% of the interested parties are satisfied with the management system) 3= Very satisfied ($\geq 68\%$ of the interested parties are satisfied with the management system)
3. Internal process perspective	1. The achievement of action plan implementation	The implementation plan has been achieved	- Management system audit - Observation	0 = Not implemented 1= Less than 50% of the implementation plan has been implemented 2= Equal or more than 50% of the implementation plan has been implemented 3= All implementation plan has been implemented
	2. A working team has been assigned	Top management assign safety or environmental officer to	- Management system audit - Observation	0 = No working team 1= A working team has been assigned

Table 3.4 (Continued)

Perspective	Criteria	Target	Method	Score
		implement the EMS & OHS management system for SMEs		
	3. Budget	Top management provides financial support for implementing such a management system	- Management system audit - Observation	0 = No budget provided 1= Low budget has been provided (Less than the required budget for safety and environmental objectives) 2 = Sufficient budget has been provided (Budget has been provided for all safety and environmental objectives)
	4. Monitoring and evaluation	The internal audit program has been carried out	- Management system audit - Observation	0 = Internal audit has not been conducted 1= Internal audit has been conducted to meet some requirements 2 = Internal audit has been conducted to meet all requirements
4. Organization learning and growth perspective	1. The process to enhance safety and environmental performance has been developed	Work instructions relate to the occupational health, safety risks and environmental aspects had been established	- Management system audit - Observation	0 = No work instruction has been developed 1= Work instruction has been developed but not effectively address risks and environmental aspects 2 = Effective work instruction has been developed to address risks and environmental aspects

Source: Thepporn Jaroenroy, 2018.

The total score of the balanced scorecard is 22 points (100%) and the acceptable score of the three voluntary enterprises that implement the integrated safety, occupational health and environmental management system is 15.4 (70%) from 22 points. All evidence related to the balanced scorecard was examined to ensure the achievement of each criterion.

3.4 Data Collecting Tool

Data collection tools for this study composed of the questionnaire, interview questions and evaluation criteria which were generated from the literature review and were reviewed by an expert to ensure that the tools would be aligned to the study objectives. Description of each tool is explained below:

3.4.1 Questionnaire

To collect the data from SMEs with 5 parts of questions;

Part 1: General information of SME

Part 2: Occupational Health, Safety, and Environment management in the organization

Part 3: Barriers and Motivators to implementing Occupational Health, Safety and Environmental management system in SMEs

Part 4: Barriers and Motivators to implementing Integrated occupational health, Safety and Environmental management system in SMEs

Part 5: Suggestion for establishing Integrated occupational health, Safety and Environmental management system in SMEs

The design of the survey instrument is focused on barriers and motivators discussed in the literature review of Chapter 2. Each barrier and motivator is rated on a 9-point Likert scale to provide a wider range of the options available to the respondents. In the case of barriers, 1 means not impeding and 9 means severely impeding the implementation of Occupational health, safety and environmental management system. In the case of motivators, 1 means not enabling and 9 means highly enabling the implementation of Occupational health, safety, and environmental management system. The questionnaire was validated by the experts using Item-Objective Congruence Index (IOC). Reliability was tested using Cronbach Alpha with 30 SMEs in various industries in Chonburi, Rayong, and Chachoengsao provinces, so it is possible to adapt this questionnaire with other industries other than metal product manufacturer for data collection. The complete survey instrument can be found in Appendix A.

3.4.2 Interview Questions

For an expert who works in the Occupational health, safety and environment field on how to design the practice management system for SMEs

Part 1: General information of an expert

Part 2: How to design integrated safety, occupational health and environmental management system for SMEs in your point of view?

Part 3: How to adopt integrated safety, occupational health and environmental management system in SMEs?

How to encourage SMEs to be aware of the benefits of safety, occupational health and environmental management system implementation?

What is the role of the government's organization to encourage SMEs to adopt safety, occupational health and environmental management system within their organization?

The structured interview form was validated by the experts using the Item-Objective Congruence Index (IOC)

The complete survey instrument can be found in Appendix B.

3.4.3 Evaluation Criteria by Using the Balanced Scorecard

To evaluate the output of integrated safety, occupational health, and environmental management system for SMEs from 3 sites.

The criteria consist of 4 perspectives.

3.4.3.1 Effectiveness perspective,

3.4.3.2 Stakeholder perspective,

3.4.3.3 Internal process perspective and

3.4.3.4 Organization learning and growth perspective.

3.5 Data Analysis

3.5.1 Quantitative Data Analysis

According to the quantitative data analysis, the researcher applied the statistical program to analyze the data. In the first part, descriptive statistics for sample groups explained.

3.5.1.1 The general information of the samples,

3.5.1.2 Percentage and mean of sample information, mean and standard deviation of barriers and motivators to implementing Occupational Health and Safety Management System,

In the second part, inferential statistics were applied to examine the relationships between and among variables to understand the interaction between them. The relationship between SME size, SHE policy, safety problems, environmental problems and the interest in adopting safety, occupational health and environmental management system has been analyzed by Pearson Chi-square to identify which factors are correlated with the interest of such management system adoption. The correlation between barriers and motivators to implementing safety and occupational health management system, environmental management system and integrated occupational health, safety, and environmental management system has been analyzed by Pearson Correlation.

3.5.2 Qualitative Data Analysis

Regarding the qualitative data analysis, content analysis has been used to analyze data obtained from the expert interview. The conceptual framework and draft of integrated safety, occupational health, and environmental management system have been created from points of view of all experts. In addition, the result of an integrated management system has been analyzed using the balanced scorecard to evaluate how such a management system fit for the characteristics of SMEs.

3.5.3 Data Analysis: Existing Environmental, Occupational Health and Safety Management System (ISO 14001: 2015, ISO 45001: 2018, OHSAS 1800: 2007)

To identify how existing environmental, occupational health and safety management system to suit the characteristics of SMEs, the existing management systems were analyzed. Each approach was studied to find out how it addressed the cycle of Plan- Do- Check- Act (PDCA) in the conceptual framework. The analysis provides general information regarding the planning process for existing environmental, occupational health and safety management system, the requirements

of each management system, the monitoring and evaluation processes to evaluate the achievement of the objectives and operational goals, and finally, the action to improve the management system. After reviewing the environmental, occupational health and safety management system in this way, general comments are given regarding the elements of the approach that are particularly suitable (or not suitable) for SMEs.

3.5.4 Data Analysis: Expert Interviews and Focus Group Discussion

The expert interviews were recorded and summarized in Appendix C. Content Analysis was used to determine the categories of the data from the experts. The interview transcript has been coded into manageable content categories by reducing the text to categories consisting of a word, set of words or phrases. The data from expert interviews were partially used as a basis of the model for integrated safety, occupational health and environmental management system for SMEs.

Moreover, the information from the focus group discussion of experts in the draft of the integrated safety, occupational health, and environmental management system for SMEs was analyzed by content analysis. The data from focus group discussion were used to improve the draft of model for integrated safety, occupational health and environmental management system for SMEs.

3.5.5 Data Analysis: The Evaluation of Integrated Safety, Occupational Health and Environmental Management System for SMEs Implementation at the Pilot Sites.

The achievement of the integrated management system of the pilot sites was evaluated by using the balanced scorecard that considers four perspectives:

- 1) Effectiveness perspective,
- 2) Stakeholder perspective,
- 3) Internal process perspective and
- 4) Organization learning and growth perspective.

The balanced scorecard criteria were created by considering the requirements of the designed integrated management system. The evidence of the management system implementation was verified to evaluate the effectiveness of the management system, as well as study whether the designed integrated management system fit the

SMEs characteristics and its context. As mentioned in Table 3.3, the performance of the integrated safety, occupational health, and environmental management system implementation in three voluntary enterprises was evaluated by the score. The total score is 22 points, the acceptable score is 15.4 points (70%).

The summary of data collection and data analysis is shown in Table 3.5

Table 3.5 Summary of Data Collection and Data Analysis for Each Objective of the Study

Objective	Key Informants/ Sample Size	Data Collection Tools	Validation of Data Collection Tools	Data Analysis
1. To identify the occupational health risks, environmental aspects, motivators, and barriers to adopting the integrated safety, occupational health and environmental management system in small and medium enterprises of metal product manufacturers in Thailand.	SMEs 887 firms	Questionnaire	Cronbach's Alpha	Percentage, Mean
2. To identify the factors related to the adoption of the integrated safety, occupational health and environmental management system by SMEs.	SMEs 887 firms	Questionnaire	Cronbach's Alpha	- Pearson chi-square - Pearson correlation coefficients

Table 3.5 (Continued)

Objective	Key Informants/ Sample Size	Data Collection Tools	Validation of Data Collection Tools	Data Analysis
3. To design integrated safety, occupational health and environmental management system from the integration of ISO 14001: 2015, OHSAS 18001: 2007 and ISO 45001: 2018 for small and medium enterprises of metal product manufacturers in Thailand.	17 Experts	In-depth interview	Item Objective Congruence Index (IOC)	Content Analysis
4. To trial an integrated safety, occupational health and environmental management system in pilot SMEs and evaluate the implementing results.	10 Experts	Group discussion	-	Content Analysis
4. To trial an integrated safety, occupational health and environmental management system in pilot SMEs and evaluate the implementing results.	3 pilot SMEs	Management system audit, observation	Item Objective Congruence Index (IOC)	The balanced scorecard

Source: Thepporn Jaroenroy, 2018.

CHAPTER 4

RESULT OF ANALYSIS

In this chapter, the analytical results are presented in two parts: 1) a display of the findings from the statistical analysis and 2) findings from an integrated safety, occupational health and environmental management system in pilot enterprises will be described and interpreted to clarify the suitability of such designed management system to SMEs. The analysis of the responses is organized according to the research objectives raised in Chapter 1. The results of the analysis are presented as follows:

4.1 Objectives of the Study

1) To identify the occupational health risks, environmental aspects, motivators, and barriers to adopting the integrated safety, occupational health and environmental management system in small and medium enterprises of metal product manufacturers in Thailand.

2) To identify the factors related to the adoption of the integrated safety, occupational health and environmental management system by SMEs
3) To design integrated safety, occupational health and environmental management system from the integration of ISO 14001: 2015, OHSAS 18001: 2007 and ISO 45001: 2018 for small and medium enterprises of metal product manufacturers in Thailand.

4) To trial an integrated safety, occupational health and environmental management system in pilot SMEs and evaluate the implementing results.

The study was undertaken in consideration of the limitations of SMEs on adopting well-known environmental, occupational health and safety international standards such as ISO 14001: 2015, OHSAS 18001: 2007 and ISO 45001: 2018 that encourages the author to create new alternative integrated environmental, occupational health and safety management system that suits SMEs especially steel manufacturer.

Motivators and barriers to implementing such a management system obtained from literature reviews have been used to collect data from metal product manufacturing SMEs to define the motivators and barriers of SMEs to implementing such a management.

In another process, new alternative integrated management system has been created from data gathered from literature review, expert interview and surveyed questionnaire with SMEs in 3 provinces of Thailand (Chonburi, Chachoengsao and Rayong). These are the areas of the Eastern Economic Corridor as the new investment area under the big improvement project of the Thai Government to develop Thailand to be a high-income country.

4.2 Descriptive Data

4.2.1 General Information

Due to the fact that this research aimed to assess the factors that influenced the adoption of the management system by SMEs, 88 SMEs from three provinces were selected for this research. SMEs were identified according to the size of the enterprise, duration of business operation, certification of environmental management system or occupational health and safety management system as well as the certification of EMS and OHS integration as detailed below.

Table 4.1 Size of SMEs

Size of SMEs	Number of SMEs	Percentage
Small size	47	53.4
Medium size	41	46.6
Total	88	100

Source: Thepporn Jaroenroy, 2018.

As shown in the table, it is indicated that 47 SMEs are small (53.4%), 41 are medium-sized (46.6%) from the total of 88 SMEs in those areas.

Table 4.2 How Long of Business Operation

Year of business operation	Number of SMEs	Percentage
1-10 Years	38	43.2
11-20 Years	40	45.5
21-30 Years	8	9.1
31-40 Years	1	1.1
41-50 Years	0	0.0
51-60 Years	1	1.1
Total	88	100

Source: Thepporn Jaroenroy, 2018.

As seen in the table, it is indicated that the year of service of SME businesses is 11-20 years that represents 45.5% and 1-10 years represents 43.2% respectively.

Table 4.3 Safety Award/ Certification of Occupational Health and Safety Management System

Safety Awards/ management system certified	Number of SMEs	Percentage
No award/certification	16	18.2
Get award/certification	72	81.8
Total	88	100

Source: Thepporn Jaroenroy, 2018.

It is indicated that 72 SMEs get award or certification related to occupational health and safety management system (81.8%), and 16 SMEs do not get any award or such certification (18.2%).

Table 4.4 Environmental Award/Certification of Environmental Management System

Environmental Awards / management system certified	Number of SMEs	Percentage
No award/certification	54	61.4
Get award/certification	34	38.6
Total	88	100

Source: Thepporn Jaroenroy, 2018.

It is indicated that 34 SMEs get awards or certifications related to environmental management system (38.6%), and 54 SMEs do not get any award or such certification (61.4%).

4.2.2 Environmental, Safety and Occupational Health Management in SMEs

The characteristics of SMEs in term of environmental, safety and occupational health management in SMEs in this study were identified through their policy, safety and environmental problem as shown in Table 4.5

Table 4.5 Policy Establishment

Policy establishment	Number of SMEs	Percentage
Have the policy	70	79.5
Have no the policy	18	20.5
Total	88	100

Source: Thepporn Jaroenroy, 2018.

As shown in the table, it is indicated that 70 SMEs have a safety, occupational health and environmental policy (79.5%), while only 18 SMEs do not have a safety, occupational health and environmental policy (20.5%).

Table 4.6 Safety Problems in SMEs

Safety problem	Number of SMEs	Percentage
Machine	62	70.5
Physical	45	51.1
Chemical	39	44.3
Ergonomics	27	30.7
Biological	15	17.0
Stress	12	13.6
Other	7	8.0

Source: Thepporn Jaroenroy, 2018.

As shown in the table, the highest percentage of safety problems of SMEs is machine hazard that represents 70.5%, while physical hazard represents 51% and chemical hazard represents 44.3% respectively.

Table 4.7 Environmental Problems in SMEs

Environmental problem	Number of SMEs	Percentage
Waste	59	67.0
Noise	42	47.7
Wastewater	29	33.0
Air Emission	12	13.6
Other	3	3.4

Source: Thepporn Jaroenroy, 2018.

As shown in the table, the highest percentage of environmental problems of SMEs is waste that represents 67%, while noise represents 47.7% and wastewater represents 33.0% respectively.

Table 4.8 The Interest of SMEs in Adopting Safety, Occupational Health and Environmental Management System within their Organization

Interest in adopting a management system	Number of SMEs	Percentage
Interesting	50	58.6
Not interesting	38	43.2
Total	88	100

Source: Thepporn Jaroenroy, 2018.

As shown in the table, it is indicated that 50 SMEs have interest in adopting safety, occupational health and environmental management system within their organizations (58.6%). 38 SMEs have no interest in adopting such a management system within their organizations (43.2%).

The relationship between SME size, SHE policy, safety problems, environmental problems and the interest in adopting safety, occupational health and environmental management system has been analyzed by Pearson Chi-square to identify which factors are correlated with the interest of such management system adoption, based on the following hypothesis.

Hypothesis 1: Business size has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 2: SHE policy has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 3: Safety problem - machine hazard has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 4: Safety problem - biological hazard has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 5: Safety problem - physical hazard has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 6: Safety problem - ergonomics hazard has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 7: Safety problem - chemical hazard has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 8: Safety problem - stress hazard has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 9: Environmental problem - waste has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 10: Environmental problem – wastewater has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 11: Environmental problem - noise has a relationship with the interest in the safety, occupational health, and environmental management system adoption

Hypothesis 12: Environmental problem - air emission has a relationship with the interest in the safety, occupational health, and environmental management system adoption

The results of the relationship are shown in Table 4.9.

Table 4.9 The Relationship between Business Size SHE Policy, Safety Problems, Environmental Problems and the Interest in the Management System Adoption

Factor	Variable	<i>Chi-square</i>	<i>P-value</i>
SME size	Interest in management system adoption	3.434	0.064
SHE Policy	Interest in management system adoption	4.052	0.044*

Table 4.9 (Continued)

Factor	Variable	Chi-square	P-value
Machine hazard	Interest in management system adoption	0.699	0.403
Biological hazard	Interest in management system adoption	2.085	0.149
Physical hazard	Interest in management system adoption	0.380	0.538
Ergonomics hazard	Interest in management system adoption	1.193	0.275
Chemical hazard	Interest in management system adoption	3.247	0.072
Stress hazard	Interest in management system adoption	0.263	0.608
Waste	Interest in management system adoption	0.057	0.811
Wastewater	Interest in management system adoption	0.057	0.811
Noise	Interest in management system adoption	0.003	0.953
Air Emission	Interest in management system adoption	1.300	0.254

Source: Thepporn Jaroenroy, 2018.

Note: * The relationship is significant at 0.05

When considering all factors, it was found that only SHE Policy have a relationship with the interest in management system adoption (the relationship is significant at 0.05 level).

The correlation between barriers and motivators to implementing safety and occupational health management system, environmental management system and integrated management system has been analyzed by Pearson Correlation that is shown in Table 4.10- 4.12

Table 4.10 The Correlation between Barriers to Implementing Safety and Occupational Health Management System and Motivators to Implementing Safety and Occupational Health Management System

Factor	Factor	<i>r</i>²	<i>P-value</i>
barriers	motivators	-0.122	0.257

Source: Thepporn Jaroenroy, 2018.

As shown in the table, it is indicated that the correlation between barriers to implementing safety and occupational health management system and motivators to implementing safety and occupational health management system is not significant at $p < 0.05$.

Table 4.11 The Correlation between Barriers to Implementing Environmental Management System and Motivators to Implementing Environmental Management System

Factor	Factor	<i>r</i>²	<i>P-value</i>
barriers	motivators	-0.136	0.206

Source: Thepporn Jaroenroy, 2018.

As shown in the table, it is indicated that the correlation between barriers to implementing an environmental management system and motivators to implementing environmental management system is not significant at $p < 0.05$.

Table 4.12 The Correlation between Barriers to Implementing Integrated Management System and Motivators to Implementing an Integrated Management System

Factor	Factor	r^2	<i>P-value</i>
barriers	motivators	-0.052	0.627

Source: Thepporn Jaroenroy, 2018.

As shown in the table, it is indicated that the correlation between barriers to implementing an integrated management system and motivators to implementing integrated management system is not significant at $p < 0.05$.

Barriers and motivators to implementing Occupational Health and Safety Management System, Environmental management system, and Integrated Safety, Occupational Health, and Environmental Management System from Likert scale have been analyzed by using the following 5-point scale in Table 4.13

Table 4.13 The Definition of 5 Likert Scales

Scale	Definition
1.00 – 2.69	Not at all
2.70 – 4.29	Slightly related
4.30 – 5.89	Moderately related
5.90 – 7.49	Very related
7.50 – 9.00	Extremely related

Source: Thepporn Jaroenroy, 2018.

Barriers and motivators to implementing the Occupational Health and Safety Management System can be summarized as shown in Table 4.14- 4.15.

Table 4.14 Ranks of Internal and External Barriers to Implementing Occupational Health and Safety Management System

Barrier	Mean	Standard Deviation	Definition
Internal barrier			
Lack of budget	4.26	2.47	Slightly related
Top management lacks of safety management skill	3.60	2.42	Slightly related
Low safety and occupational health knowledge	3.49	2.34	Slightly related
No commitment to implementing safety and occupational health management system from the top management	3.82	2.50	Slightly related
Lack of time	4.24	2.51	Slightly related
External barrier			
Safety legal compliance	2.81	2.08	Slightly related
Lack of information on safety management system	3.19	2.29	Slightly related
Safety management system consultancy cost	5.33	2.81	Moderately related

Source: Thepporn Jaroenroy, 2018.

All internal barriers have been identified as slightly related to impediments to the implementation of the occupational health and safety management system. Additionally, safety legal compliance and lack of the information of safety management system are the external barriers that have been identified as slightly related to impediments to the implementation of the occupational health and safety management system, while the cost of safety management system consultancy was identified as a moderately related barrier.

Table 4.15 Ranks of Internal and External Motivators to Implementing Occupational Health and Safety Management System

Motivator	Mean	Standard Deviation	Definition
Internal motivator			
Safety attitude of top management	6.55	2.28	Very related
Safety awareness of employee	6.08	2.09	Very related
Strengthen the business competition	5.61	2.26	Moderately related
Need to eliminate the hazards	6.73	2.24	Very related
The commitment of top management	6.24	2.32	Very related
External Motivator			
Information support from the government sector	5.76	2.29	Moderately related
Lack of safety guideline	5.55	2.24	Moderately related
Strict Safety law enforcement	6.28	2.32	Very related

Source: Thepporn Jaroenroy, 2018.

Safety attitude of top management, safety awareness of employees, need to eliminate the hazards, and commitment of the top management are the internal motivators that were identified as very related to expediting the implementation of the occupational health and safety management system. Meanwhile improving the business competitiveness is the internal motivator that was identified as moderately related to expediting the implementation of the occupational health and safety management system.

Information support from the government sector and lack of safety guideline are the external motivators that moderately relate to the implementation of the occupational health and safety management system. Meanwhile the strict enforcement of safety law is very related to the implementation of the occupational health and safety management system.

Barriers and motivators to implementing Environmental Management System can be summarized as shown in Table 4.16 - 4.17.

Table 4.16 Ranks of Internal and External Barriers to implementing Environmental Management System

Barrier	Mean	Standard Deviation	Definition
Internal barrier			
Lack of budget	4.64	2.73	Moderately related
Lack of skilled staff to implement the management system	5.27	2.39	Moderately related
Lack of time	4.66	2.51	Moderately related
Lack of commitment from top management	4.30	2.75	Moderately related
Lack of knowledge in term of environmental issues in the organization	4.10	2.40	Slightly related
A low commitment of social responsibility in term of environment	4.05	2.52	Slightly related
External barrier			
Lack of information of environmental management system	4.13	2.36	Slightly related
The high cost of the management system auditing	5.36	2.65	Moderately related
No specific management system for SMEs	4.97	2.61	Moderately related

Source: Thepporn Jaroenroy, 2018.

Lack of budget, lack of skilled staff to implement the management system, lack of time, and lack of commitment from top management have been identified as

moderately related to impediments to the implementation of the environmental management system, while lack of knowledge in term of environmental issues in the organization and low commitment to environmental responsibility impede the implementation of the environmental management system slightly.

The high cost of the management system auditing and no specific management system are the external barriers that have been identified as slightly related to impediments to the implementation of the environmental management system, while lack of information on environmental management system is identified as a slightly related barrier.

Table 4.17 Ranks of Internal and External Motivators to Implementing Environmental Management System

Motivator	Mean	Standard Deviation	Definition
Internal Motivator			
Cost saving	6.39	2.29	Very related
Fulfill the customer satisfaction	7.28	1.95	Very related
Strengthen the business competitive	6.98	2.02	Very related
Top management focuses on the environmental performance	6.82	2.15	Very related
External Motivator			
Customer need	7.06	2.01	Very related
Environmental legislation and requirements	7.10	1.89	Very related
Build up the good relationship with the community	7.07	1.85	Very related
The agreement of the trade organization	6.61	2.29	Very related
Policy from the stakeholder	5.63	2.65	Moderately related

Source: Thepporn Jaroenroy, 2018.

All internal motivators have been identified as a motivator very related to expediting the implementation of the Environmental management system. Customer

need, environmental legislation and requirements, the good relationship with the community, and the agreement of the trade organization are the external motivators that are very related to the implementation of the Environmental management system. Meanwhile, policy from the stakeholder relates to the implementation of Environmental management system moderately.

Barriers and motivators to implementing Integrated Safety, Occupational Health, and Environmental Management System can be summarized as shown in Table 4.18 - 4.19.

Table 4.18 Ranks of Internal and External Barriers to Implementing Integrated Safety, Occupational Health, and Environmental Management System

Barrier	Mean	Standard Deviation	Definition
Internal barrier			
Lack of budget	4.89	2.74	Moderately related
Lack of knowledge in term of integrated management system implementation	5.25	2.58	Moderately related
Lack of employee participation	5.53	2.47	Moderately related
Lack of time	4.93	2.43	Moderately related
Lack of commitment from top management	4.63	2.52	Moderately related
Change resistance from employee	5.03	2.61	Moderately related
External barrier			
No support from external party	5.30	2.55	Moderately related
High cost of the management system auditing	5.90	2.43	Very related

Source: Thepporn Jaroenroy, 2018

All internal barriers have been identified as moderately related to impediments to the implementation of the Integrated Safety, Occupational Health and Environmental

management system. No support from an external party is identified as an external barrier impeding the implementation of the Integrated Safety, Occupational Health and Environmental management system as moderately related, while high cost of the management auditing is very related to the implementation of the Integrated Safety, Occupational Health and Environmental management system.

Table 4.19 Ranks of Internal and External Motivators to Implementing Integrated Safety, Occupational Health, and Environmental Management System

Motivator	Mean	Standard Deviation	Definition
Internal Motivator			
Need to improve the organization performance	6.63	2.00	Very related
Cost-saving by integrating the management system	6.32	2.16	Very related
Need of employee	5.84	2.18	Moderately related
Increase the organization profit	6.49	2.28	Very related
External Motivator			
Legal and other requirements	6.70	2.05	Very related
Customer Need	6.63	2.21	Very related
Policy from the stakeholder	5.57	2.61	Moderately related

Source: Thepporn Jaroenroy, 2018

The need to improve the organizational performance, cost saving by integrating the management system, and increasing the organization profit are the internal motivators that are very related to the implementation of the Integrated Safety, Occupational Health, and Environmental management system. Meanwhile, the need of employee was identified as a moderately related internal motivator.

Legal and other requirements and customer needs are the external motivators that are very related to the implementation of the Integrated Safety, Occupational

Health, and Environmental management system, while policy from stakeholder was identified as moderately related.

4.3 Findings from an expert interview

In this section, the findings from expert interviews and focus group discussion have been analyzed by content analysis method. The interview data have been classified by domain analysis and the findings are finalized as follows:

4.3.1 Barriers and Motivators to Implementing Safety, Occupational Health and Environmental Management System in SMEs

4.3.1.1 Barriers

The barriers in the points of view of 14 experts can be grouped into the following:

- 1) Lack of the experts to implement safety, occupational health and environmental management system,
- 2) The limitation of access to technology especially the technology related to health, safety, and environment,
- 3) Lack of financial resource to support safety and environmental management system,
- 4) Lack of information related to the safety, occupational health and environmental management system, especially the guidelines for implementing such a management system,
- 5) Lack of time for implementing safety and environmental management system,
- 6) Lack of specific management system for SMEs that is the important barrier,
- 7) Many documents have been created from the well-known management systems such as OHSAS 18001:2007, ISO 14001:2015 that SMEs cannot generate such documents to comply with those management systems,
- 8) The existing safety and environmental management systems are not simple and are difficult to implement in SMEs. Additionally, the experts

described the barrier to implementing safety, occupational health and environmental management system as follows:

“In my opinion, the significant barriers to implementing the management system in SMEs are: lack of staff who have a good knowledge on how to implement the management system, SMEs still face financial and time constraints, lack of specific safety, occupational health and environmental management system for SMEs and the complexity of existing safety and environmental management system” (Expert 1).

“The barriers to safety, occupational health and environmental management system implementation in SMEs are: lack of expert who will implement the management system, time constraint on management system implementation, lack of safety and environmental management system that fit SMEs characteristics and many documents in the existing safety and environmental management system” (Expert 2).

“The implementation of safety and environmental management system in SMEs always faces financial constraint, and manpower for safety and environmental management system implementation due to excessive workloads of employees. SMEs have a limitation of access to technology especially in safety and environmental technology. Additionally, the international standards such as ISO 14001 and OHSAS 18001 maybe not suitable for SMEs. On the other hand, SMEs need specific safety and environmental management system that fits them” (Expert 3).

“SMEs have difficulty in implementing an international management system such as OHSAS 18001 and ISO 14001 that are complicated and need a lot of documents. I think in Thailand we lack specific safety and environmental management system for SMEs that suit their characteristics. Another barrier is the staff who will implement the management system. Many SMEs cannot hire a responsible person to implement the management system, so they assign this work as an extra task for the existing staff. Additionally, SMEs lack finance, time and source of data for safety and environmental management system implementation” (Expert 4).

“SMEs always have a budgeting problem to support safety and environmental management system implementation. Moreover, lack of manpower for handling the management system is another problem found in SMEs. Most employees have a lot of work and no time for other additional tasks. They do not know how to find

the guideline for safety and environmental management system implementation. Moreover, SMEs need specific safety and environmental management system that is simple and requires low effort for implementation” (Expert 5).

“The complexity of existing safety and environmental management system is the significant barrier for SMEs to adopt such a management system within their organization. Additional barriers are the assigned person for management system implementation, limitation of access to the safety and environmental technology, lack of budget and time” (Expert 9).

4.3.1.2 Motivators

The motivators to encouraging SMEs to implement safety, occupational health and environmental management system are grouped as follows:

1) The organization structure of SMEs is a flat organization that makes it easy to implement a management system, the expert explained that:

“The flat organizational structure of SMEs is an advantage that supports SMEs to implement safety and environmental management system because the communication process can be conducted quickly” (Expert 7).

2) The flat organization can encourage good communication within the organization due to a small number of employees,

3) The decision making can be done by the owner-manager without any stakeholder, as the expert explained that:

“The organization of SME is normally a flat structure without complexity. So it is easy to communicate and make everyone understand the direction of the organization. And when the owner-managers decide to adopt the management system in their organization, there is no need to ask for opinions from other stakeholders” (Expert 13).

4) The good relationships among employers, employees, and colleagues can be the significant motivator to implementing safety, occupational health and environmental management system.

5) Informal control and informal documentation can be used to implement such management system in SMEs, as the expert explained that:

“The small number of employees in SMEs is an advantage of adopting safety and environmental management system because the owner-managers

always have a good relationship with all employees, and the owner-managers can motivate employees to adopt safety and environmental practices in their works” (Expert 10).

4.3.2 How to Implement Safety, Occupational Health and Environmental Management System in SMEs

In order to ensure the success of safety, occupational health and environmental management system, the processes and methods of implementing the management system have been summarized and grouped from the points of view of all experts as follows:

4.3.2.1 Resources:

All essential resources for implementing management system shall be supported by top management. The staff who will implement safety, occupational health and environmental management system should have knowledge of safety and environment. Implementation of the management system in SMEs may take a longer period than the large enterprises. To support this factor, a quote from fieldwork interviews is presented below.

“Top management shall support all essential resources to safety and environmental management system implementation including a staff member who will take care of such management system, and time for their staff to establish and maintain the management system” (Expert 1).

4.3.2.2 Method:

The simple and specific safety, occupational health and environmental management system should be designed and implemented in SMEs with the concept of Plan-Do-Check-Act (PDCA) cycle to ensure that SMEs can implement such management system with low effort. The organizational self-assessment should be carried out prior to the planning process to understand the context of the organization. The documentation of the management system should be reduced to match the characteristic of SMEs, while the requirements of the management system should be trained to staff who implement such management system to ensure that the staff understands how to implement and maintain that system. Finally, monitoring process

should be carried out to monitor the effectiveness of the management system implementation at regular intervals. To support this idea, the expert explained that:

“PDCA cycle is still very important and needs to be maintained for all management systems, so I think safety and environmental management system should be designed based on the PDCA cycle. The owner-manager should communicate with all employees about the benefits of such management system prior to implementing it in their organization” (Expert 2).

“SMEs need simple safety and environmental management system that makes them feel comfortable to implement it. Plan-Do-Check-Act is still a basic structure for the management system design to ensure the continual improvement” (Expert 5).

“The safety, occupational health and environmental management system for SMEs should be simple and easy to understand. SMEs do not need to create a large amount of document because many SMEs do not have a safety, environmental officer or an expert who can handle tasks of safety and environment which can be the important obstacle for SMEs to implement such management system” (Expert 4).

4.3.2.3 Employee participation and engagement:

The participation and engagement of all employees are the key driver to ensure the success of management system implementation. The benefits of implementing the management system should be provided to the top management to make them feel confident that the safety, occupational health, and environmental management system will enhance safety and environmental performance as well as improve their business performances. The management system is not just for the better image of the organization, but it is also a powerful tool to strengthen their business and ensure the readiness for competition in the global market.

Moreover, the benefits of the management system must be communicated to all related employees, especially, how safety, occupational health, and environmental management system affect them in terms of workplace safety, injury and illness prevention as well as pollution prevention which will ensure the smooth operation without plant shutdown from any complaints or non-compliance with legislation that affect their work and income. To support this idea, the expert explained as follows:

“The first thing that can motivate the enterprise owners to be interested in safety and environmental management system is the benefits from such a management system. The government should give the information about the benefits of implementing the management system to the enterprise owners and how such management system can boost their business. The safety and environmental management system can help the enterprises to comply with legal requirements, eliminate the hazards and prevent the pollutions. Finally, the safety and environmental management system can help the enterprises to minimize their business risks” (Expert 11).

“Before implementing the safety and environmental management system within the organization, the responsible person should communicate the benefits of the management system to all employees, especially, the benefits that they can gain from the management system implementation such as workplace safety, security on their works, etc. If all employees accept such a management system, it can ensure that the management system implementation will be done successfully. Moreover, the manager should urge all employees to participate in the management system implementation” (Expert 2).

4.3.2.4 Monitoring:

The monitoring program should include both internal and external audits to ensure the continual improvement of the management system. The expert explained that:

“The government should support the monitoring process of the management system implementation, especially surveillance audit, to ensure that SMEs will implement and maintain such a management system all the time. Additionally, the government should support SMEs by providing consultants to coach SMEs to implement the safety and environmental management system” (Expert 13).

4.3.3 Which Support from the Government Can Encourage SMEs to Implement Safety, Occupational Health and Environmental Management System Effectively

From the points of view of all experts, the government should provide assistance in implementing the management system in SMEs. The assistance from the government should consist of the following:

4.3.3.1 Provide a consultant to coach SMEs to adopt safety, occupational health and environmental management system within their organization.

“The consultant must be provided for SMEs to help them in implementing safety and environmental management system because it is hard for SMEs to adopt the management system by themselves without any support from the relevant organization of the government” (Expert 1).

“The government should provide safety and environmental consultant to coach SMEs in safety and environmental management system implementing. A training program should be provided to make the employees understand and get them buy-in for such management system” (Expert 4).

4.3.3.2 Financial support to mitigate the budget constraint that can be set as a consulting project for SMEs. Financial support should include training budget, consultation fees, unsafe condition improvement budget, and surveillance audit fees. In addition, loans with low-interest rates shall be provided in case SMEs need to implement the management system and pay all implementation cost by themselves. According to the financial support, it should motivate SMEs to be interested in management system adoption.

4.3.3.3 Special benefits from safety, occupational health, and environmental management system implementation should be proposed by the government, for instance: a tax rate reduction, premium rate reduction, etc. All these benefits should be demonstrated to SMEs that such management system can strengthen their business.

“The government should provide financial aid to support SMEs for implementing safety and environmental management system, including financial aid for improving the unsafe condition within SMEs to eliminate the hazards in their workplaces” (Expert 9).

“The loans with low-interest rates should be provided for SMEs to support the safety and environment improvement in case of SMEs lack of budget. Moreover, other special benefits should be provided for SMEs that implementing safety and environmental management system such as safety and environmental course with no charge, etc.” (Expert 10).

4.3.3.4 The cooperation with large enterprises should be carried out in term of the procurement process. Safety and environmental criteria should be one of the criteria for vendor selection of large enterprises that can force SMEs to improve their safety and environmental performance to meet their customer requirements.

“The government should have a cooperation with large enterprises to create a criteria for safety and environment in the supply chain that will force SMEs to improve their safety and environmental performance, so that they will be selected by large enterprises to be the supplier or vendor and join the business” (Expert 8).

4.3.3.5 The surveillance audit for management system is the important process that the government should support, especially the external audit. A surveillance audit will be the mechanism to urge all SMEs that implement management system to continuously improve their management system according to the concept of continual improvement. The surveillance audit should be carried out and maintained at least once a year.

“The audit program is very important for ensuring that SMEs will implement and maintain safety and environmental management system as well as improve their safety and environmental performance. The surveillance audit should be conducted every year after the enterprises have been audited for the first time. This surveillance audit should be supported by the government” (Expert 1).

4.3.3.6 The knowledge-sharing program should be provided to owner-managers of SMEs to ensure that they can understand their hazards, environmental aspects, and how to manage those risks and environmental aspects as well as how to cope with their business risks. The practices of knowledge sharing may be done in collaboration with SMEs that are successful in implementing management system. The meeting among SMEs should be set and the site visit program is another idea to demonstrate that the management system can improve safety and environmental performance, as well as improve the overall process of the business operation.

“The knowledge sharing in term of safety among SMEs should be done to increase safety and environmental knowledge of owners and staff who will take care of the safety and environmental management system. Site visit at the enterprises that succeed in safety and environmental management system implementation is the best way to motivate other SMEs to be interested in such a management system. The real atmosphere at the visited site will ensure other SMEs that the management system can help their business” (Expert 11).

4.3.3.7 The local authority officers should take a role of the inspector responsible for safety, occupational health, and environment in the enterprises located in their areas, to ensure that minimum requirements of safety and environmental legislation have been implemented. Moreover, the inspection program by the authority officers is a proactive measure that can prevent accidents and serious environmental problems.

“The local authorities in each area should have a role in conducting a safety and environment inspection in the factory in that area that will help the enterprises to prevent injury, illness and environmental problems from their business activities. Additionally, the authority officers can share the safety and environmental knowledge to the enterprises during their visit” (Expert 8).

4.3.3.8 The long-term support for implementation of safety, occupational health, and environmental management system should be provided to ensure the continual improvement of the safety and environmental performance in SMEs that implement such management system.

According to the points of view of all experts, the data demonstrate that SMEs need strong support from the government in terms of financing, consultation, knowledge sharing and extra benefits, which will motivate SMEs to change for the good performance of safety and environment by considering the management system adoption in their enterprises.

4.4 Findings from Focus Group Discussion

4.4.1 Safety, Occupational Health and Environmental Management System Model for SMEs

The draft of conceptual framework and requirement of safety, occupational health and environmental management system has been discussed by 10 experts during focus group discussion. The recommendations from all experts can be summarized as follows:

4.4.1.1 Some terms and definitions need to be changed to ensure that SMEs will understanding all of them. The following terms and definitions should be revised:

- 1) Self-assessment
- 2) Document

In addition, some terms and definitions need to be added.

4.4.1.2 Wording in the requirements should be simple and specific words that are difficult to understand should be avoided.

4.4.1.3 The requirements for hazard identification and environmental aspect should be separated to ensure that the requirements are clear and simple.

4.4.1.4 “Safety, occupational health and environmental objective” has been changed to “Objective and mitigation plan”

4.4.1.5 Other requirements in term of safety, occupational health and environment from interested parties need to be added to legislative requirement.

4.4.1.6 “Documented information” should be changed to “documentation”.

4.4.1.7 Safety, occupational health and environment training session should be evaluated to ensure the effectiveness of the training.

4.4.1.8 In part of “Action for continual improvement”, the periodic management review should be carried out by top management at least once a year.

4.4.1.9 The safety, occupational health and environmental management system implementation manual should be developed with the simple templates.

4.4.1.10 The frequency of the management reviews for the integrated safety, occupational health, and environmental management system for SMEs should be defined in the requirement at least once a year.

4.4.1.11 The recommendations for the management system improvement should be included as an input to the management review.

All recommendations have been carefully considered in order to ensure that the draft of safety, occupational health and environmental management system for SMEs will be revised according to the points of view of the experts.

Finally, safety, occupational health and safety management system for small and medium-sized enterprise has been established in consideration of the limitations of SMEs such as human resource, budget and time, to support SMEs in management system implementation. The purpose of such management system is to reduce injury and illness cases in SMEs as well as prevent and mitigate the environmental impact of their operations to ensure the business continuity. Finally, the management system will help SMEs to improve the safety and environmental performance and ready for competition in the market.

4.5 Safety, Occupational health and Environmental Management System for Small and Medium Enterprise

4.5.1 The Conceptual Framework of Safety, Occupational Health and Environmental Management System for SMEs has been Designed as Figure 4.1;

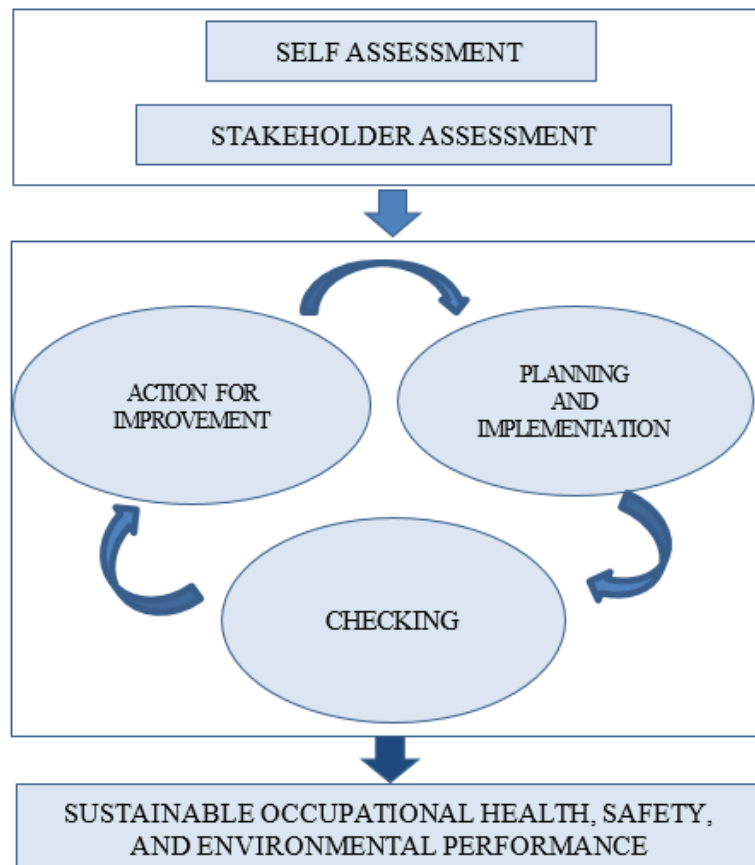


Figure 4.1 Safety, Occupational Health and Environmental Management System Framework

Source: Thepporn Jaroenroy, 2018.

4.5.2 Definition

4.5.2.1 Safety, Occupational health and Environmental Management System for SMEs: Part of the management system for the organization to define and implement safety, occupational health and environmental policy and to cope with the business risks.

4.5.2.2 Interested party: person or group of people either working inside or outside the organization that can get the consequence from activities of the organization in term of safety, occupational health and environment.

4.5.2.3 Safety, occupational health and environmental policy: intention and direction of the organization on safety, occupational health and environmental management that is identified by top management

4.5.2.4 Top management: person or group of people who directs and controls an organization

4.5.2.5 Hazard: source with a potential to cause injury and ill health (ISO 45001:2018)

4.5.2.6 Hazard identification: process of recognizing that a hazard exists and defining its characteristics (OHSAS 18001:2007)

4.5.2.7 Risk assessment: process of evaluating the risk(s), taking into account the adequacy of any existing controls, and deciding whether or not the risk(s) is acceptable (OHSAS 18001:2007)

4.5.2.8 Environmental aspect: element of an organization's activities or products or services that interacts or can interact with the environment (ISO 14001:2015)

4.5.2.9 Environmental impact: change to the environment, whether adverse or beneficial, wholly or partially resulting from organization's environmental aspects (ISO 14001:2015)

4.5.2.10 Environment: surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans and their interrelationships (ISO 14001:2015)

4.5.2.11 Occupational health and safety: conditions and factors that affect, or could affect, the health and safety of employees or other workers (including temporary workers and contractor personnel), visitors, or any other person in the workplace (OHSAS 18001:2007)

4.5.2.12 Safety, occupational health and environmental legislation: safety, occupational health and environmental legislation related to organization's activities

4.5.2.13 Safety, occupational health and environmental objective: safety, occupational health and environmental goal that an organization sets itself to achieve

4.5.2.14 Document: information and its supporting medium (OHSAS 18001:2007)

4.5.2.15 Audit: systematic, independent and documented process for obtaining “audit evidence” and evaluating it objectively to determine extent to which “audit criteria” are fulfilled (OHSAS 18001:2007)

4.5.2.16 Accident: an incident which has given rise to injury, ill health or fatality (OHSAS 18001:2007)

4.5.2.17 Nonconformity: non-fulfillment of a requirement (OHSAS 18001:2007)

4.5.2.18 Corrective action: action to eliminate the cause of nonconformity and to prevent recurrence

4.5.2.19 Continual improvement: recurring activity to enhance performance

4.5.2.20 Self-assessment: process to understand the organization by identifying either positive or negative issues that affect the business and safety, occupational health and environmental management system.

4.5.3 Safety, Occupational Health and Environmental Management System for Small and Medium Enterprises

4.5.3.1 Self-assessment

1) Understanding the organization and its context

The organization shall define internal and external issues which affect business operation either positive or negative, as well as the issues which affect safety, occupational health and environmental management system.

2) Understanding the needs and expectations of interested parties

The organization shall define the interested parties that are relevant to safety, occupational health and environmental management system, and what are the needs and expectations of these interested parties

4.5.3.2 Planning and implementation

1) Safety, occupational health and environmental policy

Top management shall establish, implement and maintain a safety, occupational health and environmental management system and ensure that it;

(1) Is appropriate to the status of an organization, hazards and environmental aspects

(2) Provides a framework for safety, occupational health and environmental objectives

(3) Includes a commitment to injury and illness prevention as well as pollution prevention from all activities of an organization

(4) Includes a commitment to fulfilling safety, occupational health and environmental legislation and related requirements

(5) Includes a commitment to continual improvement of the safety, occupational health and environmental management system

(6) Communicates the safety, occupational health and environmental policy within the organization

(7) Documents the safety, occupational health and environmental policy which is signed by top management

2) Identification of safety and environmental problems

(1) Hazard identification and risk assessment

The organization shall identify the hazards from all activities of the organization and activities of contractors and visitors inside the organization vicinity.

The organization shall determine the criteria for risk assessment.

The organization shall document and keep records of hazard identification and risk assessment

(2) Environmental aspects

The organization shall identify environmental aspects of its activities, products and services that it can influence; the environmental impacts arising from normal, abnormal and emergency conditions.

The organization shall determine the criteria to clarify significant environmental aspects.

The organization shall document and keep the results of environmental aspect identification and assessment.

3) Objective and Mitigation plan

The organization shall establish safety, occupational health and environmental objectives to address significant aspects and hazards, issue referred to self-assessment. The environmental objectives shall be:

- (1) Consistent with safety, occupational health and environmental policy
- (2) Measurable
- (3) Communicated within the organization

When planning to achieve its safety, occupational health and environmental objectives, the organization shall determine:

- What will be done;
- Responsible person
- Time frame to achieve that objective
- Required resources

The organization shall follow up and monitor those objectives in the defined period.

4) Legal and other requirements

The organization shall identify a safety, occupational health and environmental legal and other requirements that are applicable to it and keep information up-to-date.

The organization shall periodically evaluate the compliance with applicable legal and other requirements and address the nonconformity to those applicable legal and other requirements.

The organization shall document and keep records of legal and other requirements identification and the results of the periodic evaluations.

5) Training

The organization shall provide safety, occupational health and environmental training to ensure that workers will recognize the hazards, environmental aspects related to their works and on how to prevent that hazards and mitigate the environmental impacts. The topics of training shall be determined as follows:

- (1) Safety, occupational health and environmental policy

(2) Hazards and environmental aspects of their works and how to manage and control those hazards and environmental aspects

(3) Roles and responsibilities related to safety, occupational health and environmental legal and other requirements

The effectiveness of the training shall be evaluated.

The organization shall document and keep records of the training.

6) Document

The organization shall establish the document control process to ensure that the documents in safety, occupational health and environmental management system for SMEs will be updated and ready to use according to the intention of such documents. The organization shall ensure that:

(1) Documents have been approved prior to use

(2) Changes and the current revision of documents are identified

(3) Documents are reviewed and updated as necessary

(4) Retention periods for all records are identified.

4.5.3.3 Checking

1) Internal audit

The organization shall conduct an internal audit. An audit frequency, audit method, the responsibilities of the auditors, audit reporting and audit criteria shall be defined. The organization shall establish internal audit team.

The organization shall document and keep records of the internal audit programs.

2) Accident Investigation

The organization shall provide accident reports and identify a root cause if an accident takes place. The root causes must be addressed to prevent the recurrence of the accident. The results of the investigation shall be communicated with related employees. The organization shall document and keep the records of accident investigation as defined retention period.

4.5.3.4 Action for continual improvement

1) Corrective action

In case nonconformity has been found while implementing safety, occupational health and environmental management system for SMEs, the root cause of nonconformity shall be identified and addressed to prevent the recurrence. The organization shall document and keep the record of nonconformity.

2) Management review

Management review of the management system shall be carried out by top management at least once a year to ensure the effectiveness and continual improvement of such management system. Inputs to management reviews shall include:

- (1) Follow-up actions from previous management reviews;
- (2) Safety, occupational health, and environmental policy;
- (3) Needs and expectations from stakeholders;
- (4) Significant hazards and environmental aspects;
- (5) Business risks;
- (6) Achievement of action plan for risks and impacts mitigation;
- (7) Safety, occupational health, and environmental performance of the organization;
- (8) Adequacy of resources;
- (9) Recommendations for improvement.

The outputs of the management review shall be used to make a decision for the improvement of such management system.

The organization shall document and keep the record of management review, according to the integration of ISO 14001: 2015, OHSAS 18001: 2007, and ISO 45001: 2018 that transform to the Integrated safety, occupational health, and environmental management system for SMEs. Description of the integration is shown in Table 4.20

Table 4.20 The Integration of ISO 14001: 2015, OHSAS 18001: 2007, and ISO 45001: 2018

ISO 14001: 2015	ISO 45001: 2018	OHSAS 18001: 2007	Integrated safety, occupational health, and environmental management system for SMEs
1 Scope	1 Scope	1 Scope	-
2 Normative reference	2 Normative references	2 Reference publications	ISO 14001: 2015 OHSAS 18001: 2007 ISO 45001: 2018
3 Term and condition	3 Terms and definitions	3 Terms and definitions	Definition
4 Context of the organization (title only)	4 Context of the organization (title only)	-	Self-assessment
4.1 Understanding the organizations and its context	4.1 Understanding the organizations and its context	-	Understanding the organization and its context
4.2 Understanding the needs and expectations of interested parties	4.2 Understanding the needs and expectations of workers and other interested parties	-	Understanding the needs and expectations of interested parties
4.3 Determining the scope of the environmental management system	4.3 Determining the scope of the OH&S management system	4 OH&S management system requirements (title only)	-
4.4 Environmental management system	4.4 OH&S management system	4.1 General requirements	-
5 Leadership (title only)	5 Leadership and worker participation (title only)	-	-

Table 4.20 (Continued)

ISO 14001: 2015	ISO 45001: 2018	OHSAS 18001: 2007	Integrated safety, occupational health, and environmental management system for SMEs
5.1 Leadership and commitment	5.1 Leadership and commitment	-	-
5.2 Environmental policy	5.2 OH&S policy	4.2 OH&S policy	Safety, occupational health, and environmental policy
5.3 Organizational roles, responsibilities and authorities	5.3 Organizational roles, responsibilities, accountabilities and authorities	4.4.1 Resources, roles, responsibility, accountability and authority	-
	5.4 Consultation and participation of workers	4.4.3.2 Participation and consultation	-
6 Planning (title only)	6 Planning (title only)	4.3 Planning (title only)	-
6.1 Actions to address risks and opportunities (title only)	6.1 Actions to address risks and opportunities (title only)	-	-
6.1.1 General	6.1.1 General	-	-
	6.1.2 Hazard identification and assessment of OH&S risks (title only)		
6.1.2 Environmental aspects	6.1.2.1 Hazard identification	4.3.1 Hazard identification, risk assessment and determining controls	Hazard identification and risk assessment Environmental aspects

Table 4.20 (Continued)

ISO 14001: 2015	ISO 45001: 2018	OHSAS 18001: 2007	Integrated safety, occupational health, and environmental management system for SMEs
	6.1.2.2 Assessment of OH&S risks and other risks to the OH&S management system	-	-
	6.1.2.3 Assessment of OH&S opportunities and other opportunities for the OH&S management system	-	-
6.1.3 Compliance obligations	6.1.3 Determination of legal requirements and other requirements	4.3.2 Legal and other requirements	Legal and other requirements
6.1.4 Planning action	6.1.4 Planning action	-	-
6.2 Environmental objectives and planning to achieve them (title only)	6.2 OH&S objectives and planning to achieve them (title only)	-	-
6.2.1 Environmental objectives	6.2.1 OH&S objectives	4.3.3 Objectives and programmes	Objective and Mitigation Plan
6.2.2 Planning actions to achieve environmental objectives	6.2.2 Planning to achieve OH&S objectives	-	Objective and Mitigation Plan
7 Support (title only)	7 Support (title only)	-	-

Table 4.20 (Continued)

ISO 14001: 2015	ISO 45001: 2018	OHSAS 18001: 2007	Integrated safety, occupational health, and environmental management system for SMEs
7.1 Resources	7.1 Resources	4.4.1 Resources, roles, responsibility, accountability and authority	-
7.2 Competence	7.2 Competence	4.4.2 Competence, training and awareness	Training
7.3 Awareness	7.3 Awareness		
7.4 Communication (title only)	7.4 Communication	4.4.3 Communication, participation and consultation (title only)	-
7.4.1 General	7.4.1 General		
7.4.2 Internal communication	7.4.2 Internal communication		
7.4.3 External communication	7.4.3 External communication	4.4.3.1 Communication	
7.5 Documented information (title only)	7.5 Documented information (title only)	-	Document
7.5.1 General	7.5.1 General	4.4.4 Documentation	Document
7.5.2 Creating and Updating	7.5.2 Creating and updating	4.4.5 Control of documents	
7.5.3 Control of documented information	7.5.3 Control of documented information	4.5.4 Control of records	
8 Operation (title only)	8 Operation (title only)	4.4 Implementation and operation (title only)	-
8.1 Operational planning and control	8.1 Operational planning and control	4.4.6 Operational control	
	8.1.1 General		
	8.1.2 Eliminating hazards and		

Table 4.20 (Continued)

ISO 14001: 2015	ISO 45001: 2018	OHSAS 18001: 2007	Integrated safety, occupational health, and environmental management system for SMEs
	reducing OH&S risks	4.3.1 Hazard identification and operation	
	8.1.3 Management of change	(title only)	
	8.1.4 Procurement	4.4.6 Operational control	
	8.1.4.1 General		
	8.1.4.2 Contractors		
	8.1.4.3 Outsourcing		
8.2 Emergency preparedness and response	8.2 Emergency preparedness and response	4.4.7 Emergency preparedness and response	-
9 Performance evaluation (title only)	9 Performance evaluation (title only)	4.5 Checking (title only)	-
9.1 Monitoring, measurement, analysis and evaluation (title only)	9.1 Monitoring, measurement, analysis and evaluation (title only)	4.5.1 Performance measurement and monitoring	
9.1.1 General	9.1.1 General		
9.1.2 Evaluation of compliance	9.1.2 Evaluation of compliance	4.5.2 Evaluation of compliance	Legal and other requirements
9.2 Internal audit (title only)	9.2 Internal audit (title only)	4.5.5 Internal audit	Internal audit
9.2.1 General	9.2.1 General		
9.2.2 Internal audit programme	9.2.2 Internal audit programme		
9.3 Management review	9.3 Management review	4.6 Management review	Management review
10 Improvement (title only)	10 Improvement (title only)	4.5.3 Incident investigation,	Accident investigation
10.1 General	10.1 General	nonconformity,	

Table 4.20 (Continued)

ISO 14001: 2015	ISO 45001: 2018	OHSAS 18001: 2007	Integrated safety, occupational health, and environmental management system for SMEs
10.2 Nonconformity and corrective action	10.2 Incident, nonconformity and corrective action	corrective action and preventive action 4.5.3.1 Incident investigation 4.5.3.2 Nonconformity, corrective action and preventive action	Corrective action
10.3 Continual improvement	10.3 Continual improvement	4.1 General requirements 4.2 OH&S policy 4.6 Management review	Management review

Source: Thepporn Jaroenroy, 2018.

The newly designed integrated safety, occupational health, and environmental management system tries to minimize the complexity of the requirements of ISO 45001: 2018, ISO 14001: 2015, and OHSAS 18001: 2007. Additionally, the specific safety, occupational health and environmental requirements for SMEs were designed to fulfill the Ministerial regulation on the prescribing of standard for administration and management of occupational safety, health and environment B.E. 2553 (A.D. 2010) with the implementation manual for SMEs.

The requirements of ISO 45001: 2018 and ISO 14001: 2015 that were excluded from the integrated safety, occupational health, and environmental management system for SMEs consist of:

1) Leadership and commitment of top management- the reason to remove this requirement because it should be the main responsibility of the top management when the top management made a decision to adopt the management system in their organization.

2) Organizational roles, responsibilities and accountabilities- due to the reason that the comprehensive training process can help all employees understand their roles, responsibilities, and accountabilities automatically that there is no need to identify the roles, responsibilities and accountabilities in term of safety, occupational health and environment.

3) Consultation and participation of workers- the flat organization of SMEs that promotes the good relationship between employer and employee can encourage consultation and participation of workers in term of safety. That is the reason to exclude this requirement from the newly designed management system for SMEs.

4) Resources- all organizations that would like to implement the management system need to provide the essential resources to ensure the achievement of the management system implementation, so there is no need to include this requirement in the newly designed management system for SMEs.

5) Communication- a comprehensive training process can encourage communication in the organization, moreover, SMEs are often more familiar with informal communication than formal communication.

6) Operational planning and control- according to the newly designed management system for SMEs, all hazards and environmental aspects, as well as other risks will be addressed by the objectives and mitigation plans and the organization shall follow up and monitor those objectives within the defined period.

7) Emergency preparedness and response- all emergency events should be identified by the hazard identification and environmental aspect process. All emergency events must be addressed by the objectives and mitigation plans.

To ensure that the designed safety, occupational health and environmental management system has been implemented in 3 pilot enterprises in Chonburi and

Chachoengsao provinces with the observation program by the author who take a role of a consultant for the management system implementation, the period of implementation was determined for 5 months and the implementation manual was developed to comply with safety, occupational health, and environmental management system requirement. The results of implementation in pilot enterprises have been evaluated by using a balanced scorecard that is shown in Chapter 5 to Chapter 7.

4.6 Reliability and Validity

The reliability of the study may have influenced by several factors, the influenced factors consist of participant error or participant bias, and observer error or observer bias (Saunders et al., 2008). Participant error can be occurred and affected the answer of the participant from their subconscious. In this case, the roles and responsibilities of the interviewees within their organization as well as their educational background may affect their knowledge of safety, occupational health, and environment management system. Additionally, the position of the interviewees in the enterprises may also have led a bias of the answers. To eliminate the observer error, the interview had been conducted by the researcher only. The observer bias may have influenced the analysis of the case study that implementing the integrated safety, occupational health and environmental management system in three pilot enterprises. The observer bias can occur from the perception of the researcher and the relationship with the interviewees.

According to the background of the enterprises that participated in the study, all of participated enterprises implemented the Environmental management system (ISO 14001: 2015) that is the limitation of this study. The results of the integrated safety, occupational health and environmental management system for SMEs might not represent the exact consequence to the SMEs in term of environmental performance improvement, that might affect the validity of the study. Future research may focus the case study with the SMEs that do not implement any safety and environmental management system before.

CHAPTER 5

RESULT OF IMPLEMENTING INTEGRATED SAFETY, OCCUPATIONAL HEALTH AND ENVIRONMENTAL MANAGEMENT SYSTEM MODEL FOR SMALL AND MEDIUM ENTERPRISE IN PILOT ENTERPRISE: CASE STUDY 1

The first enterprise that has implemented integrated safety, occupational health and environmental management system within their organization is a manufacturer of metal products for automotive that is located in Bangnumpraew district, Chachoengsao province.

5.1 Company Background

The enterprise of case study 1 is a Thai enterprise that was established on September 23, 1993. Currently, the company has 2 factories: Factory 1 is located at 10 Soi Ramindra 117 Yeak 2, Ramindra Road., KM. 14, Minburi, Bangkok with 6,400 square meters and total employees of 140 persons; Factory 2 is located at 77/7 Moo 13 Saladaeng, Bangnumpreaw district, Chachoengsao province with 68,800 square meters and total employees of 110 persons. The location is shown in picture 5.1. In this study, an integrated management system has been implemented in factory 2. Case study 1 enterprise, factory 2 is certified to ISO/TS 16949: 2009 and ISO 14001: 2004.

The main products are powertrain parts, interior parts, and chassis for automotive.

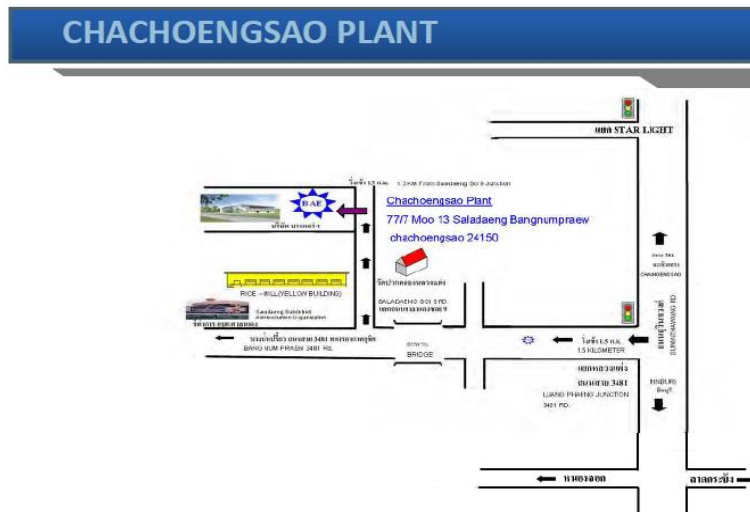


Figure 5.1 Map of Case Study 1 Enterprise

Source: Brother Auto Part & Engineering Co., Ltd, 2018.

The products of case study 1 enterprise are shown in figure 5.2



Figure 5.2 Automotive Part Products

Source: Brother Auto Part & Engineering Co., Ltd, 2018.

The company has a high commitment to providing highest satisfaction for customers with the core values as follows:

Q - Quality Excellent

C - Cost competitive

D - Delivery Schedules

CQ - Communication & Quick Action

K - Kaizen

The products and services of the enterprise consist of tooling shop, press shop, and assembly shop. The following machines are provided to support its customers;

Table 5.1 List of Machines of Case Study 1 Enterprise

Machine	Unit	Remark
500 Ton	2	Progressive 2 Unit
350 Ton	2	Progressive 1 Unit
200 Ton	4	
150 Ton	2	
130 Ton	1	
110 Ton	6	Progressive 1 Unit
100 Ton	2	
80 Ton	4	Progressive 1 Unit
75 Ton	2	
60 Ton	6	
55 Ton	1	
45 Ton	1	
35 Ton	1	Progressive 1 Unit
Stamping Automation	1	Robot Progressive
Robot Arc Welding	1	YASKAWA
Spot Welding	5	
CNC LATHE	1	MAZAK1505

Source: Brother Auto Part & Engineering Co., Ltd, 2018.

The pictures of all important machines are shown in figure 5.3-5.5 as follows:



Figure 5.3 Stamping Automation

Source: Brother Auto Part & Engineering Co., Ltd, 2018.

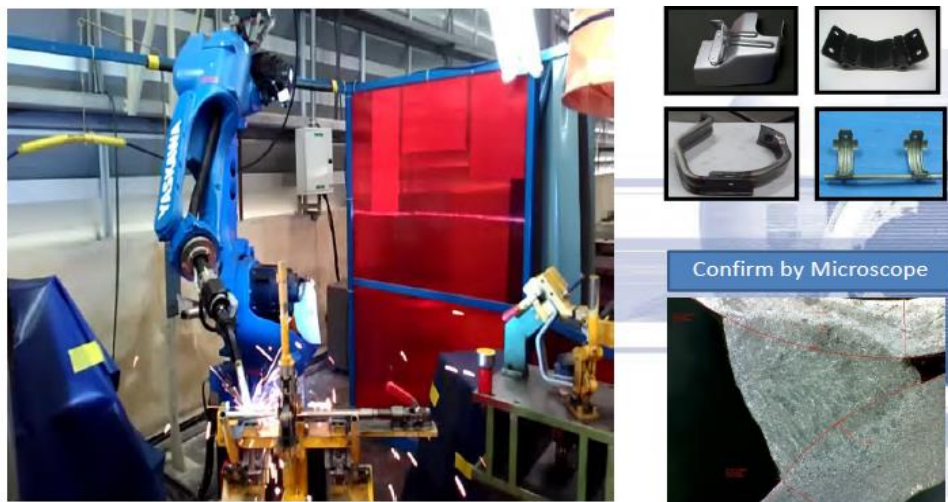


Figure 5.4 Robot Arc Welding

Source: Brother Auto Part & Engineering Co., Ltd, 2018.



Figure 5.5 Spot Welding

Source: Brother Auto Part & Engineering Co., Ltd, 2018.

With its high manufacturing capability, the enterprise has achieved to serve customer requirements and its main customers include the following;

- Mitsubishi Motors (Thailand) Co., Ltd.
- Emerson Climate Technologies Thailand Co., Ltd.
- H-One Part Thailand Co., Ltd.
- Bridgestone NCR Co., Ltd
- Mahle Engine Components (Thailand) Co., Ltd.
- Thongchai Industries Co., Ltd.
- CH Radiators Co., Ltd.
- Ogihara (Thailand) Co., Ltd.
- Hitachi Consumer Products (Thailand) Ltd.
- Techno Associe (Thailand) Co., Ltd.
- Innova rubber Co., Ltd.
- NHK Spring (Thailand) Co., Ltd.
- Magna Automotive (Thailand) Co., Ltd.
- Thai Kokubu Rubber Co., Ltd.
- Kurashiki Siam Rubber Co., Ltd.
- Gate Unitta (Thailand) Co., Ltd.

The main manufacturing processes of factory 2 consist of:

- production planning;
- production process: stamping, welding assembly, arc welding;
- In-process and final inspection
- Finished goods storage and delivery

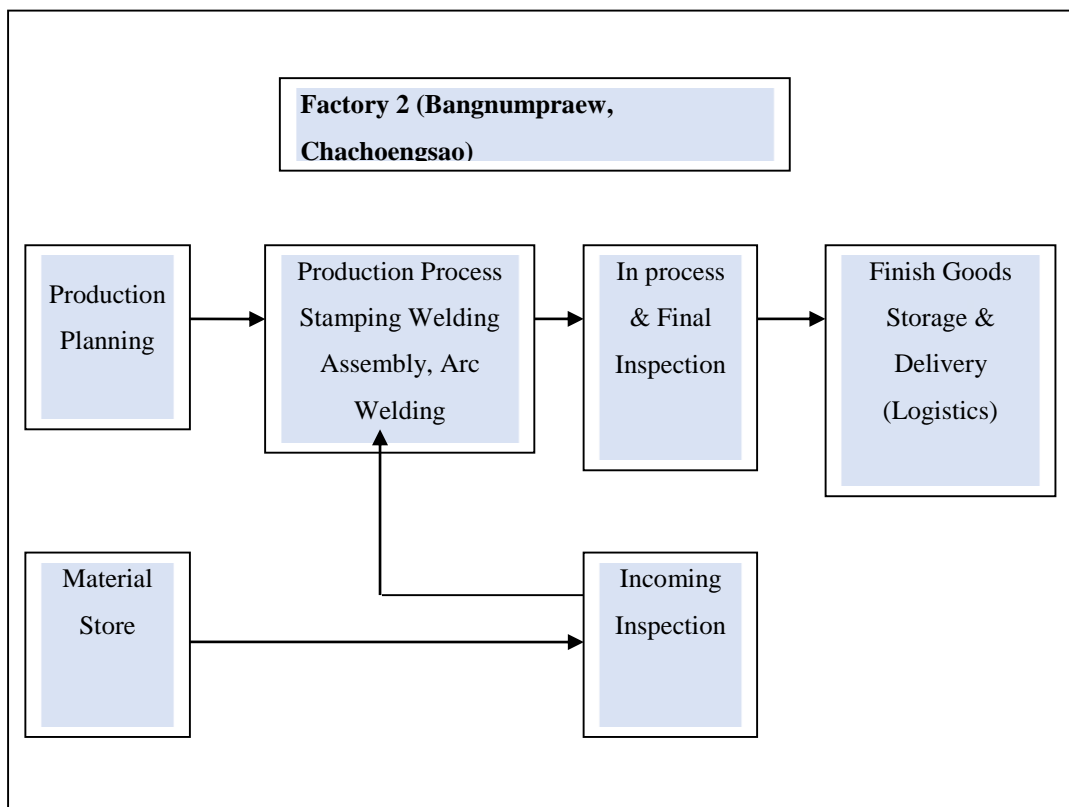


Figure 5.6 Process Flow Diagram

Source: Brother Auto Part & Engineering Co., Ltd, 2018.

5.2 Integrated Safety, Occupational Health and Environmental Management System for SMEs Implementation

Since the enterprise was interested to implement such management system within their organization, the author made an appointment to explain a process of implementation and schedule a site visit to support the organization in terms of training and consultation to ensure that the implementation team understands the requirements

of such management system. The implementation can be categorized into 4 steps as explained below.

5.2.1 Self-Assessment

5.2.1.1 Understanding the organization and its context

Internal and external issues related to the business objectives have been identified and assessed, and the effects of each internal and external issue have been identified too. The significant risks from the assessment are:

- 1) The score of customer satisfaction does not achieve the company's target
- 2) The implementation of the quality management system is not effective in some areas that can generate the quality problem in the future
- 3) The external complaint in noise and wastewater discharge to neighbor's land that may result in business interruption by the order of the authority.

The action plans have been developed to address the significant risk issues. The management representative explained that:

“All internal issues related to the market, products, new product development, policy and strategy, production technology, quality management system, knowledge management, and culture have been considered to determine whether these internal issues affect the business, safety and environmental performance. Moreover, all external issues have been listed and considered also, focusing on marketing situation, legal and other requirements and social needs. To ensure that all internal and external issues have been raised, I invited one member from each department to attend the meeting and discuss the positive and negative effects of each issue on business and safety, environmental performance”.

5.2.1.2 Understanding the needs and expectations of interested parties

To ensure the compliance with this requirement, the enterprise identified all interested parties related to their business, safety, and environmental management system. The interested parties consist of customers, authority officers, suppliers, contractors, stakeholders, communities and employees. The needs and expectations of

all interested parties have been identified which one is the risk and which one is an opportunity. The enterprise created their own criteria for assessing all needs and expectations from severity and occurrence. Finally, the organization can identify the significant risk regarding the complaints from neighbors about noise and wastewater discharge from the process. The action plans have been developed to mitigate the risk. Safety officer who is a member of the working team of the management system implementation explained that:

“The needs and expectations of the interested parties is the new requirement that our company would like to fulfill. To identify the needs and expectations, all departments were invited to join the meeting and discuss about who are the interested parties for each department. The brainstorming technique was used to identify their needs and expectations”.

As the author took the consultant role during the study, the author could observe that the implementation team could not identify all interested parties that are related to safety and environmental management system. Therefore, the author recommended them the additional interested parties that should be added to the list such as neighbors and contractors. Finally, all related interested parties were listed and all their needs and expectations were identified for further actions.

5.2.2 Planning and Implementation



5.2.2.1 Safety, occupational health, and environmental policy

The enterprise has created an integrated safety, occupational health and environmental policy to direct how it will manage safety, occupational health, and environment. The policy was created and signed by top management on 20 July 2018 with the following commitments:

- 1) Encouraging efficient use of natural resources, including the reuse of resources,
- 2) Pollution prevention,
- 3) Preventing work-related injury and illness,
- 4) Providing safety and environmental knowledge by focusing on safety risks, natural resources conservation,
- 5) Complying with safety and environmental legislation,

- 6) Ensuring the continual improvement of the management system implementation,
- 7) Safety, occupational health, and environmental policy has been provided and ready to be disclosed to all interested parties.

The policy has been communicated to all employees, contractors, visitors and other related interested parties. For employees, the policy has been communicated via safety and environmental board, email, morning meeting, while the contractors and visitors have been communicated via safety training. The details of the policy are shown in figure 5.7


Brother Auto Parts & Engineering Co., Ltd.


10 Soi Ramindra 117 Yek 2 Ramindra Rd. Minburi, Minburi Bangkok 10510 Tel. 02-517-2648, 918-6986 Fax: (662) 918-5463
10 ซอยรามอินทรา 117 หมู่ 2 ถนนรามอินทรา แขวงมีนบุรี เขตมีนบุรี กรุงเทพฯ 10510 โทร. 02-5172648 แฟกซ์ (662) 918-5463

**นโยบายความปลอดภัย อาชีวอนามัย และสิ่งแวดล้อม
บริษัท บราเดอร์ ออโต้พาร์ทส์ แอนด์ เอ็นจิเนียริง จำกัด**

บริษัท บราเดอร์ ออโต้พาร์ทส์ แอนด์ เอ็นจิเนียริง จำกัด ดำเนินธุรกิจในการผลิตผลิตภัณฑ์ ชิ้นส่วนยานยนต์ และอุปกรณ์ทั่วไป ด้วยวิธีการปั๊ม หรือกระแทก รับข้างเจาะ, คว้าน, กัด, ไส, กัด, และการเชื่อมโลหะ โดยคำนึงถึงความปลอดภัย อาชีวอนามัยและสิ่งแวดล้อม รวมถึงการใช้ทรัพยากรอย่างคุ้มค่า จึงได้ดำเนินการจัดทำระบบการจัดการด้านความปลอดภัย อาชีวอนามัยและสิ่งแวดล้อม

เพื่อให้เกิดความมั่นใจในการปฏิบัติตามนโยบาย เราจึงดำเนินการในระบบการจัดการความปลอดภัย อาชีวอนามัยและสิ่งแวดล้อมตามข้อกำหนด จึงได้กำหนดนโยบายดังต่อไปนี้

1. ส่งเสริมให้มีการใช้ทรัพยากรธรรมชาติ และพลังงานอย่างประหยัด รวมถึงการนำกลับมาใช้ใหม่ เพื่อให้เกิดประโยชน์สูงสุด
2. ป้องกัน ควบคุม และลดมลพิษ รวมทั้งของเสียที่เกิดขึ้น จากการดำเนินงานของบริษัทฯ อย่างต่อเนื่อง
3. ป้องกันการเกิดอุบัติเหตุ และการเจ็บป่วยจากการทำงาน
4. ส่งเสริมการให้ความรู้แก่พนักงานด้านความเสี่ยงจากการทำงาน การอนุรักษ์ทรัพยากรและสิ่งแวดล้อม เพื่อให้เกิดความปลอดภัยและสภาพแวดล้อมที่ดี
5. ดำเนินงานให้เป็นไปตามกฎหมายความปลอดภัย อาชีวอนามัยและสิ่งแวดล้อม ซึ่งมีความสัมพันธ์กับ ลักษณะความเสี่ยงจากการทำงานและปัญหาสิ่งแวดล้อม
6. บริษัทฯ มีความมุ่งมั่นในการปรับปรุงระบบการจัดการความปลอดภัย อาชีวอนามัยและสิ่งแวดล้อมอย่างต่อเนื่อง
7. เผยแพร่ประชาสัมพันธ์ นโยบายความปลอดภัย อาชีวอนามัยและสิ่งแวดล้อมต่อสาธารณชน สังคม และชุมชน

ประกาศ ณ วันที่ 20 กรกฎาคม 2561

Figure 5.7 Safety, Occupational Health, and Environmental Policy

Source: Brother Auto Part & Engineering Co., Ltd, 2018.

5.2.2.2 Identification of safety and environmental problems

Regarding this requirement, the enterprise needs to identify both safety hazards and environmental aspects of all its activities.

1) Hazard identification and risk assessment

To ensure that the staff who would identify the hazards and conduct risk assessment have understood this process, the training session was conducted. All departments needed to identify their hazards and organized the assessment to categorize the hazards. The results of the risk assessment show that the main hazards were generated from the machine hazards, electrical hazards and fire hazards from the welding process. However, the record of hazard identification and risk assessment would be reviewed by a safety officer to ensure that all hazards have been identified. Finally, the high hazards would be addressed by the action plans that were developed. Safety officer explained the activities in this requirement as follows:

“Hazard identification and risk assessment is a new thing for people here, so before we begin to identify a hazard, the training session on how to find the hazards and how to assess the risks has been provided to related employees, especially, the managers and supervisors of all departments. At the end of training class, all participants will be asked to identify their hazards and conduct risk assessment and submit to safety officer once they have finished. During the review process, I found that some types of hazards have not been identified by some departments, so I recommended the responsible person to revise the hazard identification record. Finally, the action plan will be created to solve the problems of all high hazards”.

During this process, the author observed that although the training session of hazard identification and risk assessment was conducted for all related staff, the results of hazard identification and risk assessment were still not correct and did not cover all hazards in each department. In this process, the organization needs to have a professional safety officer to review and give them the suggestions on how to find the hazards in their areas.

2) Environmental aspects

Regarding the environmental aspects, the enterprise has identified the environmental aspects of all activities, products, and services under

normal, abnormal and emergency conditions. The significant aspects are categorized into 4 groups:

- (1) Noise from press machine,
- (2) Wastewater from floor cleaning activity,
- (3) Wastes - general wastes and hazardous wastes,
- (4) A fire that may occur from the welding process.

All significant aspects have been summarized in significant aspects summary sheet. Finally, all significant aspects would be addressed by the action plan that each department has already developed. To get the data on environmental aspects, safety officer explained that:

“The most significant aspect is the wastewater from floor cleaning activity. The wastewater will mix with oil and our company is trying to solve this problem by installing the oil trap to separate oil before discharging wastewater into sewage system. All departments have a person who is responsible for identifying environmental aspect. However, all environmental aspects will be reviewed by myself to ensure that all environmental problems have been identified”.

5.2.2.3 Objective and Mitigation plan

Action plans to address the problems from business operation, high hazards and significant aspects have been developed. The objectives for each problem have been set by the plan to achieve those objectives. The action plans consist of:

- 1) Customer satisfaction improvement

This action plan has been developed to solve the problem that was identified by the self-assessment process. This action plan was intended to increase the score of customer satisfaction in terms of quality, safety, and environment; and the responsible person to implement the action plan was the sales manager.

- 2) Developing an audit plan for the quality management system

The result of self-assessment shows that the organization has problems with the implementation of quality management system on their site; many employees have low awareness of quality. The quality management representative would like to elevate awareness in all departments by setting up the interval plan to conduct the quality audit in all departments and give them suggestions when they have

problems with quality management system implementation. This action plan will be carried out by the quality management representative.

3) Action plan for noise and wastewater control

According to the result of self-assessment from interested parties, noise and wastewater are the significant aspects that need to be addressed immediately to prevent complaints from neighbors. This action plan will be implemented by the environmental management representative.

4) Action plan for safety problems

Action plan for improving the machine guarding has been created to eliminate the hazards from the existing machines that will be implemented by the engineering manager. An electrical hazard is another risk that needs to be eliminated. The action plan for electrical hazard has been created and implemented. The main objectives focus on lockout and tagout procedures, yearly electrical inspection and grounding. All actions will be implemented by electrical supervisor.

5) Waste management program

This action plan has a clear objective to segregate hazardous wastes from general wastes, to ensure that all hazardous wastes are disposed in the proper method. Furthermore, the enterprise would like to reduce hazardous waste that is mixed with general waste. This action plan will be implemented by the safety officer. For more details, a quote from fieldwork interviews is presented below.

“The action plan will be assigned to all relevant departments to determine the plan to achieve the objectives. All action plans will be followed up by the management team during a monthly management meeting. The budget is an important obstacle to achieving the objectives. However, we try to fix the most significant problem first. Moreover, we try to solve the problems that affect the neighbors to prevent their complaints and may become a big problem in the future” (Factory manager).

Although the company has a limitation in the budget for safety and environmental improvement, the responsible person for each action plan tries to create a possible action plan to ensure that it can solve the problems by giving priority to cost.

5.2.2.4 Legal and other requirements

The enterprise has provided the list of safety and environmental legal and other requirements by the safety officer. The legal and other requirements cover all national and local legislation related to the activities of the organization. The documents of the legal and other requirements have been distributed to all relevant departments so that all operations can be carried out according to the legal and other requirements. The evaluation of legal and other requirements to ensure the compliance of all legal and other requirements will be conducted twice a year by the ISO 14001 committee. Once a non-compliance has been found, the action plan must be created to address those non-compliance issues by the related departments. All non-compliance issues will be reported in a management review meeting. The safety officer who is responsible for this requirement explained that:

“All safety, occupational health and environmental legal and other requirements of our customers and local authorities have been collected to create a list of legal and other requirements. I will distribute the legal and other requirements to all relevant departments and communicate with them on how to implement those legal requirements. Furthermore, relevant departments need to evaluate their compliance with the legal and other requirements twice a year. If they found any non-compliance, they need to create the action plan to address those non-compliance issues”.

During the site visit, the author found that currently the organization does not comply with the legal requirements of the Department of Industrial Works in wastewater issue, and requirements of the Ministry of Labor in the topic of light intensity, noise and electrical safety. In this case, the organization needs to provide the action plans to address all non-compliance issues.

5.2.2.5 Training

To develop safety and environmental knowledge of employees, training plan has been developed in safety, occupational health and environmental master plan 2018. The training topics consist of:

- 1) Safety course according to the legislation, such as safety officer, crane safety operation, etc.
- 2) Safety course related to hazard from their activities: chemical safety, machine safety, personal protective equipment,

- 3) Environmental course: only 1 course in environmental awareness that has been identified in the annual plan.

The training plan has been created by the safety officer in cooperation with the human resources department. After the training session, the training record will be kept by human resources department. Moreover, human resources department has training plan for other topics, especially in quality, but safety and environment-course cannot be found in this training plan. The safety officer explained that:

“The company tries to provide the essential training courses for all employees to improve their safety and environmental awareness. The safety training courses have been defined in safety, occupational health and environmental master plan 2018 by focusing on a basic safety training course to comply with safety legislation. However, we need to provide more training courses in environment to increase awareness in environment”.

Regarding the implementation of this requirement, the author found that the organization needs to provide more environmental training courses, especially for the employees whose work affects the environmental performance of the organization. The author suggests that the environmental awareness training course should be provided for newcomers. Moreover, other environmental class, such as waste management and energy conservation should be trained to all employees to prevent the deviation from the operational control criteria. Besides, the safety and environmental training sessions should be provided to all contractors too. Finally, the organization should provide training for all employees to ensure that they will be aware of: safety and environmental policy, hazards and environmental aspects, roles and responsibilities related to safety, occupational health and environmental legal and other requirements.

5.2.2.6 Document

The enterprise has established document control procedure (P-DC-01 Rev.06) to control that documents will be updated and accessible to the employees. All processes of document control have been defined with the following details: the approval process for new documents or revised documents, how to identify the revision of the document, how often to review the document and how long the record should be retained. The documents have been controlled by document controller. The necessary documents that consist of manuals, procedures, work instructions and forms have been

distributed to all related departments and kept at workstation to ensure that all related employees can access to the necessary documents. Moreover, the obsolete documents will be removed from workstation and replaced with new updated document. In this requirement, the document controller explained that:

“I take care of document control for all management systems: ISO 9001, ISO 14001 and IATF 16949. Our company created a procedure of document control (P-DC-01 Rev.06) to control all documents in our organization, starting with document creation request, the review process, approval process, distribution, removal of the obsolete documents and control of the record. The hard copy documents have been distributed to all departments, and all employees can access to the necessary documents by using the distributed one”.

5.2.3 Checking

The checking process is an important requirement to ensure the compliance of safety, occupational health, and environmental management system. The checking process can assist the organization to find the nonconformity issues and problems in the management system.

5.2.3.1 Internal audit

Internal audit procedure has been established to define the details of an internal audit program. Normally this program is planned by management representative. The last version of internal audit procedure was generated in April 2018 that covered quality and environmental management system. The internal audit program of safety management system still is not defined during the period that the safety, occupational health and environmental management system for SMEs has been implemented in the organization. The internal audit program has been audited once a year by internal auditors whom the company believes to have an appropriate competence. Each internal audit team consists of lead auditor and auditor. The audit report will be submitted to management representative and recorded in the log sheet by document controller, before the report with corrective action request, in case the auditor finds the nonconformity issues, will be distributed to relevant department for acknowledging and problem-solving. The auditor who issued the corrective action request should verify the actions to address the nonconformity issues before closing out

such nonconformity issues. Finally, the status of internal audit will be reported to the top management. A quote from management representative is shown below:

“The internal audit process is very important to drive our management system because it means that if we cannot maintain the audit program as planned, our management system cannot be improved too. For audit program, I follow our internal audit procedure (P-QMS-03) that covers the entire process of internal audit starting with establishing the internal audit plan and ensure the completion of nonconformity issues by follow up audit of the auditors. All results from the audit will be summarized and analyzed before I present the status of internal audit to the top management in management review meeting that will be held once a year. The audit program normally can be carried out smoothly. However, we need to improve the competence of our auditors to ensure that they can understand the requirements of the management system clearly and have good skills in the auditing process”.

5.2.3.2 Accident investigation

The organization has a clear procedure of accident investigation as defined in incident investigation procedure (P-SE-13 Rev.0). The procedure covers both accident and near-miss investigation. The accident types have been categorized into 4 types: type 0 is near-miss, type 1 is a first aid accident, type 2 is a lost-time accident with less than 3 days absence, and type 4 is lost time accident with more than 3 days absence. The first report of accident will be generated by the supervisor of injured employee. After that, the investigation team will conduct the investigation in case of lost time accident. The root causes from the investigation process must be addressed within the defined time frame. The status of accident and near-miss investigation will be reported once a month in safety committee meeting to ensure that all root causes will be addressed in timely manner. The accident report will be kept for 3 years. Regarding the implementation of this requirement, the safety officer explained that:

“Accidents still occur in our company; however, we have the procedure to manage an accident and near-miss. The accident and near-miss report will be generated by the supervisor firstly. The investigation will be conducted by the investigation team in serious accident, but in case of near-miss, first aid case, the supervisors can conduct the investigation by themselves. I generated two forms for

accident and near-miss report; the first one is accident investigation report(F-SE-13-01), the second form is near-miss investigation report (F-SE-03-02). I will report the status of accident and near-miss in monthly safety committee meeting”.

5.2.4 Action for Continual Improvement

To address the nonconformity in safety, occupational health and environmental management system for SMEs, the corrective action procedure has been revised by using the existing procedure of quality management system. Management review meeting has been carried out to review the output of the management system to ensure the continual improvement.

5.2.4.1 Corrective action

When the nonconformities have been found from the internal audit conducted once a year and from other sources such as complaints from customers, communities, etc., the organization would revise the corrective and preventive action from the existing procedure of quality management system. The corrective action request will be initiated by the auditor or the management representative and distributed to relevant departments. The relevant supervisors or managers need to investigate such nonconformity to find the root causes. The corrective actions must be addressed within a specific time frame and the responsible person for each action must be defined. Finally, the nonconformity will be monitored by the auditor or the initiator of each nonconformity. A quote from management representative is shown below:

“Normally, most nonconformities are generated from internal audit and complaints from interested parties such as customers but mainly in quality issues. After we get a complaint or an audit report from the auditor, I will review such nonconformity, especially the complaint. If it is true, I will issue a corrective action request to the relevant department. The relevant department needs to investigate and find a root cause, as well as identify the action to fix such problem. All actions will be followed up and closed out by the auditor or myself to ensure that the actions can eliminate the root causes.”

5.2.4.2 Management review

Management review meeting for quality, the environmental management system has been conducted once a year, while the review of safety management system

has been set for the next management review. However, safety performance will be reviewed in the safety committee meeting once a month focusing on safety incident. The results from the management review will be communicated to relevant departments via email, while the assignments from the management review will be assigned to relevant employees to handle. The management representative explained that:

“All data mentioned in the requirements of quality, the environmental management system will be prepared and summarized for the top management. The decision to improve the management system will be recorded and works will be assigned to relevant persons. And normally, we will set the schedule for management review once a year”.

During the implementation of safety, occupational health and environmental management system, management review meeting has been carried out at the end of the coaching period. However, the inputs to the last review do not cover all inputs required by the management system. The missing input is the data of safety performance.

5.3 Evaluating the Implementation of Integrated Safety, Occupational Health and Environmental Management System for SMEs by Using the Balance Scorecard

To ensure the suitability of the integrated safety, occupational health, and environmental management system, the balanced scorecard has been used to evaluate the effectiveness of the implementation in four dimensions that consist of effectiveness perspective, stakeholder perspective, internal process perspective, and organization learning and growth perspective. The management system audit has been carried out during the consultancy period and the data are used to evaluate the fit of such management system to SMEs.

5.3.1 Effectiveness Perspective

The criteria for the effectiveness perspective is the achievement of environmental, occupational health and safety objectives. The management system audit has been carried out during the consultancy period and the results show that:

5.3.1.1 Safety, occupational health, and environmental management system for SMEs implementation

The result of the management system implementation shows that the organization can implement most elements of safety, occupational health and environmental management system for SMEs except internal audit and management review. The organization cannot integrate safety requirements into the existing internal audit plan, so the safety requirements are not audited according to the last plan of the internal audit. And internal audit requirement has an impact on management review requirement because internal audit result must be reviewed by top management. A quote from management representative is shown below:

“The overall safety, occupational health and environmental management system for SMEs implementation in our company can improve the performance of safety and environment, especially in the environmental aspect. We can manage our wastes to comply with the legislation and we have an environmental management plan to manage the energy conservation in our organization”.

The representative of the employees has been interviewed to get his point of view on the effectiveness of the management system. The production supervisor explained that:

“All employees receive the training on waste management and energy conservation that can help us to segregate the hazardous wastes from general wastes. In my opinion, the environmental management system can help us to carry out production activities in compliance with laws. Regarding safety, we have a work instruction to manage the hazardous chemicals and work instruction on how to do in case of fire. I think safety is very important for our works in the factory”.

The safety officer was interviewed to obtain her opinion in safety and environmental management system performance after implementing the safety, occupational health and environmental management system for SMEs. The safety officer explained that:

“As the safety management system is a new management system for our employees, the results of hazard identification and risk assessment are not quite good and need a review by myself. For the environmental aspect, we have a procedure for significant aspects such as waste management procedure. However, we have still found some problems with waste segregation. I think we need more time to improve safety and environmental awareness of our employees”.

The conclusion can be explained that the organization has tried to implement safety, occupational health and environmental management system for SMEs. However, some requirements were not implemented completely i.e. objectives and mitigation plan, internal audit, and management review. The objectives and mitigation plan for safety problems need to be established and all actions need to be implemented to ensure that the organization can improve the safety performance. While environmental awareness of all employees needs to be improved.

5.3.1.2 The achievement of safety, occupational health and environmental objectives

From the author’s observation during the implementation period, safety and environmental management plans have been established as follows:

- 1) Hearing conservation program,
- 2) Electrical hazard prevention program,
- 3) Lifting management program for warehouse,
- 4) Wastewater quality improvement plan.

The hearing conservation program has been implemented as planned by the safety officer. Administration method and personal protective equipment have been used to protect workers from noise exposure. Moreover, the activities with high levels of noise are not operated during night time to avoid complaints from neighbors. The management team has implemented administrative control by establishing the work instruction on how to work with noise and providing personal protective equipment such as earplug and earmuff instead of the engineering control, because engineering control needs a high budget.

Electrical hazard has been controlled to prevent electrical shock for the employees who are exposed to electrical hazards such as machine operator and maintenance technician. The main activities are: 1) conduct an annual electrical

inspection and ensure that electrical grounding has been installed for all machines, 2) establish lockout/tagout procedure to prevent electrical shock during electrical maintenance. The electrical hazard prevention program has been implemented by maintenance supervisor. All action plans are implemented and finished in October 2018.

Lifting management program for warehouse operator has been implemented in the warehouse department by warehouse manager, focusing on lifting training and controlling the awkward position based on work instruction. The lifting training session has been provided for all relevant operators, and the lifting behavior of all warehouse operators has been monitored by warehouse supervisor.

The wastewater quality improvement plan has been established to mitigate the problem of wastewater from floor cleaning process of both the production floor and canteen floor. The significant wastewater problem is high biological oxygen demand (BOD). The main objective is reducing BOD to comply with the legislation. This objective has been met and the BOD parameter has been improved and compliant with the legislation.

The objectives of environmental, occupational health and safety implementation have been fulfilled by all action plans, however, the control method would be considered based on the budget. In particular, hearing conservation program and noise control by engineering need a high budget, so in this case, administration control has been selected to solve this problem instead. For the overall effectiveness, the organization can demonstrate the achievement of their environmental, occupational health and safety objectives as the evidence above.

5.3.1.3 Obstacle to implementing safety, occupational health and environmental management system for SMEs

Regarding the limitation of SMEs on implementing safety and environmental management system, many scholars indicate that the main obstacle for SMEs is lack of financial resources (Champoux and Brun 2003 as cited in Floyd et al., 2013, Natarajan and Wyrick, 2012). The enterprise also has the problem of financial resource. An only small budget is provided for safety and environmental improvement. Safety and environmental annual budget has never been provided. The safety and environmental officer has to ask for the budget for all safety and environmental

objectives that are planned to achieve, including the budget for regular plan for safety and environment such as environmental monitoring, safety training, etc. The hierarchy of controls most frequently selected are administrative control and personal protective equipment that use low budget. However, the mentioned control method cannot eliminate the root cause of environmental impact and hazard. The more effective way should be engineering control that can prevent environmental impact, injury and illness for the employees. But this method needs a bigger budget and may affect the company's cash flow.

The other problem is the environmental and safety awareness of the employees is quite low, which may be the consequence of poor environmental and safety knowledge. The environmental and safety knowledge of employees has an impact on the result of hazard identification and risk assessment as well as environmental aspect identification. Moreover, the idea to improve safety and environmental performance is a difficult thing for the employees and they need support from the professional safety and environmental officer. The safety officer explained that:

“Our employee's knowledge in environment and safety need to be improved in the future. I think we need to provide environmental and safety knowledge to all employees and ensure that they understand about their roles and responsibilities for protecting themselves from all hazards. Anyway, regarding how to work and prevent the impact to our environment, that needs to take several years”.

5.3.2 Stakeholder Perspective

To ensure that the environmental, occupational health and safety management system for SMEs is suitable to implement in the organization, the participation of all employees is very important. Moreover, the satisfaction of the management implementation is another issue that related to the sustainability of such management system. The participation and satisfaction of interested parties has been defined with the following details.

5.3.2.1 Employee participation

The interviews with employees and the observation have been conducted during the consultancy program at the site. The author found that during the

implementation program, the candidates from all departments were invited to attend the training and do the workshop to ensure that they would understand the requirements and could implement the management system properly. Furthermore, the candidates from each department were invited to attend the site visit session for 5 times during the implementation period. On each site visit, the author would give them the assignments such as hazard identification and risk assessment, environmental aspect identification, etc. The results from the observation show that all departments can complete the assignment, however, the assigned task might not be correct. A quote from management representative is shown below:

“We try to encourage all employees to participate in quality, environmental and safety management system, because we realize that the management system will not be maintained and improved without our employee participation. I think our employees need to know what are the hazards and environmental problems of their works. Moreover, they should know how to control the quality of our products. I would like to motivate all employees to participate in the management system”.

The safety officer is the important person who tries to encourage the employee participation and she explained that:

“When we will start new management system or practice in our company, the key person of all departments must be communicated and trained on the new management system. They should understand the requirement, as it will help them to implement the management system correctly. For safety and environmental system, I focus on hazard identification and risk assessment, aspect identification, and risk mitigation plan. They should know about their workplace hazards and environmental aspects”.

5.3.2.2 The interested parties' satisfaction

The interview was conducted to measure the satisfaction of the management representatives, the safety officers and the villagers near the factory.

The management system representative appreciates the environmental, occupational health and safety and explained that:

“The environmental, occupational health and safety system is simple and not complicated. I think it matches SMEs and if we implement the requirements strictly,

I am sure that it can help the organization to improve safety and environmental performance”.

The safety officer believes that the designed management system that was implemented in the site is easy to implement when compared with the international management systems such as ISO 14001:2015 and OHSAS 18001:2017. A quote is shown below:

“Such management system is easy to understand when compared with other international management systems, and I think it can help SMEs to prevent accident and environmental impact. I am happy with this alternative management system”.

The villagers around the factory were interviewed about their satisfaction with the safety and environmental management system, and one villager explained that:

“I don’t have any complaint about this factory. I think the owner has tried to prevent the environmental problems that will affect the surrounding community. Previously, it ever had a problem about noise at night time, but now this problem has been solved.”

The satisfaction can be summarized that the implementation team appreciates the management system, because they feel that such management system is simple and easy to implement. Other interested parties such as villagers feel that the organization tries to prevent all problems about safety and environment in order to prevent any complaint from the villagers.

5.3.3 Internal Process Perspective

The internal process is one perspective that needs to be evaluated to ensure that the designed management system is suitable for SMEs. The achievement of action plan implementation, quantity of the implementation team, budget, monitoring, and evaluation process have been evaluated as follows.

5.3.3.1 The achievement of action plan implementation

The implementation plan for environmental, occupational health and safety management system has been set for 5 months period with the consultancy by the author. The result shows that the organization can implement most activities in

compliance with the schedule. Internal audit and management review have been delayed, but finally, the organization was able to conduct the remaining 2 processes completely. A quote from the management representative is shown below:

“We try to follow the implementation plan that was set by the consultant, although we have a lot of works. Some important tasks may be delayed, but we try to do our best”.

5.3.3.2 The implementation team

The implementation team has been established and announced to ensure that everyone understands their roles and responsibilities. The key person who implements the management system is the safety officer with the support of the candidates from all departments. Normally, the safety officer is based at Bangkok site and goes to work at Chachoengsao site around 2 days per week. So in case that other implementation team members need an assistant in term of safety and environmental aspects, they need to wait until the safety officer comes to work at the Chachoengsao site.

The organization should assign one person to be responsible for safety and environment in Chachoengsao site to facilitate the management system implementing, that can support other departments if they need any assistance.

5.3.3.3 Budget

The limited budget has been provided for the management system implementation. However, the management representative tries to manage such budget for the priority issues by focusing on wastewater quality improvement and electrical hazard prevention. The budget is the significant barrier that affects the effectiveness of the risk and environmental impact control, because the best way to eliminate the risks and environmental impacts should be engineering control. The safety officer explained that:

“I need to request the budget for improving the unsafe condition and for environmental management plan and the budget was limited”.

The annual budget should be provided for safety and environmental improvement, especially, to fulfill the safety and environmental legislation that will ensure the continual improvement of the management system.

5.3.3.4 Monitoring and Evaluation

The monitoring and evaluation have been carried out at the last stage of implementation plan by the internal audit and management review. The internal audit has been conducted by internal auditors that were properly trained, and the audit plan covered all activities of the organization. The nonconformity would be summarized by the document controller under the review of the management representative. Management review has been carried out to evaluate the performance of environmental, occupational health and safety management system for SMEs with the inputs according to the requirements. Finally, the decision making of top management must be defined to improve the management system. The management representative explained that:

“Internal audit will be conducted once a year to monitor the compliance with the requirements by internal auditors. If the auditor finds the nonconformity, corrective action request will be issued to identify the root causes of nonconformity. And we will evaluate the management system by top management in management review meeting; all inputs will be reviewed. Finally, the actions must be identified to improve our management system”.

The organization can establish the monitoring and evaluation process to monitor the compliance with environmental, occupational health and safety management system for SMEs. The monitoring and evaluation must be conducted as planned to ensure that the management system will be maintained and improved.

5.3.4 Organization Learning and Growth

The safety, occupational health, and environmental management system can improve the safety and environmental knowledge of the employees. Furthermore, the work instructions have been improved too. Training session on safety and environment has been provided by focusing on occupational and safety risks, environmental aspect and how to manage those risks and environmental aspects. A quote from production supervisor is shown below:

“Our operators have more knowledge about the risks in their works, so they can inform me when they find the unsafe condition or environmental problems. They can identify the difference between hazardous waste and general waste. I think their knowledge of safety and environment has been improved”.

Work instructions have been revised and included the safety and environmental practices to ensure that all activities will be carried out safely and the environmental impacts can be prevented. The revised work instructions will be trained to all relevant employees and the supervisors will monitor them to ensure that they can work properly according to the new work instructions.

In this perspective, the organization can improve the employee's knowledge in term of safety and environment. Additionally, the organization can improve the work process by the revised work instructions.

The implementation evaluation by the balanced scorecard can be as shown in Table 5.2.

Table 5.2 The Score of the Balanced Scorecard from the Implementation Results of Case Study 1 Enterprise by the Author

Perspective	Result	Score
1. Effectiveness perspective		
1.1 Safety, occupational health and environmental management system implementation	Most of the requirements of the integrated management system have been implemented completely except the internal audit and the management review	2
1.2 The achievement of safety, occupational health and environmental objectives	All four objectives had been achieved	3
2. Stakeholder perspective		
2.1 Employee participation	More than 68% of the target employees attend the training workshop on the implementation of the management system	3
2.2 Interested party satisfaction	All interested parties satisfy the integrated management system	3
3. Internal process perspective		

Table 5.2 (Continued)

Perspective	Result	Score
3.1 The achievement of action plan implementation	Internal audit and management review were implemented behind the schedule	2
3.2 Working team has been assigned	The implementation team has been assigned from the candidates of all departments	1
3.3 Budget	The enterprise faces with the budget constraint and low budget	1
3.4 Monitoring and Evaluation	The internal audit program and the management review meeting have been carried out, but not included the safety management system	1
- 4. Organization learning and growth		
4.1 The process to enhance safety and environmental performance has been developed	<ul style="list-style-type: none"> - Safety and environmental knowledge of the employees had been improved - Work instructions relate to the occupational health, safety risks and environmental aspects had been established 	2
Total Score		18

Source: Thepporn Jaroenroy, 2018.

The implementation score of case study 1 enterprise is 18 points (81.8%) that meet the target score, so the integrated safety, occupational health and environmental management system for SMEs implementation results are acceptable.

Moreover, the assessment of the integrated safety, occupational health, and environmental management system for SMEs has been carried out by the management representative which is shown in Table 5.3.

Table 5.3 The Score of the Balanced Scorecard from the Implementation Results of Case Study 1 Enterprise by the Management Representative

Perspective	Result	Score
1. Effectiveness perspective		
1.1 Safety, occupational health and environmental management system implementation	Most of the requirements of the integrated management system have been implemented completely except the internal audit and the management review	2
1.2 The achievement of safety, occupational health and environmental objectives	All four objectives had been achieved	3
2. Stakeholder perspective		
2.1 Employee participation	More than 68% of the target employees attend the training workshop on the implementation of management system	3
2.2 Interested party satisfaction	All interested parties satisfy the integrated management system	3
3. Internal process perspective		
3.1 The achievement of action plan implementation	Internal audit and management review were implemented behind the schedule	2
3.2 Working team has been assigned	The implementation team has been assigned from the candidates of all departments	1
3.3 Budget	The enterprise faces with the budget constraint and low budget has been provided	1
3.4 Monitoring and Evaluation	The internal audit program and the management review meeting have been carried out, but not included the safety management system	1
4. Organization learning and growth		
4.1 The process to enhance safety and environmental performance has been developed	- Safety and environmental knowledge of the employees had been improved - Work instructions relate to the occupational health, safety risks and environmental aspects had been established	2
Total Score		18

Source: Thepporn Jaroenroy, 2018.

The result shows that the scores of the integrated safety, occupational health, and environmental management system implementation in SMEs using the modified balanced scorecard are equivalent between the evaluation of the author and the management representative. The score can demonstrate the effectiveness of the designed management system according to the views of the author and the management representative of the enterprise.

CHAPTER 6

RESULT OF IMPLEMENTING INTEGRATED SAFETY, OCCUPATIONAL HEALTH AND ENVIRONMENTAL MANAGEMENT SYSTEM MODEL FOR SMALL AND MEDIUM ENTERPRISE IN PILOT ENTERPRISE: CASE STUDY 2

6.1 Company Background

The enterprise of case study 2 is a Japanese enterprise that was established on October 4, 2006, with registered capital of 475 million baht. The site is located at 177/1 Moo 7, Gateway City Industrial Estate, Tambon Huasamgong, Amphur Plaengyao, Chachoengsao, 24190, Thailand, and the total employees is 83 persons. The location is shown in figure 6.1. The enterprise is certified to ISO 9001: 2018. The product is copper alloy strips with the capacity of about 4,200 tons

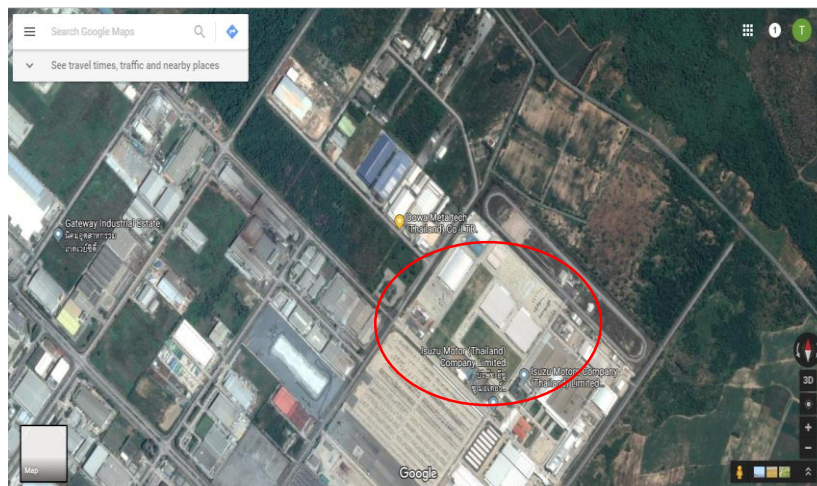


Figure 6.1 Map of Case Study 2 Enterprise

Source: Dowa Metaltech (Thailand) Co., Ltd, 2018.

The products of the enterprise are shown in figure 6.2

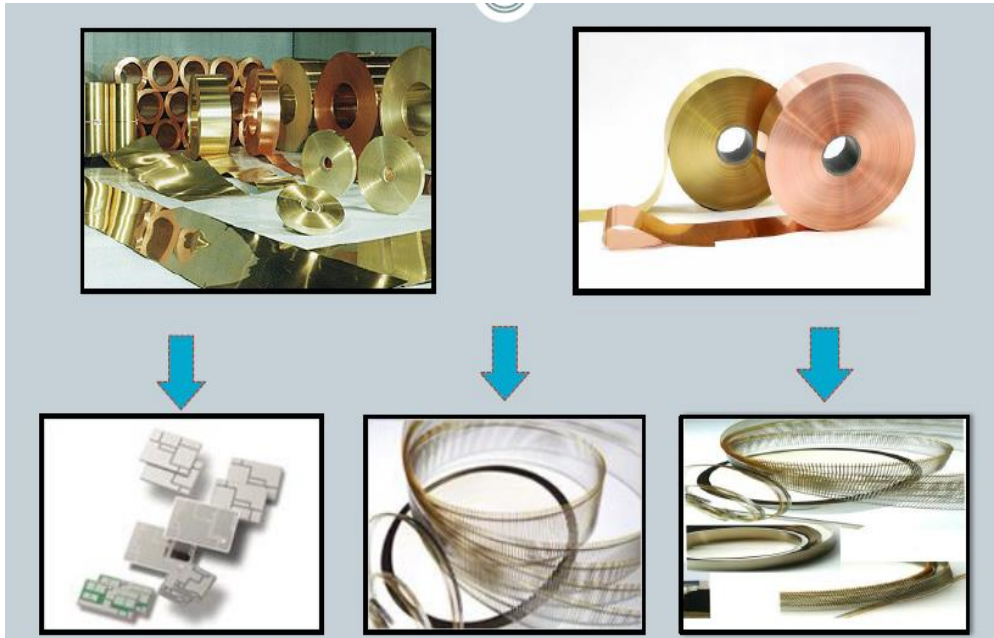


Figure 6.2 Copper and Brass Strips

Source: Dowa Metaltech (Thailand) Co., Ltd, 2018.

The company has a high commitment to improving the management system in the organization to fulfill the customer satisfaction with a good reputation. The following topics are given highest priority.

- Sales volume: The organization would like to increase the sales volume by 10% from 2017
- Inventory: The inventory must be controlled and not exceed 25 days
- No accident: No accident case within 365 days

With the high manufacturing capability, The enterprise achieves to serve the customers both in domestic and international markets as follows;

Domestic customers

- Kodo Metal (Thailand) Co., Ltd
- Kawabe Precision (Thailand) Co., Ltd
- Kyouei Precision Device Co., Ltd
- Kobe Electronics Material (Thailand) Co., Ltd

- Thai Allow Products Co., Ltd
- Panasonic Electric Works (Thailand) Co., Ltd
- Fugen (Thailand) Co., Ltd
- UMT International Co., Ltd
- Plasess Hi-Tech Co., Ltd
- Kodai Co., Ltd
- Ohgitani (Thailand) Co., Ltd

International customers

- Dawa Metaltech Co., Ltd
- Fujihiro Philippines, Inc
- Kodo Co., Ltd

The main manufacturing processes of the enterprise consist of:

1. Plating process
2. Slitter Process
3. Packaging process

The process flow is shown in figure 6.3

- 1) The employees lack environmental awareness in energy saving,
- 2) The machines generate the pollutions and hazards,
- 3) Low efficiency of a wastewater treatment plant,
- 4) Noncompliance with safety and environmental legislation,
- 5) Poor communication with the contractor in term of safety and environmental regulation.

The action plans have been established to address the significant risk issues. The organization will consider the control measures for managing the risk and opportunities as follows:

- 1) Risk and opportunity management plan,
- 2) Establishing procedure and work instruction to control the risks and opportunities,
- 3) Operational control,
- 4) Training, and
- 5) Emergency preparedness and response plan.

The safety and environmental supervisor explained that:

“The meeting has been conducted with all relevant departments to identify an internal and external issues affecting the organization either positive or negative. All factors including social, culture, technology, economic, environment, legislation, resources and emergency cases have been considered to identify risks and opportunities. Our company set our own criteria to assess risks and opportunities”.

The procedures of the context of the organization, interested parties, risks and opportunities were established to identify the risks and opportunities, as well as identify the criteria for evaluating the significance of risks and opportunities.

6.2.1.2 Understanding the needs and expectations of interested parties

To ensure the compliance with this requirement, the enterprise has identified all interested parties related to their business, safety and environmental management system. The interested parties consist of employees, contractors, customers, vendors, authority officers, stakeholders, communities, Non-government organization (NGO). The needs and expectations of all interested parties were identified which one was a risk and which one was an opportunity. The enterprise created their

own criteria for assessing all needs and expectations from severity and occurrence. Finally, the organization can identify the significant risks. The high risks are the noncompliance of plant operation with legislation and lack of safety and environmental communication to the contractor prior to performing any work on site. The action plans were established to mitigate the risk. The action to address the risk of noncompliance with legislation is the legislation communication program, while the risk of communication with the contractor will be addressed by the training program. Safety and environmental supervisor who is the person in the implementation team of the management system explained that:

“The needs and expectations of the interested parties were identified by considering the interested parties related to all departments. I invited all departments to discuss about the interested parties and communicate with all of them about the criteria to assess the risks and opportunities from the needs and expectations”.

The organization can identify all related interested parties that affect to the organization performance in terms of business, safety and environment, which can assist the organization to develop an action plan and address those risks and opportunities before the problems occur.

6.2.2 Planning and Implementation

6.2.2.1 Safety, occupational health, and environmental policy

The enterprise established a safety and environmental policy to determine the direction how it will manage safety, occupational health and environment within its organization. The safety and environmental policies were created separately and signed by top management on 1 April 2018 with the following commitments:

Safety Policy

- Complying with safety and occupational health legislation,
- Reducing the hazards from unsafe conditions and unsafe acts,
- Continual improvement to ensure that all employees will work safely

The safety objectives were set regarding the following: reducing accident and tragedy, improving all hazard areas and high-risk activities. The targets of safety were defined as follows: the accident must be reduced by 50 percent compared to the

previous year. Moreover, the organization must improve the unsafe conditions and unsafe acts by 100 percent if possible. The safety policy is shown in figure 6.4.

Environmental policy

- Complying with environmental legislation
- Reducing the energy consumption continuously by the concept of 3R (Reduce, Reuse, Recycle)
- Doing business in consideration of the natural resources and environmental conservation

The environmental objectives are 1) reducing the energy consumption of machine at least 1 percent compared to the previous year, 2) reducing hazardous waste at least 1% compared to the previous year. The target of hazardous waste generation in 2018 was 14.48 kilogram/ton of production. The environmental policy is shown in figure 6.5.

DOWA นโยบายความปลอดภัย 安全方針

ปฏิบัติตามกฎหมายที่เกี่ยวข้องกับเรื่องความปลอดภัยในการทำงาน ผู้บริหารและพนักงานร่วมมือกันลดพื้นที่อันตรายและการปฏิบัติงานที่เสี่ยงต่ออันตราย ดำเนินการจัดการด้านการรักษาความปลอดภัยอย่างต่อเนื่องเพื่อให้ทุกคนภายในโรงงานสามารถปฏิบัติงานได้อย่างปลอดภัยและสบายใจ

労働安全に関する法律を遵守し、管理者と従業員が一体となり危険箇所、危険作業の撲滅を目指し、工場内で働くすべての人が安全に安心して作業ができるよう安全マネジメントを継続する



วัตถุประสงค์目的

* ลดจำนวนอุบัติเหตุและภัยพิบัติ ปรับปรุงพื้นที่อันตรายและการปฏิบัติงานที่เสี่ยงอันตราย
事故及び災害の削減、危険箇所および危険作業の改善

* ลดจำนวนอุบัติเหตุและภัยพิบัติครั้งหนึ่ง (เมื่อเปรียบเทียบกับปีที่แล้ว) ดำเนินการให้พื้นที่อันตรายและการปฏิบัติงานที่เสี่ยงอันตรายระดับ A เป็นศูนย์
事故及び災害の半減（前年比）、危険箇所および危険作業ランクAをゼロ

เป้าหมาย目標

1. เมื่อเทียบกับปีก่อนอุบัติเหตุลดได้ 50% 災害前年比50%減
2. ดำเนินการหัวข้อที่ควรปรับปรุงในการปฏิบัติงานทำได้ 100% 作業改善項目実施率100%

承認 Approval	作成 Date
 1-9-18	 11/Sept

Rev.00 Up Date : 1 Apr 2018

Figure 6.4 Safety Policy

Source: Dowa Metaltech (Thailand) Co., Ltd, 2018.

DOWA นโยบายสิ่งแวดล้อม 環境方針

ปฏิบัติตามกฎหมาย ลดการใช้พลังงาน ทำกิจกรรม 3R (REDUCE, REUSE, RECYCLE) และเข้าร่วมกิจกรรมเพิ่มพื้นที่สีเขียว ในนิคมอุตสาหกรรมอย่างต่อเนื่อง โดยถือเป็นส่วนหนึ่งของการรักษาสีเขียวสิ่งแวดล้อม เพื่อมุ่งมั่นที่จะเป็นธุรกิจที่เป็นมิตรต่อสิ่งแวดล้อม

法令を遵守し、環境保護の一環として省エネルギーおよび3R活動を継続的に行い、工業団地に緑を増やす活動に協力して環境にやさしい企業を目指す

[เป้าหมายสิ่งแวดล้อม 環境目標]

ลดต้นทุนต่อหน่วยเรื่องพลังงานที่เครื่องจักรใช้ลงอย่างน้อย 1 %

・設備のエネルギー-原単位の削減 1%以上

ต้นทุนต่อหน่วย = ปริมาณพลังงานไฟฟ้าที่ใช้ของแต่ละเครื่องจักร/รายได้จากการผลิต (Process income)

原単位 = 各設備毎の電力使用量 / 加工収入

ต้นทุนต่อหน่วย = ปริมาณพลังงานไฟฟ้าที่ใช้ของแต่ละพื้นที่/รายได้จากการผลิต (Process income)

原単位 = エリア毎の電力使用量 / 加工収入

BM : ผลดำเนินการประจำปี 2017

BM : 2017年度実績

การลดปริมาณกากอุตสาหกรรม

・廃棄物の削減

ลดต้นทุนต่อหน่วยของขยะอันตราย ไม่ต่ำกว่า 1%

危険ごみの原単位削減 1%以上

ต้นทุนต่อหน่วย = ปริมาณการเกิดขยะ (Kg) / ปริมาณการขาย (t)

原単位 = ごみの発生量 (kg) / 販売量 (t)

BM : ขยะอันตราย 14.63 kg/t

BM : 危険ごみ 14.63 kg/t

Target : ขยะอันตราย 14.48 kg/t

Target : 危険ごみ 14.48 kg/t

承認 อนุมัติ	作成 จัดทำ
<i>[Signature]</i> 3-4-2018	<i>[Signature]</i> 3/12/2018

Rev.01 Date : 3 Apr 2018

Figure 6.5 Environmental Policy

Source: Dowa Metaltech (Thailand) Co., Ltd, 2018.

Both safety and environmental policies are compliant with the requirements of safety, occupational health and environmental management system for SMEs. The environmental and safety policies were communicated to all employees, contractors, visitors and other related interested parties via various types of communication, such as safety and environmental board, email, morning meeting, and training. Additionally, the organization plans to review the safety and environmental policies once a year.

6.2.2.2 Identification of safety and environmental problems

According to this requirement, the enterprise needs to identify both safety hazards and environmental aspects of all its activities.

1) Hazard identification and risk assessment

To ensure that the employee who will identify the hazards and conduct risk assessment understand this process, the training session was conducted. All departments need to identify their hazards and make the assessment to identify the significant hazards. The results from the risk assessment process show that the significant hazards have been generated from welding and cutting by industrial gas, raw material receiving, crane operation, unpacking, electrical hazards from machine maintenance and working at height. The safety supervisor explained about the activities in this requirement as follows:

“All departments must participate in this process, as they should know what are the hazards in their areas. The top management has a strong commitment to eliminating the hazards in all areas, so we need to ensure that we can identify all hazards in each area. To identify the hazards, I invited the candidates from all departments to discuss what they need to identify and how to conduct the risk assessment. And when they finish identifying the hazards, they will submit the hazard identification and risk assessment record to me for review. The significant hazards will be addressed by the action plans”.

During this process, the organization has another method to identify the hazards - all operators need to identify in their area at least one hazard per month. This can encourage the participation of all employees. The risks that can be addressed easily will be eliminated immediately, while the risks that need high effort will be reviewed again and the hazards will be identified and risk assessment will be conducted with the safety professional. Additionally, the risk elimination will be monitored once a month by the safety committee to ensure that the hazards will be addressed as much as possible.

2) Environmental aspects

Regarding the environmental aspects, the enterprise identified the environmental aspects from all activities, products, and services under normal, abnormal and emergency conditions. The significant aspects consist of

- (1) High energy consumption in the production area,
- (2) Wastewater from the production process,
- (3) Oil spillage
- (4) Fire from abnormal case

All significant aspects were summarized in significant aspects summary sheet. Finally, all significant aspects were addressed by the action plan that each department had already developed. To collect the data on environmental aspects, safety officer explained that:

“The candidates from all departments were invited to discuss how to identify the environmental aspect of their activities. I explained to them about the issues that can have a negative impact on environment and resource consumption that affects the environment too. I assigned all candidates from all departments to identify the environmental aspects and assess such aspects. After that they would send the report to me for my review in case something is not clear. All significant aspects were summarized and the action plan was developed to cope with such aspects”.

The criteria for identifying the significant aspect was defined by considering the likelihood and the consequence of environmental impacts and resources consumption.

6.2.2.3 Objective and mitigation plan

Action plans to address the problems from business operation, high hazards and significant aspects were developed. The objectives for each problem were implemented as defined in the action plan to achieve those objectives. The action plans consist of:

- 1) Improve the environmental knowledge of relevant employees

The organization feels concerned that the increased capacity will lead to waste generation and the employees have low awareness of environment. This action plan was established to solve the problem that was identified by the self-assessment process. This action plan was aimed to increase the environmental awareness of all employees by providing an environmental training program, establishing monitoring process and encouraging the employees with activities such as energy conservation week, etc.

- 2) Fire prevention

The result of self-assessment shows that the organization has a problem with a fire response plan that needs to improve the emergency preparedness and response plan in case of fire. The schedule for conducting the fire drill was set in

cooperation with the local fire brigade to ensure that in case of fire all relevant employees will know their duties and act in the right way that can assist to mitigate the fire incident as soon as possible.

3) Waste reduction program

The organization aims to reduce the quantities of waste by 1% compared to 2017. The 3R's (Reduce, Reuse, Recycle) principle is used for waste reduction program. The activities consist of

- (1) Analyze types and quantities of wastes,
- (2) Segregate wastes by focusing on hazardous waste,
- (3) Improve the productivity's yield to reduce the wastewater discharge,
- (4) Select the new type of packaging for water treatment chemicals. The project's leader is the safety supervisor with the support from all departments. This program was completely finished in December 2018 and all data were analyzed and compared with the waste reduction target (1% reduction). The result shows that this program can achieve the target with 1.5% waste reduction.

4) Energy conservation program

An action plan to ensure that all energy will be used effectively has been carried out with the target of reducing the energy consumption per machine at least 1%. The energy saving measures have been determined such as installing the sensor to measure the wastewater quality to reduce wastewater treatment processes which can save energy. Additional machine was installed to reduce the cycle time of basket washing. The monitoring meeting was conducted to follow up the progression of the program once a month. Additionally, the energy patrol was carried out once a month to ensure that all relevant employees work properly and comply with all conservation measures.

For more details, a quote from safety supervisor is presented below.

“The leader of each action plan will be assigned to ensure that the project will be handled appropriately. Our top management has a high commitment to preventing the accident and preventing the environmental impact and ensure that all activities comply with Thai legislation. All necessary resources for implementing the action plans were provided. Furthermore, the top management regularly follows up the action plan once a month, if there are any obstacles, our top management will help us make a decision to overcome such obstacles.”

The author observed that all action plans were monitored strictly by the top management. That is a good motivator for driving the safety, occupational health and environmental management system in this organization.

6.2.2.4 Legal and other requirements

The enterprise provided the list of safety and environmental legal and other requirements by the environmental officer. The relevant legislation was categorized into 10 groups as follows:

- 1) Hazardous substance,
- 2) Environmental management,
- 3) Waste management,
- 4) Building,
- 5) Machine,
- 6) Energy conservation,
- 7) Safety and occupational health
- 8) Emergency response,
- 9) Labor protection, and
- 10) Customer requirements.

The environmental officer will read and identify the relevant requirements with the organization activities. The documents of the legal and other requirements have been distributed to all relevant departments so that all operations can be carried out according to the legal and other requirements. The evaluation of legal and other requirements to ensure the compliance of all legal and other requirements will be conducted twice a year by the safety supervisor. Once a non-compliance has been found, the action plan must be created to address those non-compliance issues by the related departments. All non-compliance issues will be reported in the management

review meeting. The environmental officer who is responsible for this requirement explained that:

“All safety, occupational health and environmental legal and other requirements of our customers, local authorities have been collected to create a list of legal and other requirements. I will distribute the legal and other requirements to all relevant departments and communicate with them on how to implement those legal requirements. Furthermore, relevant departments need to evaluate their compliance with the legal and other requirements twice a year. If they found any non-compliance, they need to create the action plan to address those non-compliance issues. However, as we conduct the legislative compliance audit, the results show that our organization complies with all legislation in the list”.

During the site visit, the author found that the organization excludes the Ministerial Regulation on the Prescribing of Standard for Administration and Management of Occupational Safety, Health and Work Environment in Confined Space from the legislation list. However, the confined spaces were found during the site tour. The legislation of confined space was added according to the suggestion of the author.

6.2.2.5 Training

To develop safety and environmental knowledge of employees, training plans were created separately for safety and environment. The safety training plan was established by considering the occupational health and safety risks and the training courses that were defined by the safety legislation. As a result, 24 courses on safety and occupational health have been provided for the relevant employees. Regarding the safety courses specified in the legislation, the training participants will be evaluated by the post-test, while other courses maybe evaluated by the practice or post-test. The safety courses consist of the following:

- 1) Basic safety training,
- 2) Office safety,
- 3) Working at height,
- 4) Material handling,
- 5) Safe chemical handling,
- 6) Electrical safety,

- 7) Defensive driving,
- 8) Machine safety,
- 9) Safe work with sharp and heavy materials,
- 10) Crane operation,
- 11) Forklift,
- 12) First aid,
- 13) Fire response plan,
- 14) Gas leakage response plan,
- 15) Chemical spill response plan,
- 16) Radiation safety,
- 17) Natural gas operator,
- 18) Hazardous substance controller,
- 19) Safety officer: management level,
- 20) Safety officer: supervisor level,
- 21) Safety committee,
- 22) Lessons learned from previous accidents,
- 23) Basic safety legislation,
- 24) Pump inspection and maintenance.

Furthermore, the environmental training course has been provided by considering the related environmental legislation and environmental aspects. Environmental policy, waste segregation, environmental aspect identification and assessment and emergency preparedness and response plan shall be provided for all employees in the organization. The safety supervisor explained that:

“The top management provides the budget for the training courses related to safety, occupational health and environment. I try to set the training program to solve our problems in term of safety and environment, as well as comply with the legislation. However, we have a problem in completing the training as planned, due to the time constraint in the production department that make us fail to meet the training plan”.

Regarding the implementation of this requirement, the author found that the organization has a problem in conducting a training as planned, because the employees cannot leave their workstation to attend the training. As a result, the training

plan falls behind the schedule. A new method of training should be considered to allow the employees to attend the class with less time-consuming.

6.2.2.6 Document

The enterprise has established document control and record control procedure (QE-SA00-RE-016 Rev.02) to control that all documents in environmental, occupational health and safety management system will be approved by authorized person prior to using such documents, and ensure that all documents will be updated and accessible to the employees. Roles and responsibilities related to document and record control have been identified, and the codes that will be used in the procedure have been defined. Types of documents consist of

- 1) Manual,
- 2) Procedure,
- 3) Work instruction,
- 4) Record and form.

The control process of the outside documents has been included in the procedure. The relevant documents will be distributed to all relevant departments to ensure that all employees have access to the necessary documents, especially the work instructions related to their works. The documents will be controlled by the document controller. To implement this requirement, the document controller explained that:

“Safety and environmental documents will be controlled according to the document control and record control procedures that identify the simple flow chart. The flowchart shows the following processes: the document requester asks to create or revise the document, the requester creates the document or revises the document and submits to me. Once I review the document that everything complies with the document control and record control procedures, I will propose it to the authorized person for approval. Next, I will register such document and distribute to all relevant departments, while the original one will be kept at my office.”

As the author observed during the implementation process, the organization has a good system to control the documents and records which can ensure that all documents will be updated and used according to the purposes of such documents.

6.2.3 Checking

The organization established the internal audit to monitor the compliance of the management system, however, the safety management system was not carried out during the consultation program by the author.

6.2.3.1 Internal audit

Internal audit procedure was established to define the details of the internal audit program. The internal audit procedure (QE-QA00-RE-013 Rev.05) defines that the internal audit will be carried out once a year. The procedure mentions quality and environmental management system but its details include a safety management system. The last internal audit was conducted in April 2018. The auditors will be selected by the management representative. The appointment of all auditors will be announced to ensure that all auditors recognize their roles and responsibilities. Each internal audit team will consist of lead auditor and auditor. The audit report will be submitted to management representative and recorded in the log sheet by document controller, before the report with corrective action request, in case the auditor finds the nonconformity issues, will be distributed to relevant department for acknowledging and problem-solving. The auditor who issued the corrective action request should verify the actions to address the nonconformity issues before closing out such nonconformity issues. Finally, the status of internal audit will be reported to the top management. A quote from management representative is shown as follows:

“The internal audit can help our organization to improve our management system, because I feel that if we don’t conduct the internal audit, we cannot find the problems in our management system. Normally, I will develop the internal audit schedule that is planned once a year. However, we need to add the audit schedule for safety management system”.

The organization has a formal internal audit process that covers all activities by following the internal audit procedure. However, to ensure that safety management system will be monitored, the audit program for safety management system should be added to the existing internal audit plan.

6.2.3.2 Accident investigation

The enterprise established the accident investigation process and created an accident investigation form. The accident types can be grouped into 6 types:

- 1) An accident with injury,
- 2) Fatality case,
- 3) Disability case,
- 4) Property damage,
- 5) Loss of organ, and
- 6) First aid case.

All accident cases must be investigated within 24 hours. In 2018, the organization has only first aid cases. In case of an accident, the supervisor must report to their manager and safety supervisor immediately, including providing the initial accident report to the safety supervisor. The accident analysis must be carried out by at least 2 investigation team members (safety supervisor and supervisor of the area in which the accident occurred). The accident report will be proposed to the manager of the area in which the accident has taken place and other recommendations may be added if necessary. Next, the report will be submitted to the top management for review and making additional recommendations. All actions mentioned in the accident investigation must be done completely. Finally, the safety supervisor will evaluate all actions to ensure that the root causes of the accident are eliminated. For implementing this requirement, the safety supervisor explained that:

“Accidents rarely occur in our organization. In 2017 and 2018, we have only first aid cases of accident. Our management has a strong commitment to eliminating the hazards from workstation by encouraging all employees to identify the hazards and report to their supervisor immediately. That’s why the serious accidents cannot occur in our organization. The accident investigation flow chart will be communicated to all supervisors and managers to ensure that they can practice in compliance with our flow chart, especially we can help our employees immediately in case an accident occurs”.

The organization has a systematic process to conduct the accident investigation by the investigation team; they can find the root causes and try to eliminate such root causes that is very important to improve the management system.

6.2.4 Action for Continual Improvement

To address the nonconformities with safety, occupational health and environmental management system for SMEs, the corrective action procedure was

revised by integrating with quality management system. Management review meeting was carried out to review the output of the management system to ensure the continual improvement.

6.2.4.1 Corrective action

The nonconformity may be generated from many sources as follows:

- 1) Internal audit,
- 2) Certification body,
- 3) Nonconformity from evaluation of legal compliance and,
- 4) Nonconformity during implementation process.

The corrective action request will be initiated from the auditor or the management representative and distributed to relevant departments. The relevant supervisors or managers need to investigate such nonconformity to find the root causes. The nonconformity report must be returned to the management representative within 7 days and the nonconformity must be addressed within 30 days. The corrective actions must be addressed within a specific time frame and the responsible person must be assigned for each action. Finally, the nonconformity will be monitored by the auditor or the initiator of each nonconformity. A quote from management representative is shown as below:

“Nonconformities have been found from various sources such as internal audit, certification body, and from all employees if they found any nonconformity during daily operations. But most nonconformities come from internal audit process. The corrective action request (CAR) must be used to identify the root causes and corrective actions must be done to address such nonconformity. All corrective action requests will be kept by document controller and the document controller will register all corrective action requests. All nonconformities will be reviewed in management review meeting to find the measure to prevent the repetition of such nonconformities”.

6.2.4.2 Management review

Management review procedure (Document number: QE-QA-RE-020 Revision 04) has been established to explain the process of management review for both quality management system and environmental management system. The management review meeting will be conducted once a year, the quality management representative and environmental management representative have a responsibility to prepare the inputs for the management review. The inputs have been prepared as follows:

- 1) Evaluation result of product quality
- 2) Internal audit result
- 3) Quality claims
- 4) Customer satisfaction
- 5) Achievement of quality objectives
- 6) Production report
- 7) Non-conformity and corrective action
- 8) Follow-up actions from previous management reviews
- 9) Compliance with legal and other requirements
- 10) Actions to fulfill legal and other requirements
- 11) Communication with interested parties and complaint management
- 12) Environmental performance (Environmental monitoring, emergency drill)
- 13) Achievement of environmental objectives
- 14) Changes in external and internal issues that affect the environmental management system
- 15) Suggestion for improvement

The president will review all inputs and assign the responsible person to address the problem if the results show that action is needed for the management system improvement. And finally, the meeting minutes will be recorded and retained for 3 years.

Regarding the inputs of the management review, safety performance is still not included in the existing management review procedure. However, the

organization plans to add the safety topic to the agenda in the future to ensure that safety performance will be reviewed and improved. The environmental management representative explained that:

“The preparation of inputs of the management review meeting will be assigned to relevant departments and they have to prepare the data related to their work. Once they finish preparing the data, they will submit to me and I will collect all data and prepare the presentation for the meeting. The president will be the chairman of the meeting and review all inputs, and make a decision about the issues that require an action. The meeting minute will be carried out by the document controller and distributed to all department heads, and it must be communicated to the subordinates.”

Before the coaching period took place, the management review meeting had been carried out in April 2018. The next management review will be held on the second quarter of 2019 and the organization plan to review the safety performance as well.

6.3 Evaluating the Implementation of Integrated Safety, Occupational Health and Environmental Management System for SMEs by Using the Balanced Scorecard

To ensure the suitability of the integrated environmental, occupational health and safety management system, the balanced scorecard has been used to evaluate the effectiveness of the implementation in four dimensions that consist of effectiveness perspective, stakeholder perspective, internal process perspective and organization learning and growth perspective. The management system audit has been carried out during the consultancy period and the data are used to evaluate the fit of such management system to SMEs.

6.3.1 Effectiveness Perspective

The criteria for the effectiveness perspective is the achievement of environmental, occupational health and safety objectives. The management system audit has been carried out during the consultancy period and the results show that:

6.3.1.1 Safety, occupational health and environmental management system for SMEs implementation

The result of the management system implementation shows that the organization can implement most elements of safety, occupational health and environmental management system for SMEs except the internal audit and management review requirements. The organization plans to integrate the safety requirements in the next internal audit program in 2019. The organization can implement the requirements related to hazard identification, risk assessment and environmental aspect quite good. All employees have been involved in hazard identification process; they need to identify the hazards in their area once a month. The environmental aspects will be identified for all activities and products. A quote from management representative is shown below:

“The implementation of safety, occupational health, and environmental management system can improve our safety practices. A suggestion on identifying the hazards in various sources can motivate us to identify hazards better, especially the hazards caused by electricity and other energy sources during the maintenance job. In environment term, our significant waste is wastewater from production process. However, the quality of wastewater has been controlled to comply with the local legislation. All metal wastes have been sent back to the headquarters in Japan for recycling. I plan to combine safety to an existing internal audit program next year, because we just finished conducting internal audit in April 2018”.

The representatives of the employees have been interviewed to get their points of view on the effectiveness of the management system. The production operator explained that:

“I feel that workplace here is safe and our management has a great commitment to safety and environment improvement. My colleagues and I need to identify the hazards in our area once a month and we must segregate wastes, especially hazardous wastes and general wastes to prevent its mixing. Safety and environmental policy has been communicated to us via morning meeting. And safety risks and environmental problems have been informed also to make me understand how we can work safely and avoid environmental impact.”

The safety supervisor was interviewed to obtain her opinion in safety and environmental management system after implementing the environmental, occupational health and safety management system for SMEs. The safety supervisor explained that:

“Regarding the previous action plan for safety, we have just implemented safety according to Thai legislation and have followed the requirements from a headquarter, especially for hazard identification and risk assessment method we have used the guideline from our headquarters in Japan, but for other requirements of safety we have not yet implemented it. After we have adopted safety, environmental management system for SMEs, other requirements of safety have been implemented in our organization. For environmental management system, we have implemented ISO 14001:2015. However, we consider reviewing our context of the organization and our interested parties to ensure that all internal and external issues have been considered, as well as all interested parties have been listed and their needs and expectations have been identified.”

The conclusion can be explained that the organization has a good practice for implementing an environmental management system, while safety management system must be improved by integrating other safety requirements of the management system for SMEs into the existing environmental management system. Additionally, internal audit for safety management system must be incorporated into the existing audit program, and the safety performance must be included in the inputs of the management review meeting. During the consultancy program, the missing of safety legislation for confined space has been found, hence the related safety legislation must be reviewed strictly to ensure that all related safety legislation has been listed and implemented properly. The organization should apply the new method to provide the safety and environmental training for all related employees to mitigate the problem in case the employees cannot attend the training as scheduled such as morning meeting, video training etc. The continual improvement of the management system should be maintained to ensure better safety and environmental performance in the future.

6.3.1.2 The achievement of environmental, occupational health and safety objectives

From the author observation during the implementation period, safety and environmental management plans have been established as follows:

- 1) Waste reduction program,
- 2) Reducing the energy consumption of machines in production line,
- 3) Accident prevention for product loading in logistic area,
- 4) Prevention of crane accidents,
- 5) Prevention of forklift accidents,
- 6) Prevention of coil unpacking accidents,
- 7) Fire prevention during hot work,
- 8) Lockout and Tagout program for maintenance,
- 9) Working at height program,
- 10) Chemical safety program.

The result of each program can be explained as follows.

1) Waste reduction program is implemented as planned. This program aims to encourage the employees to reduce waste by the 3Rs principle (Reduce, Reuse and Recycle) and the target is reduction of hazardous waste by 1% compared to 2017. The result was evaluated at the end of 2018 and it could achieve the waste reduction goal.

2) Reducing the energy consumption of machines in production line. This program aims to reduce the energy consumption in all machines by analyzing the energy consumption data and identifying the measures to reduce the energy use, for instance, reducing time for basket cleaning in production process, installing sensor for monitoring the wastewater to reduce the re-treatment of wastewater. The target of this program is to reduce energy consumption of the machine by 1% compared to 2017. All activities have been implemented as scheduled and the target is achieved now.

3) Accident prevention for product loading in logistic area. This program aims to prevent accidents during finished good loading and raw material unloading. All necessary actions have been identified and implemented. All actions will be implemented by store officer and monitored by store supervisor. The program has been done completely since the end of August 2018.

4) Prevention of crane accidents. To ensure the compliance with Thai safety regulation of crane operation, all cranes and equipment must be inspected in accordance with the regulation. The program will be implemented by the supervisors of all areas where cranes operate, while the inspection program will be included in the yearly safety plan by the safety supervisor. All actions in this program have been done completely.

5) Prevention of forklift accidents. The actions consist of engineering control by installing the traffic safety mirror at the junctions inside and outside building, training all forklift drivers and identifying the authorized driver by forklift driver card, forklift inspection and maintenance and speed limit of forklift. All actions have been done completely as planned.

6) Prevention of coil unpacking accidents. The work instruction has been established to guide related operators who unpack the coil packages on how to unpack properly and use proper personal protective equipment. To ensure the compliance with the work instruction, safety supervisor will monitor the practice once a month.

7) Fire prevention during hot work. Gas welding and cutting pose a high risk of fire incident. Hot work permit must be implemented strictly by all maintenance technicians under the supervision of maintenance supervisor. The program will be monitored at intervals by the safety supervisor to ensure that all assigned measures have been taken properly.

8) Lockout and Tagout program for maintenance. This program is being implemented by the safety supervisor and maintenance supervisor by identifying all energy sources and providing the appropriate lockout and tagout equipment. The program was finished in December 2018.

9) Working at height program. Working at height poses a high risk for maintenance work. The program includes working at height permit, establishing the work instruction of working at height, providing all fall protection equipment. The work instruction has been trained to all maintenance technicians including the maintenance supervisor. All actions have been done completely.

10) Chemical safety program. The actions in this program consist of chemical safety training for related employees, warning signs, chemical

storage according to the Thai safety regulation, safety audit in storage area, providing eye shower and emergency shower, providing spill kit in the case of chemical spill, and chemical concentration measurement in the workstation. All actions have been done and monitored by the safety supervisor in each area.

All action plans of environmental, occupational health and safety objectives have achieved the targets, especially the lockout-tagout procedure is implemented to achieve the target of accident prevention from hazardous energy. Additionally, each action plan must be monitored to ensure the compliance with the operating criteria that were identified by the leader of each program.

6.3.1.3 The obstacles to implementing environmental, occupational health and safety management system for SMEs

The outcome of environmental, occupational health and safety management system implementation for SMEs is quite good which results from the strong commitment of the top management. However, the fact that the employees do not have enough time to attend the safety and environmental training is a significant problem here. Especially, the production operators cannot leave their station during the working time, so the new method of training should be considered to solve this problem. The safety supervisor explained that:

“We have obtained great support from top management to implement safety and environmental management system, but one problem here is that I cannot complete the yearly safety and environmental training plan. When I started the training class, I found that only a few employees can attend the class, especially the production operator. My boss asked me to find a new way to conduct safety and environment training for our employees such as using multimedia for training etc. On the other hand, our employees pay their contribution to safety and environment in their duties such as identifying the hazards in their area, segregating the wastes, etc.”

6.3.2 Stakeholder Perspective

To ensure that the environmental, occupational health and safety management system for SMEs is suitable to implement in the organization, the participation of all employees is very important. Moreover, the satisfaction of the management system implementation is another issue related to the sustainability of such management

system. The participation and satisfaction of interested parties have been defined with the following details.

6.3.2.1 Employee participation

The interview with employees and the observation have been conducted during the consultancy program at the site. The author found that during the implementation program, the employees have been involved in the management system implementation via many activities such as hazard identification, energy-saving as well as safety and environmental programs that were established during the implementation period. Moreover, the representatives from all departments are a part of safety and the environmental committee. They can share their needs and expectations in term of safety and environment as well as cooperate with the team to drive and improve the safety and environmental performance of the organization. A quote from a management representative is shown below:

“I feel happy with our safety and environmental performance. Accidents rarely occur here and we can manage our wastes very well. The main environmental aspect that we need to control strictly is wastewater treatment and all parameters of wastewater must comply with local environmental legislation. The participation of our employees in safety and environmental activities is quite good in my opinion. All employees follow the safety and environmental rule very well, and they inform safety and environmental risks to their supervisor when they find any abnormal situation”.

The safety supervisor who drives employee participation in the organization explained that:

“Due to the high level of management commitment to safety and environment, everyone here feels that safety and environmental issues are very important and they need to pay attention to this. All employees need to submit an unsafe act or unsafe condition report to me once a month, and if they find any issue about the environment, they need to report to their supervisor or me directly. I am happy with the safety and environmental practice in my organization”.

Moreover, the quote from the production supervisor indicates that:

“Safety is our responsibility that must be incorporated in our normal work, and I need to take care of the environment too. I participate in the safety

management system by following the safety rules and reporting the unsafe act or unsafe condition. Besides, I need to classify the waste before throwing it into the bin”.

6.3.2.2 The interested parties' satisfaction

The interview was conducted to measure the satisfaction of the management representatives, the safety officers and the industrial estate officer of Gateway industrial estate, Chachoengsao

The management system representative appreciates the environmental, occupational health and safety and explained that:

“I am satisfied with the result of environmental, occupational health and safety management system implementation for SMEs here. Although we are certified to ISO 14001:2015, the management system's model for SMEs can improve our safety practice, especially safety legislation, we can identify all applicable safety legislation that related to our activities. Moreover, the context of the organization and all needs and expectations of all interested parties have been reviewed and the safety issues have been added to the existing documents”.

The safety supervisor feels that the designed management system can assist the organization that adopts it to improve the environment and safety performance, especially to prevent an accident and environmental impact. A quote is shown below:

“I think it is a simple environmental and safety management system that suits SMEs because it does not need to create many documents. The requirement is easy to understand with the implementation manual that can support SMEs so much”.

The officer of Gateway industrial estate was interviewed about his satisfaction to the safety and environmental management system. The officer explained that:

“I don't have any complaint for this factory. The top management is always willing to join all safety and environmental programs that are provided by the industrial estate and this company joins the green industry project too. The related report regarding the safety and environment has been submitted to our office on time”.

The conclusion of the satisfaction can be summarized that the implementation team is satisfied with the management system, because they feel that such management is simple, creates less document, and easy to implement. Other

interested parties such as the authorized officer feels that the organization is the role model in term of safety and environment management. The officer does not have any complaint about this organization.

6.3.3 Internal Process Perspective

The internal process is one perspective that needs to be evaluated to ensure that the designed management system is suitable for SMEs. The achievement of action plan implementation, quantity of the implementation team, budget, monitoring, and evaluation process have been evaluated as follows.

6.3.3.1 The achievement of action plan implementation

The implementation plan for environmental, occupational health and safety management system has been set for 5 months period with the consultancy by the author. The result shows that the organization can implement all activities in compliance with the schedule. For internal audit and management review, the organization plans to integrate the safety audit program into the existing internal audit program, including adding the input of safety to the management review in 2019. A quote from the management representative is shown below:

“I think we have achieved our goals of implementing the environmental, occupational health and safety management system for SMEs. However, some requirements have not yet been fulfilled, but we plan to do it next year.”

6.3.3.2 The implementation committee

The implementation team has been established and announced to ensure that everyone understand their roles and responsibilities. The key person who implements the management system is the safety supervisor with the support of the candidates from all departments. Regarding the observation during the 5 months implementation program, the author found that the implementation team has good knowledge of safety and environmental management, so they can implement such management system quickly. All employees know what are their roles and responsibilities in safety and environmental management system.

6.3.3.3 Budget

The organization does not have any problem with the budget for safety and environmental program. The budget will be provided once a year to comply with

safety and environmental yearly plan. Although the environmental, occupational health and safety management system for SMEs will be designed in consideration of the limitation of resources, the budget for safety and environmental improvement project is still needed. The safety supervisor explained that:

“There is no problem with safety and environmental budget in our organization. If we have a new project to solve the safety problem, I can submit a budget proposal to my boss. And my boss understands that all Thai safety and environmental legislation must be fulfilled. So if our project is related to the legislation, it means that the budget is never blocked.”

The essential budget can drive the continual improvement of environmental, occupational health and safety management system in the organization. Additionally, safety and environmental budget can reflect the commitment of top management in term of safety and environment.

6.3.3.4 Monitoring and Evaluation

The monitoring and evaluation have been carried out at the last stage of the implementation plan by the internal audit and management review. The internal audit has been conducted by internal auditors that were trained, and the audit plan has covered all activities of the organization. However, the internal audit plan does not include the safety management system for the last internal audit program. The nonconformities will be summarized by the document controller under the review of the management representative. The corrective action request forms will be sent to the non-compliance department and they need to be responded within the defined date. The management review was not conducted during the consultation period because the organization had conducted it before the consultancy program started. The organization does not need to create any new procedure for management review. The existing procedure of management review can be used by adding the input of a safety management system for top management review. The management representative explained that:

“Internal audit and management review for quality and environmental management system were conducted before we join this program. So I plan to add the audit program for safety next year, as well as adding the input of the safety management system for the next management review meeting too.

The organization can establish the monitoring and evaluation process to monitor the compliance with an environmental management system for SMEs, but still does not meet the requirement of a safety management system. The monitoring and evaluation must be done as planned to ensure that the management system will be maintained to ensure continual improvement.

6.3.4 Organization Learning and Growth

The environmental, occupational health and safety management system can improve the safety and environmental knowledge of the employees, especially the safety aspects for the safety supervisor who drives safety and environmental management system of the organization. The safety supervisor can better understand the applicable safety legislation of confined space. Additionally, the context of the organization and need and expectation of the interested parties have been reviewed by including the external and internal issues related to safety performance, as well as the safety needs and expectations with the existing data. New work instructions have been created such as lockout and tagout work instruction. A quote from a safety supervisor is shown as:

“The outcome of this project can help me identify all applicable safety legislation and complete the context of the organization, as well as the needs and expectations of all interested parties. Moreover, the consultation during the implementation period can help me improve my understanding of safety and environmental management system for SMEs”.

In this perspective, the organization can improve the employees' knowledge in term of safety and environment. Additionally, the organization can improve the energy isolation work instruction for maintenance work.

The implementation evaluation by the balanced scorecard is shown in Table 6.1.

Table 6.1 The Score of the Balanced Scorecard From the Implementation Results of Case Study 2 Enterprise by the Author

Perspective	Result	Score
1. Effectiveness perspective		
1.1 Safety, occupational health and environmental management system implementation	Most of the requirements of the integrated management system have been implemented completely except the internal audit and the management review	2
1.2 The achievement of safety, occupational health and environmental objectives	Nine of the ten objectives had been achieved	2
2. Stakeholder perspective		
2.1 Employee participation	80% of the target employees attend the training workshop on implementation of the management system	2
2.2 Interested party satisfaction	All interested parties satisfy the integrated management system	3
3. Internal process perspective		
3.1 The achievement of action plan implementation	All activities comply with the action plan	3
3.2 Working team has been assigned	The implementation team has been assigned from the candidates of all departments	1
3.3 Budget	The sufficient budget has been provided for all objectives	2
3.4 Monitoring and Evaluation	The internal audit program and the management review meeting have been carried out, but not included the safety management system	1
4. Organization learning and growth		
4.1 The process to enhance safety and environmental performance has been developed	<ul style="list-style-type: none"> - Safety and environmental knowledge of the employees had been improved - The applicable safety legislation had been reviewed and added to the list of the safety, occupational health and environmental legislation and other requirements - The context of the organization and the need and expectation of the interested parties had been reviewed and updated - New work instruction of energy isolation had been established 	2
Total Score		18

Source: Thepporn Jaroenroy, 2018.

The implementation score of case study 2 enterprise is 18 points (81.8%) that meet the target score, so the integrated safety, occupational health and environmental management for SMEs implementation results are acceptable.

Moreover, the assessment of the integrated safety, occupational health, and environmental management system for SMEs has been carried out by the Management representative which is shown in Table 6.2.

Table 6.2 The Score of the Balanced Scorecard from the Implementation Results of Case Study 2 Enterprise by the Management Representative

Perspective	Result	Score
1. Effectiveness perspective		
1.1 Safety, occupational health and environmental management system implementation	Most of the requirements of the integrated management system have been implemented completely except the internal audit and the management review	2
1.2 The achievement of safety, occupational health and environmental objectives	Nine of the ten objectives had been achieved	2
2. Stakeholder perspective		
2.1 Employee participation	80% of the target employees attend the training workshop on implementation of the management system	2
2.2 Interested party satisfaction	All interested parties satisfy the integrated management system	3
3. Internal process perspective		
3.1 The achievement of action plan implementation	All activities comply with the action plan	3
3.2 Working team has been assigned	The implementation team has been assigned from the candidates of all departments	1
3.3 Budget	The sufficient budget has been provided for all objectives	2
3.4 Monitoring and Evaluation	The internal audit program and the management review meeting have been carried out, but not included the safety management system	1
4. Organization learning and growth		
4.1 The process to enhance safety and environmental performance has been developed	- Safety and environmental knowledge of the employees had been improved - The applicable safety legislation had been reviewed and added to the list of the safety, occupational health	2

Table 6.2 (Continued)

Perspective	- Result	Score
	<ul style="list-style-type: none"> - and environmental legislation and other requirements - The context of the organization and the need and expectation of the interested parties had been reviewed and updated - New work instruction of energy isolation had been established 	
Total Score		18

Source: Thepporn Jaroenroy, 2018.

The result shows that the scores of the integrated safety, occupational health, and environmental management system implementation in SMEs using the modified balanced scorecard are equivalent between the evaluation of the author and the management representative. The score can demonstrate the effectiveness of the designed management system according to the views of the author and the management representative of the enterprise.

CHAPTER 7

RESULT OF IMPLEMENTING INTEGRATED SAFETY, OCCUPATIONAL HEALTH AND ENVIRONMENTAL MANAGEMENT SYSTEM MODEL FOR SMALL AND MEDIUM ENTERPRISE IN PILOT ENTERPRISE: CASE STUDY 3

7.1 Company Background

The enterprise of case study 3 has been established since 2004, with the registered capital of 35 million baht. The site is located at Amata Nakorn Industrial Estate 700/690 Moo 1, Tambol Phanthong, Amphur Phanthong, Chonburi, 20160, Thailand. It has a total of 59 employees. The location is shown in figure 7.1 and the enterprise has been certified to ISO 9001:2018 and ISO 14001:2015.

The main products are press machine metalworking, multi-forming machine metalworking and spring with the approximate capacity of 16 million pieces.

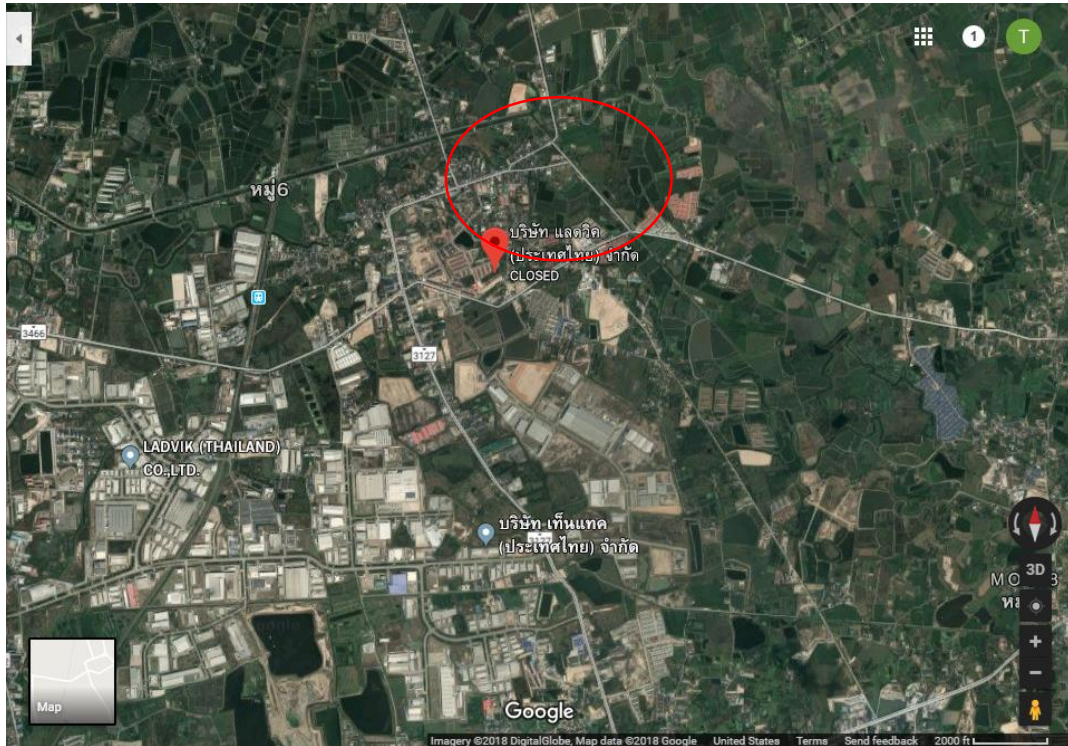


Figure 7.1 Map of Case Study 3 Enterprise

Source: Ladvik (Thailand) Co., Ltd, 2018.

The products of the case study 3 enterprise are shown in figure 7.2



Figure 7.2 Hose Clamp, Insert Collar and Wire Spring

Source: Ladvik (Thailand) Co., Ltd, 2018.

The company has a high commitment to improving the management of the organization to fulfill the customer satisfaction with a good reputation. The business flow has been created as is shown in Figure 7.3. The requirements of customer will be fulfilled by sales department and all requirements will be distributed to related departments. The purchasing department will provide the raw materials to produce the products according to customer requirements. The manufacturing process will be performed once the materials are ready for the production with the technical assistance from the enterprise headquarters in Japan. The assistance from the headquarters include production forecast, purchase order process and material delivery planning. The internal process of quality assurance is the mandatory process to ensure that all products will meet the quality criteria. When all products are produced completely with respect to both quantity and quality, the products will be delivered to the customer site.

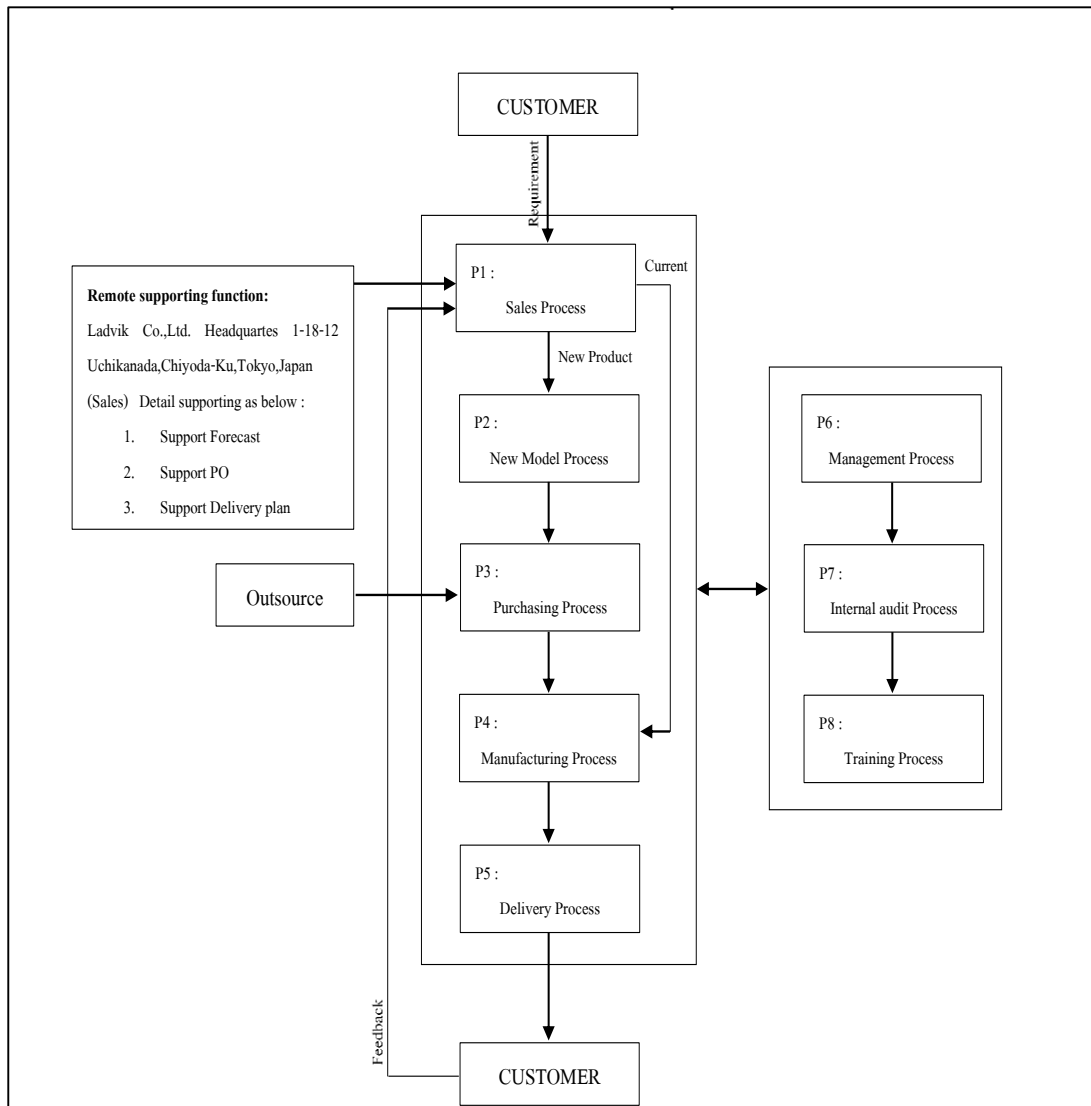


Figure 7.3 Business Flow Diagram

Source: Ladvik (Thailand) Co., Ltd, 2018.

7.2 Integrated Environmental, Occupational Health and Safety Management System for SMEs Implementation

According to the consultation plan that the author supports the organization, the site visit has been done to support the organization in term of training and consultation to ensure that the implementation team understands the requirements of environmental, occupational health and safety management system for SMEs. The implementation can be categorized into 4 steps as explained below.

7.2.1 Self-Assessment

7.2.1.1 Understanding the organization and its context

Internal and external issues related to the business objectives, safety, and environmental performance have been identified and assessed, and the effects of each internal and external issues have been identified too. The internal and external issues can be categorized into 8 groups:

- 1) Organization strategy,
- 2) Operation consisting of manpower, safety issues, technology and innovation, environment,
- 3) Regulations and other requirements,
- 4) Machine, Equipment, and Tools,
- 5) Transportation,
- 6) Facilities,
- 7) Emergency situation, and
- 8) Significant aspects.

The significant risks from the assessment are

- 1) Fire incident,
- 2) Power outage.

The action plans have been developed to address the significant risk issues. The organization has established the control measures for the risks and opportunities as follows:

- 1) Fire prevention plan,
- 2) Communication plan in case of power outage. The safety

and human resources manager explained that:

“To conduct a self-assessment of the organization, candidates of all relevant departments have been invited to brainstorm and identify the internal and external issues related to our business objectives, safety and environmental performances. All risks that were identified will be assessed by risk criteria to find the significant risks. Finally, all significant risks will be addressed by mitigation plan”.

The control measures of risks and opportunities that were identified have been implemented and followed up by the management representative, and the results of implementation have been reported in management monthly meeting. Additionally,

internal and external issues that are relevant to the business objectives and affect the ability to achieve the safety, occupational health and environmental objectives will be reviewed annually as planned.

7.2.1.2 Understanding the needs and expectations of interested parties

To ensure the compliance with this requirement, the enterprise has identified all interested parties related to their business, safety and environmental management system. The interested parties consist of shareholders, employees, contractors, customers, vendors, authority officers, neighborhood, non-government organization (NGO). The needs and expectations of all interested parties have been identified which one is the risk and which one is an opportunity. The enterprise created their own criteria for assessing all needs and expectations from severity and occurrence. Finally, the organization can identify the significant risks. The high risk is the list of the applicable safety and environmental legislation is not completed, which makes the organization at the risk of non-compliance with the added safety and environmental legislation. Another risk is the lack of budget for safety and environmental improvement. The action plans have been established to mitigate the risk. The action to address the risk of incomplete list of applicable safety and environmental legislation is the legislation training for the safety officer to ensure that the safety officer will understand better about all applicable safety and environmental legislation. Meanwhile, the risk related to the lack of safety and environmental budget will be addressed by preparing the budget proposal to the top management annually. The safety manager who is a member in implementation committee of the management system explained that:

“The budget of safety and environmental improvement will be proposed to the top management annually to ensure that the organization has the essential budget for the management system implementing. The budget is very important for the implementation team and all employees, that such budget can contribute to the safe workplace for all employees”.

The organization can identify all related interested parties that affect the organization performance in term of business, safety and environment, which can assist the organization to develop an action plan and address those risks and opportunities before the problems occur.

7.2.2 Planning and Implementation

7.2.2.1 Safety, occupational health and environmental policy

The enterprise has established a safety and environmental policy to determine the direction how it will manage safety, occupational health and environment within its organization. The safety and environmental policies have been created separately and signed by top management on 19 July 2018 with the following commitments:

- 1) Pollution prevention with the 3R principle (Reduce, Reuse, Recycle),
- 2) Complying with environmental, safety and occupational health legislation,
- 3) Continual improvement to ensure that all employees will work safely and prevent the environmental impact.


The safety objectives have been set as:

- 1) Improving and maintaining the good environment of the workplace by encouraging employees to maintain 5S activities,
- 2) Energy consumption control,
- 3) Waste management focusing on proper waste segregation, and
- 4) Complying with legal requirements and other requirements related to environment, safety and occupational health to achieve the zero accidents and ensure that wastewater parameters comply with local legislation.

The safety and environmental policy will be communicated to all interested parties. And all interested parties must pay attention to the safety and environmental policy which will help the organization to achieve the safety and environmental objectives. The period of the safety and environmental policy review has been determined as one year to ensure the suitability of the existing safety and environmental policy.

Additionally, the roles and responsibilities of all employees in the organization have been defined and announced to ensure the achievement of the safety and environmental policy. The top management will provide all resources related to the integrated management system implementation, assign the roles and responsibilities to

all related employees and monitor the results of the management system implementation. Meanwhile, management and supervisor need to provide the action plans to ensure the achievement of the safety and environmental policy and report the problems and obstacles of the integrated management system implementation to the top management. All employees need to ensure that their works are performed and complied with the direction of safety and environmental system that the top management has given, and provide the suggestions in term of safety and environment to improve the safety and environmental performance, as well as report the problems and obstacles of safety and environmental management system implementation to their supervisor directly. The safety and environmental policy is shown in figure 7.4


LADVIK (THAILAND) CO., LTD.

700/690 M.1 Amatanakorn Industrial Estate T.Penthong A.Panthong Choaburi 20160 Tel. : 038-079-929 Fax. : 038-079-930

ประกาศ

เลขที่ : ES 18-002

เรื่อง นโยบายการจัดการสิ่งแวดล้อมและความปลอดภัยอาชีวอนามัย

บริษัท แลควิค (ประเทศไทย) จำกัด มีความมุ่งมั่นที่จะป้องกันมลภาวะที่จะส่งผลกระทบต่อสิ่งแวดล้อมความปลอดภัยและสภาพแวดล้อมในการทำงาน ที่เกิดจาก กิจกรรม ผลิตภัณฑ์และบริการของบริษัทฯ และดูแลการใช้ทรัพยากรธรรมชาติให้ประหยัด คุ่มค่าที่สุด เพื่อตระหนักถึงประโยชน์ของทรัพยากรธรรมชาติรวมถึงการทำงานเกี่ยวกับสารเคมีและงานที่มีต่อการเกิดอ็อกซิเจน จึงกำหนดนโยบายและวัตถุประสงค์ ดังต่อไปนี้

นโยบายระบบการจัดการสิ่งแวดล้อมและความปลอดภัยอาชีวอนามัย

เรามุ่งมั่นที่จะป้องกันมลภาวะที่จะส่งผลกระทบต่อสิ่งแวดล้อมความปลอดภัยและสภาพแวดล้อมในการทำงาน ทั้งภายในและภายนอกองค์กร โดยการค้าดำเนินงาน ด้วยระบบ 3 R (Reduce / Reuse / Recycle) ให้สอดคล้องกับข้อกำหนด และ ข้อกำหนดต่างๆและพัฒนาระบบอย่างต่อเนื่อง

วัตถุประสงค์ด้านการจัดการสิ่งแวดล้อมและความปลอดภัยอาชีวอนามัย :

1. รักษาสภาพแวดล้อมบริเวณ โรงงานและรอบนอกให้สวยงาม
 - 1.1 ส่งเสริมกิจกรรมการทำความสะอาด 5ส. โดยให้พนักงานทุกคนมีส่วนร่วม
2. ควบคุมการใช้ทรัพยากร
 - 2.1 ควบคุมของเสียที่เกิดจากกระบวนการผลิตที่เป็นปัญหาส่งผลกระทบต่อคุณภาพ
 - 2.2 ควบคุมการใช้งานทรัพยากรสิ้นเปลือง
3. ควบคุมการคัดแยกขยะ
 - 3.1 คัดแยกขยะให้ถูกต้องตามประเภท
4. ปฏิบัติตามกฎหมาย และข้อกำหนด ที่เกี่ยวข้องด้านสิ่งแวดล้อม และความปลอดภัยที่เกี่ยวข้องกับองค์กร
 - 4.1 ควบคุมเหตุเป็นอันตราย (สารเคมี / อ็อกซิเจน / บุคคลและทรัพย์สิน)
 - 4.2 ควบคุมการตรวจวัดค่าน้ำให้ได้ตามเกณฑ์ที่กำหนด

ORIGINAL

บริษัทฯ จะสื่อสารนโยบายให้กับบุคลากรทุกระดับบริหารและเปิดเสนอ ใบบอกต่อผู้มีส่วนได้ส่วนเสีย และถือเป็นหน้าที่ของพนักงานและผู้ที่มีส่วนได้ส่วนเสีย ที่จะต้องสนับสนุน และให้ความร่วมมือ รวมทั้งปฏิบัติตามกฎระเบียบในการดำเนินการตามนโยบายสิ่งแวดล้อมและความปลอดภัยเพื่อให้บรรลุตามวัตถุประสงค์และเป้าหมาย

ทั้งนี้จะมีผลตั้งแต่วันที่ 19 กรกฎาคม 2561 เป็นต้นไป



 (MR.MITSUAKI SAWANO)
 MANAGING DIRECTOR
 ประกาศ ณ วันที่ 19 กรกฎาคม 2561

Figure 7.4 Safety and Environmental Policy

Source: Ladvik (Thailand) Co., Ltd, 2018.

The safety and environmental management representative explained about the safety and environmental policy as follows:

“Our top management will direct the safety and environmental management system of the organization via safety and environmental policy based on the information provided by the representatives of the employees. This policy will be

communicated to all levels of the employees in the organization to ensure that everyone understand the company's direction. Meanwhile, the roles and responsibilities must be assigned to all relevant employees to comply with the safety and environmental policy”.

7.2.2.2 Identification of safety and environmental problems

According to this requirement, the enterprise needs to identify both safety hazards and environmental aspects of all their activities.

1) Hazard identification and risk assessment

To ensure that the employees who will identify the hazards and conduct risk assessment understand this process, the training session has been conducted for HR & Safety Manager and safety officer on how to identify the hazards and assess the risks by the author.

In this part, all activities under the control of the organization must be listed. The hazards have been identified by considering all sources that have a potential to harm the employees and other interested parties. The safety officer took around 3 months to identify the hazards of all activities including assessing and prioritizing the occupational health and safety risks. The significant risks consist of :

- (1) Chemical splash in the eye while cleaning the mold,
- (2) Back pain from material lifting in the spring line, and
- (3) Back pain from material distribution in warehouse area.

All significant risks are classified as high risk that need action to address. The safety officer explained the activities in this requirement as follows:

“All departments must participate in this process. During the hazard identification, I will collaborate with all departments to identify the hazards by observing the task performed for each activity and discuss with the worker who performed that work to ensure that all hazards are identified. In this process, it takes a lot of time because we have never identified the hazards before. Finally, I can summarize all hazards and conduct the risk assessment by using the risk assessment guideline of the consultant. The significant risks have been identified and the actions have been provided to eliminate or minimize those risks”.

The hazard identification and risk assessment results have been reviewed by the author to ensure the completion of this requirement. Some comments have been provided to the safety officer to review the hazards in the areas again. And

the author also suggests the safety officer to include the activities of the contractors that provide service to the enterprise to the hazard identification sheet. The approved hazard identification and risk assessment data have been communicated to related employees to make them aware of the hazards in their workplaces, including asking for their ideas to eliminate and minimize such hazards.

2) Environmental aspects

Regarding the environmental aspects, the enterprise has identified the environmental aspects of all activities, products, and services under normal, abnormal and emergency conditions. All environmental aspects have been prioritized into 3 levels that consist of high, medium and low impact. According to the results of environmental aspect identification and assessment, there is no longer an environmental aspect with high impact. The highest level of impact is medium. The significant aspects consist of

- (1) High energy consumption in the production area,
- (2) Hazardous waste from the production process, and
- (3) Fire from the abnormal case.

All significant aspects have been summarized in significant aspects summary sheet. Finally, all significant aspects will be addressed by the action plan that each department has already developed. To get the data on environmental aspects, the environmental management representative explained that:

“The candidates from all department have been invited to discuss how to identify the environmental aspect of their activities. I explained to them the procedure for identifying the environmental aspect and how to assess such aspects by using the defined criteria. All aspects will be reviewed by me before registration as a record. The significant aspects mainly consist of hazardous wastes, energy consumption and abnormal situation such as fire. All significant aspects must be addressed by the appropriate actions”.

The criteria for identifying the significant aspects have been defined by considering the likelihood and the consequence to the environment both of environmental impacts and resources consumption. The impact to the environment must be identified in all dimensions such as use of natural resources, noise, pollution, etc.

7.2.2.3 Objective and mitigation plan

Action plans to address the problems from business operation, high hazards and significant aspects have been developed. The objectives for each problem have been defined in the action plan to achieve those objectives. The action plans consist of:

1) Preventing accident from mold cleaning

According to the risk assessment result, the actions to prevent the accident from chemical splashing into the eye during mold cleaning have been identified. The activities consist of developing work instruction and providing personal protective equipment, work instruction training to educate all related employees about the safety practices. And finally, the monitoring program by the area supervisor will be carried out to monitor the behavior of the operators who perform this work. The work instruction has been completely developed since September 2018, and the monitoring program has been monitored since October 2018.

2) Preventing chemical exposure from cleaning product

The occupational health risk from this activity is the solvent vapor during the product cleaning process that the vapor can harm the employee's health. The actions aim to change the behavior of the related employees by encouraging them to wear chemical half mask. Training program has been carried out for all relevant employees on the topic of chemical hazards and how to protect the employee's health by using personal protective equipment. This plan has been done completely since September 2018.

3) Improving spring material lifting

Due to the effect of spring material's weight on the health of warehouse operators who lift materials to feed the production line, the lifting improvement project has been established to mitigate the health risk. They thought about how to reduce the weight of material per pack. Dividing the weight is the idea to improve the lifting task and training program on safe lifting will be conducted to all related employees. This program is being implemented in cooperation with the supplier who provides the spring material to the case study 3 enterprise.

4) Improving the workplace to fulfill the safety legislation

According to the safety and environmental compliance audit, the results show that the organization needs to improve the workplace to fulfil the safety legislation, especially hazardous substance management and fire prevention. The improvement project has been set up to fulfil the non-compliance issues. The actions consist of:

- (1) Install emergency shower and eye shower in the chemical mixing room,
- (2) Improve the machine guarding of the unsafe machine,
- (3) Install an automatic fire extinguishing system in the chemical storage room,
- (4) Install bonding and ground wire at the solvent storage room,
- (5) Provide portable extinguisher at the chemical storage room,
- (6) Install emergency light in the factory, and
- (7) Install the fire exit sign at the chemical room. The completion date of this project is mid of 2019.

For more details regarding the fulfillment of this requirement, a quote from the human resources and safety manager is presented below.

“All action plans have been initiated and implemented by the safety officer because our employees still feel that safety action plan must be implemented by the safety officer. The budget is the major issue for each project, so I try to find the most economical cost for each project to ensure that the top management will approve to implement the proposed project. Regarding the project related to personal protective equipment providing, we still need to monitor the behavior of the related employees to ensure that our employees wear the appropriate personal protective equipment while they work with the hazardous substance”.

The action plan related to the non-compliance of safety and environmental legislation should be monitored strictly by the management team to ensure that the basic requirements have been fulfilled by the organization and the safe workplace have been maintained for the employees.

7.2.2.4 Legal and other requirements

The enterprise has provided the list of safety and environmental legal and other requirements by the safety officer and review by human resources and safety manager. The actions have been identified for the organization to follow to ensure the compliance with all relevant legislation. The applicable legal and other requirements will be communicated to all relevant departments to act according to the legislation and other requirements. The evaluation of legal and other requirements will be done twice a year by safety supervisor to ensure the compliance with all legal and other requirements. Once a non-compliance has been found, the action plan must be established to address that non-compliance by the related departments. All non-compliance issues will be reported in management review meeting. The safety officer who is responsible for this requirement explained that:

“I collect all relevant safety, occupational health and environmental laws from the consulting company that updates safety and environmental laws once a month, while other safety and environmental requirements will be considered and added to the list of safety, occupational health and environmental legal and other requirements if they are applicable to the organization. I will distribute the legal and other requirements to all relevant departments and communicate with them on how to implement those legal and other requirements. I will conduct the legal and other requirements compliance audit twice a year. If any non-compliance is found, the corrective action must be provided by the non-compliance area and the action plan must be created to address those non-compliance issues. However, as we conduct the legal compliance audit the results show that our organization does not comply with some legal requirements related to fire prevention and hazardous substance management”.

Regarding the review of legal and other requirements, the author found that the safety and environmental legal requirements from the local authorities are not included in the legal and other requirements list, so the safety and environmental legislation from the local authorities should be considered and included in the list of applicable legal and other requirements to fulfill this requirement.

7.2.2.5 Training

The yearly safety and environmental training plan has been established to comply with the minimum safety and environmental legal requirement. According to the safety and environmental training plan of 2018, 9 courses on safety and

occupational health have been provided for the relevant employees. Regarding the safety courses related to the legislation, the training participants will be evaluated by the post-test, while other courses maybe evaluated by the practice or post-test. The safety courses are as follows:

- 1) Electrical safety for technician,
- 2) First Aids,
- 3) Chemical safety,
- 4) Personal protective equipment introduction,
- 5) Basic firefighting training,
- 6) Fire drill and evacuation,
- 7) Chemical spill control,
- 8) Forklift operation, and
- 9) Crane operation.

Furthermore, the environmental training course has been provided based on the related environmental legislation and environmental aspects. Environmental policy, waste segregation, environmental aspect identification and assessment, and emergency preparedness and response plan shall be provided for all employees in the organization. The human resources and safety manager explained that:

“The yearly training plan has been developed to identify all training courses related to the personnel development. Regarding the safety and environmental training courses, the training program will be set up by considering all related safety and environmental legislation. Although the budget for the training is quite limited, all basic safety training courses according to the legislation are set up. Meanwhile, the environmental training program will focus on the environmental work instruction related to the environmental management system”.

Regarding the implementation of this requirement, the author found that the organization did not define the specific environmental training course in the yearly training plan, so the essential environmental sessions should be planned to ensure that the competence of all employees whose work impact the environment is maintained properly.

7.2.2.6 Document

The enterprise has established document control and record control procedure (QS-WP-DC-001) to control that all documents in environmental, occupational health and safety management system will be approved by authorized person prior to using such documents, and ensure that all documents will be updated and accessible to the employees. Roles and responsibilities related to document and record control have been identified, and the codes that will be used in the procedure have been defined. Types of documents consist of

- 1) Manual,
- 2) Procedure,
- 3) Work instruction,
- 4) Record and form.

The control process of the outside documents has been included in the procedure. In addition, the documents must be controlled in all aspects - when they are created, changed, revised, distributed, retrieved and removed from the operation area once they are obsolete. The relevant documents will be distributed to all relevant departments to ensure that all employees can access to the necessary documents, especially the work instruction that related to their works. The document will be controlled by the document controller. To implement this requirement, the document controller explained that:

“All documents of integrated occupational health, safety and environmental management system must be approved by an authorized person before using by the employees. The revision of the documents must be specified with clear identification. Moreover, the documents must be kept and maintained in good condition and the necessary documents must be accessible to the relevant employees to ensure that they can use it when they need”.

As the author observed during the implementation process, the organization has a good system to control the documents and records that can ensure that all documents will be updated and used according to the purpose of such documents.

7.2.3 Checking

The organization established the internal audit to monitor the compliance of the management system, however, the safety management system was not carried out during the consultation program by the author.

7.2.3.1 Internal audit

Internal audit procedure has been established to define the details of the internal audit program. The internal audit procedure (QS-WP-MR-002) defines that the internal audit will be carried out once a year. The procedure mentions only quality and environmental management system but does not include safety management system. The process of internal audit has been defined in the internal audit procedure clearly. All internal auditors will be tested according to the organization criteria and their roles and responsibilities will be announced to ensure that they recognize their roles and responsibilities. According to the internal audit procedure (QS-WP-MR-002), the quality management representative (QMR) and environmental management representative (EMR) will establish internal audit plan for all processes, activities, products and services. The audit agenda will be defined and submitted to the auditees before the internal audit takes place. The audit will be conducted according to the audit plan and agenda. The auditor will prepare the audit report and non-conformity report and submit to the QMR and EMR for approval. All non-conformities will be distributed to relevant departments to identify the root causes and establish the corrective actions to address such non-conformities. The responsible persons need to submit the non-conformity report with the corrective actions to the QMR and EMR. A quote from the environmental management representative is shown as follows:

“The internal audit has been conducted for quality management system and environmental management system but the safety management system is not included. The topics related to safety are safety legislation, emergency preparedness and response only. The root causes of all major non-conformities must be identified within 7 days, while the root causes of all minor non-conformities must be identified within 21 days. I will review the effectiveness of the corrective actions before the NC closing is done completely to ensure that all root causes have been addressed”.

The organization has a formal internal audit process that covers all activities by following the internal audit procedure. However, to ensure that the safety

management system will be monitored the audit program for safety management system should be added to the existing internal audit plan.

7.2.3.2 Accident investigation

The enterprise established the accident investigation process and created an accident investigation procedure with the accident investigation form. The accident types can be grouped into 4 types:

- 1) Work-related accident,
- 2) Off the job accident,
- 3) Property damage, and
- 4) Near-miss.

All accident cases must be investigated within 24 hours. In 2018, the organization had only first aid case accident. In case of accident, the area supervisor must report to their manager and safety officer immediately, including providing the initial accident report to the safety supervisor by using accident investigation form. The accident analysis must be carried out by at least 2 investigation members (safety officer and supervisor of the area that accident has taken place). The accident report will be submitted to the manager of the area where the accident has taken place and other recommendation may be added if necessary. Next, the report will be submitted to the top management for review and making additional recommendations. All actions mentioned in the accident investigation must be done completely. Finally, the safety officer and the area supervisor will evaluate all actions to ensure that the root causes of an accident are eliminated. For implementing this requirement, the safety officer explained that:

“All accident cases will be reported and followed up in the safety committee meeting. Normally, I will report the accident case to the chairman of the safety committee. If the top management finds any problem in addressing the accident root causes, the top management will assist to solve the problem that obstruct the achievement of root cause elimination. The area supervisor of accident case will be responsible for addressing the root causes of accident case. And I will check the effectiveness of the corrective action to ensure that the accident will not occur again.”

The organization has a systematic process to conduct the accident investigation by the investigation team. The team members will find the root causes

and try to eliminate such root causes that is very important to improve the management system. The comprehensive accident investigation process has been established by written procedure. And everyone has been educated according to the written procedure to ensure that the accident case will be handled properly.

7.2.4 Action for Continual Improvement

To address the nonconformity with safety, occupational health and environmental management system for SMEs, the corrective action procedure has been revised by integrating with the quality management system and environmental management system. However, only safety legislation has been added to the nonconformity procedure. Management review meeting has been carried out to review the output of the management system to ensure the continual improvement.

7.2.4.1 Corrective action

The nonconformity may be generated from many sources as follows:

- 1) Internal audit,
- 2) Certification body audit,
- 3) Nonconformity from evaluation of legal compliance,
- 4) Nonconformity of the department objectives, and
- 5) Nonconformity during implementation process.

The corrective action request will be initiated from the auditor or the management representative and distributed to relevant departments. The relevant supervisors or managers need to investigate such nonconformity to find the root causes. The nonconformity report must be submitted to the management representative within 7 days for the major nonconformity and within 21 days for the minor nonconformity. And the nonconformity must be addressed according to the corrective action plan. The corrective actions must be addressed within a specific time frame and the responsible person must be assigned for each action. Finally, the nonconformity will be monitored by the auditor or the initiator of each nonconformity. A quote from management representative is shown below:

“The existing corrective and preventive action procedure has been established by integrating the quality, environmental management system. But regarding the safety management system, only the safety legislation, safety procedure

and the emergency preparedness and response plan have been added to the corrective and preventive action procedure according to the internal audit procedure. All nonconformities from all sources will be reviewed by me and I will distribute the nonconformities to the related departments. All nonconformities will be addressed to eliminate the root causes. And finally, the auditor who raised the nonconformity will follow up the corrective actions and close the nonconformity if they find that the measures can solve the problem effectively.”

The improvement of corrective action process should be done by adding all requirements of the safety management system to the internal audit program, so the organization can ensure that all quality, safety and environmental management system will be monitored periodically.

7.2.4.2 Management review

Management review procedure (Document number: QS-WP-MR-003 Revision 05) has been established to explain the process of management review for both quality management system and environmental management system. The report of the management review contains the problems of the quality and environmental management system implementation. The management review meeting will be conducted once a year. The quality management representative and environmental management representative have a responsibility to prepare the inputs for the management review. The inputs have been prepared as follows:

- 1) The status of actions from previous management reviews
- 2) Quality and environmental performance of the organization
 - (1) Customer satisfaction
 - (2) Needs and expectations of the interested parties
 - (3) Key environmental performance indicators
 - (4) Nonconformities and corrective actions
 - (5) Monitoring and measurement
 - (6) Outsourcing performance
- 3) Adequacy of resources for maintaining an effective quality and environmental management system

- (1) Changing circumstance that affects the quality and environmental management system, including legal and other requirements related to environmental and safety management system
- (2) Cases of poor quality
- (3) Quality and environmental complaints
- (4) Quality and environmental policy, the quality and environmental objectives have been met
- (5) Risks and opportunities
- (6) Recommendations for improvement

The president will review all inputs and assign the responsible person to address the problem if the results show that action is needed for the management system improvement. And finally, the minutes of meeting will be recorded and retained for 2 years.

Regarding the inputs of the management review, safety performance is still not included in the existing management review procedure, only one topic related to safety legal and other requirements has been reviewed. However, the organization plans to add the safety topic to the agenda in the future to ensure that safety performance will be reviewed and improved. The environmental management representative explained that:

“The management review meeting will be carried out once a year for quality and environmental performance review. The safety performance is not added in the agenda, only the compliance of safety legal and other requirements has been reviewed. The quality management representative and me will take a role of presenter to update the performance within 1 year to the top management and management team. The output of the management review meeting will be recorded and distributed to all relevant departments with the assignment of the top management to improve the quality and environmental management system. I plan to integrate the input of safety performance to the management review meeting next year”.

According to the agenda of management review meeting, the occupational health and safety hazards and the safety performance were not reviewed. The only one topic that has been reviewed is the safety legal and other requirements. The organization should include the safety performance to the management review

agenda to ensure that the safety management system will be improved according to the PDCA cycle.

7.3 Evaluating the Implementation of Integrated Safety, Occupational Health and Environmental Management System for Smes by Using the Balanced Scorecard

To ensure the suitability of the integrated environmental, occupational health and safety management system, the balanced scorecard has been used to evaluate the effectiveness of the implementation in four dimensions that consist of effectiveness perspective, stakeholder perspective, internal process perspective and organization learning, and growth perspective. The management system audit has been carried out during the consultancy period and the data are used to evaluate the fit of such a management system to SMEs.

7.3.1 Effectiveness Perspective

The criteria for the effectiveness perspective is the achievement of environmental, occupational health and safety objectives. The management system audit has been carried out during the consultancy period and the results show that:

7.3.1.1 Environmental, occupational health and safety management system for SMEs implementation

The result of the management system implementation shows that the organization can implement most elements of safety, occupational health and environmental management system for SMEs except the internal audit and management review requirements.

The organization plans to integrate the safety requirements in the next internal audit program in 2019, as well as including the safety performance in the next management review meeting. The organization can conduct a self-assessment to understand the internal and external issues which affect the business operation and integrated occupational health and environmental management system properly. The safety, occupational health and environmental policy has been established and

communicated to all related employees including other interested parties such as the contractors and visitors. All activities related to the business operation have been defined to identify the hazards and the environmental aspects. The organization can define all hazards and environmental aspects clearly. The hazards and environmental aspects are the upstream of the objective and mitigation plan that consequences related to many objectives in term of safety and environment have been established. A quote from management representative is shown below:

“Safety, occupational health and environmental management system for SMEs provide the core requirements that are easily implemented in our organization, especially hazard identification and risk assessment that our organization never identified it before. The hazard identification and risk assessment assist our organization to realize that many hazards are still hidden in our organization and we need to eliminate them immediately. Many objectives related to the hazards and environmental aspects have been defined and implemented with the target to improve the safety and environmental performance. However, our organization still have not completely implemented all requirements of the occupational health, safety and environmental management system for SMEs, especially internal audit and management review of the safety management system is still missing. To fill this gap, I plan to implement internal audit and management review for safety management system in the internal audit plan next year.”

The representative of the employees has been interviewed to get their points of view to the effectiveness of the management system. The production operator explained that:

“Although, our company is a small-sized organization, I realize that our management team tries to improve the safety and environmental performance. The management team assigns the safety manager and safety officer to provide the safety and environmental training for us, and the safety team tries to encourage all employees to participate in safety and environmental management. In my opinion, I am satisfied with the way to make the workplace safe and take care of our environment that our organization is trying to do.”

The safety officer has been interviewed to obtain his opinion in safety and environmental management system performance after implementing the

environmental, occupational health and safety management system for SMEs. The safety officer explained that:

“Previously, our organization did not implement the safety management system as a PDCA cycle. The minimum requirement is the safety legislation that we think it is enough for our organization to manage safety and make our workplace safe. After we have implemented the integrated environmental, occupational health and safety management system in our organization, I found that many things need to be improved, especially hazard identification and risk assessment process that is the key point to ensure that all hazards will be identified and addressed properly. For environmental management system, we have implemented ISO 14001:2015. However, we consider reviewing our context of the organization and our interested parties to ensure that all internal and external issues have been considered; all interested parties have been listed and their needs and expectations have been identified; as well as the safety and environmental issues have been addressed.”

The conclusion can be explained that the organization has a good practice for implementing an environmental management system, while safety management system must be improved by integrating other safety requirements of the management system for SMEs into the existing environmental management system. Additionally, internal audit for safety management system must be incorporated into the existing audit program, and the safety performance must be included in the inputs of the management review meeting.

During the consultancy program, the missing activities of sub-contractors and visitors have been added to the activity list of the organization. All hazard identification and risk assessment has been reviewed by the author, and finally, the organization can provide complete hazard identification and risk assessment record. Additionally, the list of interested parties has been reviewed to ensure that the list extended for the safety management system. The safety and environmental objectives have been established to ensure the achievement of the safety and environmental policy. However, the organization is still facing the budget constraint for safety and environmental improvement that causes a negative consequence to the progression of the actions. The organization should provide the essential yearly budget to maintain and improve the integrated environmental, occupational health and safety management

system. Moreover, the training program on environment and safety should be provided specifically for relevant employees who affect the environmental and safety performance of the organization.

7.3.1.2 The achievement of environmental, occupational health and safety objectives

From the author observation during the implementation period, safety and environmental management plans have been established as follows:

- 1) Preventing accident from mold cleaning,
- 2) Preventing chemical exposure in product cleaning,
- 3) Improving spring material lifting,
- 4) Improving the workplace to fulfill safety legislation.
- 5) Energy-saving program

The result of each program can be explained as follows.

1) Preventing accident from mold cleaning has been done completely.

This program aims to elevate the safety awareness of technicians who clean the mold by using the oil and chemical. Work instruction of mold cleaning has been established and communicated to all technicians who perform this work. The behavior monitoring is being implemented by the supervisor to ensure that the technicians work in compliance with the established work instruction.

2) Preventing chemical exposure in product cleaning

This program aims to change the behavior of the related employees by encouraging them to wear half mask to prevent inhalation of the chemical vapor. All actions have been done completely by providing the half mask for the operators who work in the cleaning room, and conducting the training course on how to use the half mask properly. The monitoring program has been done periodically by the area supervisor to ensure that the operators are aware of the hazard of chemical vapor.

3) Improving spring material lifting program

The lifting improvement project has been established to mitigate the health risk by negotiating with the supplier to reduce the weight of material per

pack. The action is being implemented. Another action is the training course provided for the operators in safe lifting. All actions in the lifting improvement project are planned to complete in March 2019.

4) Improving the workplace to fulfill the safety legislation

Regarding this program, 7 programs have been established to improve the workplace safety. Unfortunately, all programs need a high budget for the improvement, so all programs have been postponed to 2019.

5) Energy saving program

The program aims to reduce the electricity consumption of the lighting system in all offices and production areas. LED bulbs have been installed to replace the old bulbs that use high energy. The energy conservation awareness training is another action that the organization tries to change the employees' mindsets so that they will be aware of the benefits of energy conservation.

The result shows that three of five environmental, occupational health and safety objectives have been done completely, and most of the objective is the safety objective that is the consequence resulting from hazard identification and risk assessment, and the non-compliance of the safety legislation. The organization needs to address the potential hazards and all non-compliance topics related to the safety legislation. However, the organization still cannot achieve the objectives related to non-compliance to safety legislation due to the financial constraint. The essential budget should be provided to ensure the continual improvement of the management system.

7.3.1.3 Obstacles to implementing environmental, occupational health and safety management system for SMEs

The outcome of environmental, occupational health and safety management system implementation for SMEs in the case study 3 enterprise is acceptable. However, the organization lacks the budget for safety and environment improvement, so the budget should be provided annually to maintain the management system implementation. The participation of all employees is demonstrated as a low level. Most operators still cannot identify what are the hazards and environmental aspects in their area without the assistance of the safety officer. The last obstacle is the organization has a few internal auditors which affect the effectiveness of the internal

audit. To emphasize the obstacles of the management system implementing, the safety manager explained that:

“Due to the size of our organization, the safety and environmental budget is not provided annually, but the budget must be proposed to the top management for approval case by case. Indeed, it is quite difficult to get approval if the budget is too high, so I think the budget should be provided annually as planned with the safety and environment project. Another issue is the participation of our employees is quite low and we need to encourage them to be involved in the management system implementation such as hazard identification, aspect identification, etc. Finally, I think the organization should support by assigning more internal auditors to ensure that the internal audit program will be carried out effectively.”

7.3.2 Stakeholder Perspective

To ensure that the environmental, occupational health and safety management system for SMEs is suitable to implement in the organization, the participation of all employees is very important. Moreover, the satisfaction of the management system implementation is another issue that related to the sustainability of such a management system. The participation and satisfaction of interested parties has been defined with the following details.

7.3.2.1 Employee participation

The interview with employees and the observation have been conducted during the consultancy program at the site. The author found that during the implementation program, the employees have been involved in the management system implementation via many activities such as hazard identification, although most employees are not familiar with the hazard identification and need assistance from the safety officer. Moreover, the employees also have made some suggestions about hazard elimination and hazard mitigation. In terms of participation in the environmental management system, the organization has implemented the waste segregation project and the author observed that the employees participated in classifying the recycle waste and general waste. Additionally, the energy-saving program can make the employees aware of the importance of electricity conservation. They switch off the lighting every

time when they leave their office or workstation. A quote from the environmental management representative is shown below:

“Regarding the first step of the safety management system implementation of our organization, I am satisfied with the results of the implementation. Although the participation of our employees is still low, I hope that in the future this problem will be fixed by the requirement of the management system. The participation program should be provided to our employees to make them feel that the management system is very important for their works and it is not separated from the normal works. Moreover, the communication process should also be improved to ensure that all information that we need to communicate with all of them are acknowledged and responded effectively”.

The safety officer who drives the participation of the employees explained that:

“I try to encourage them to participate in hazard identification, risk assessment, as well as aspect identification. During the hazard and aspect identification, I will ask them what is the problem in term of safety and environment that they are facing and what is the consequence of such a problem. Moreover, what measures that they think about to solve the safety and environment’s problem they are facing. The accident investigation is another requirement that our employees can work well in term of the accident report and accident investigation involvement, as well as follow-up actions for eliminating the root causes of accidents in the safety committee meeting conducted monthly.”

Moreover, the quote from production supervisor indicates that:

“Safety and environment is not only the organization’s responsibility, everyone in the organization should participate in the management system implementing, especially how to prevent the hazards and environmental problem in our workplace. I try to remind my subordinates to follow the safety and environmental instruction and make them understand better the importance of safety and environment management system”.

7.3.2.2 The interested party satisfaction

An interview has been conducted to measure the satisfaction of the management representative, the safety officer and the industrial estate officer of Amatanakorn industrial estate, Chonburi.

The management system representative appreciates with the environmental, occupational health and safety and explained that:

“I feel satisfied with the result of environmental, occupational health and safety management system implementation for SMEs here. Although we got the certified ISO 14001:2015, the management system’s model for SMEs can strengthen our safety practice, especially hazard identification and risk assessment. We can identify all hazards related to the activities, services and products including the activities of the interested parties such as subcontractors, visitors, etc. Additionally, the context of the organization and all needs and expectations of all interested parties have been reviewed to ensure that they comply with safety and environmental management system”.

The safety officer feels that the designed management system can assist the organization that adopts it to improve the environment and safety performance, especially to prevent an accident and environmental impact. A quote is shown below:

“In my opinion, the integrated environmental, occupational health and safety management system for SMEs is simple and take less effort to implementing it. The implementation manual including the template make us feel comfortable and realize that the management system is not bureaucratic, and only essential documents are required in the management system. These advantages are suitable for the characteristic of the SMEs”.

The industrial estate officer of the Amatanakorn industrial estate has been interviewed to ask about his satisfaction of the safety and environmental management system, the officer explained that:

“The enterprise operates the business without any complaint from neighbors. The organization can implement its management system in term of safety and environment properly. The responsible person can submit the safety and environmental report to the authority officer on time. And this organization always joins the activities that the industrial estate promote.”

The conclusion of the satisfaction can be summarized that the implementation team is satisfied with the management system, because they feel that such management system is simple, create less document, and easy to implement with the implementation manual that can follow easily. Other interested parties such as the authority officer feels that the organization can operate in compliance with the local safety and environmental legislation, and the organization can submit all the required report to the authority officer on time. The officer does not have any complaint about this organization.

7.3.3 Internal Process Perspective

The internal process is one perspective that needs to be evaluated to ensure that the designed management system suits the SMEs. The achievement of action plan implementation, quantity of the implementation team, budget, monitoring and evaluation process have been evaluated as follows.

7.3.3.1 The achievement of action plan implementation

The implementation plan for environmental, occupational health and safety management system has been set for 5 months period with the consultancy by the author. The result shows that the organization can implement most activities as planned, except the workplace improvement project to fulfil the safety legislation. The organization needs to ask for the budget from the top management and this causes the delay of the implementation plan. For internal audit and management review, the organization plans to integrate the safety audit program into the existing internal audit program, as well as adding the input of safety for management review in 2019. A quote from the management representative is shown as:

“I think we have achieved our goal in complying with environmental, occupational health and safety management system for SMEs, especially the hazard identification, aspect identification and risk assessment that can reflect our problems in term of safety and environment. However, some requirements still have not been implemented, but we plan to implement them next year”.

7.3.3.2 The implementation committee

The implementation team has been established and announced to ensure that everyone will understand their roles and responsibilities. The key persons who

implement the management system are the safety manager and the safety supervisor with the support of the candidates of all departments. According to the observation during the 5 months implementation program, the author found that the safety manager and the safety officer have a good knowledge in safety and environmental management, while another team member needs the advisory that affects the participation of the management system implementing. The training program is needed for the other implementation committee, including all employees to make them understand their roles and responsibilities in safety and environmental management system.

7.3.3.3 Budget

The budget is the main obstacle for the integrated system implementation of the organization, regarding the workplace improvement project to comply with the safety and environmental legislation. Due to lack of budget, the implementation team cannot improve the workplace as planned and needs to propose this budget for next year. Indeed, the existing factory is the rented factory that is the key factor for the management to consider if they would benefit from investing in the rented factory. SMEs will be designed in consideration of the limitation of resources, but the budget for safety and environmental improvement project is still needed. The safety manager explained that:

“The budget is needed for the integrated environmental, occupational health and safety management system for SMEs, although the management system is designed in a simple way. I hope that in the future the budget for safety and environmental improvement will be considered annually to ensure that we can maintain such management system.”

The essential budget can drive the continual improvement of environmental, occupational health and safety management system in the organization. Additionally, safety and environmental budget can reflect the commitment of top management in term of safety and environment.

7.3.3.4 Monitoring and Evaluation

The monitoring and evaluation have been carried out at the last stage of the implementation plan by the internal audit and management review. The internal audit has been conducted by internal auditors that were trained, and the audit plan has covered all activities of the organization. However, the internal audit plan does not

include the safety management system in the last internal audit program. The nonconformities will be summarized by the document controller under the review of the management representative. The corrective action request forms will be sent to the non-compliance department and they need to respond them within the defined date. The root causes of major nonconformities must be identified within 7 days. The management review was not conducted during the consultation period because the organization had done it before the consultancy program started. The organization does not need to create any new procedure for management review. The existing process of management review can be used by adding the input of safety management system for top management review. The management representative explained that:

“The safety requirement will be added in the next management review meeting to reflect the performance of the existing safety management system. I plan to edit the existing management review procedure and include the essential input of the integrated environmental, occupational health and safety management system for SMEs to the meeting agenda. Regarding the management review process, I am quite sure that the continual improvement will take place in our organization with the decision of our top management to improve the existing management system”.

The organization can establish the monitoring and evaluation process to monitor the compliance with environmental management system for SMEs, but still does not meet the requirement of safety management system. The monitoring and evaluation must be done as planned to ensure that the management system will be maintained and improved to ensure the continual improvement.

7.3.4 Organization Learning and Growth

The environmental, occupational health and safety management system can improve the safety and environmental knowledge of the employees, especially the safety officers who drive safety and environmental management system of the organization. The safety officers can understand better the hazard identification and risk assessment method, as well as the measure to eliminate the high hazards and how to mitigate the environmental impacts. Additionally, the context of the organization and needs and expectations of the interested parties have been reviewed by including the external and internal issues related to safety performance, as well as the safety needs

and expectations with the existing data. The list of safety and environmental legislation is the key improvement of the organization. During the implementation period, the applicable safety and environmental legislation has been included in the existing legislation list. The good practice of machine guarding has been shared with the implementation team to ensure that the improvement project of machine guarding will be carried out properly and comply with the safety standard. A quote from a safety manager is shown below:

“The outcome from this project can help me to identify all applicable safety and environmental legislation relevant to our business and complete the context of the organization, as well as the needs and expectations of all interested parties. Moreover, the consultation during the implementation period can help me to improve my understanding on safety and environmental management system for SMEs, especially, the method of hazard identification, risk assessment and the measures to manage with the significant risks”.

In this perspective, the organization can improve the employees’ knowledge in term of safety and environment, especially, the safety and environmental legislation, the hazard identification and risk assessment. Additionally, the organization can improve the machine guarding for the pressing machine to ensure that the guarding will protect the employees from hazards during the machine’s operation.

The implementation evaluation by the balanced scorecard is shown in Table 7.1.

Table 7.1 The Score of the Balanced Scorecard from the Implementation Results of Case Study 3 Enterprise by the Author

Perspective	Result	Score
1. Effectiveness perspective		
1.1 Safety, occupational health and environmental management system implementation	Most of the requirements of the integrated management system have been implemented completely except the internal audit and the management review	2

Table 7.1 (Continued)

Perspective	Result	Score
1.2 The achievement of safety, occupational health and environmental objectives	Three of the five objectives had been achieved, but two objectives had been postponed	2
2. Stakeholder perspective		
2.1 Employee participation	50% of the target employees attend the training workshop on implementation of the management system	2
2.2 Interested party satisfaction	All interested parties satisfy the integrated management system	3
3. Internal process perspective		
3.1 The achievement of action plan implementation	<ul style="list-style-type: none"> - Internal audit and management review were implemented behind the schedule - Two objectives delayed according to the budget constraint (60%) 	2
3.2 Working team has been assigned	- The implementation team has been assigned from the candidates of all departments	1
3.3 Budget	- The enterprise faces with the budget constraint	1
3.4 Monitoring and Evaluation	- The internal audit program and the management review meeting have been carried out, but not included the safety management system	1
4. Organization learning and growth		
4.1 The process to enhance safety and environmental performance has been developed	<ul style="list-style-type: none"> - Safety and environmental knowledge of the employees had been improved - The applicable safety and environmental legislation had been reviewed and added to the list of the safety, occupational health and environmental legislation and other requirements - The context of the organization and the need and expectation of the interested parties had been reviewed and updated - The good practice of machine guarding installation had been applied to the press machine 	2
Total Score		16

Source: Thepporn Jaroenroy, 2018.

The implementation score of case study 3 enterprise is 16 points (72.7%) that meet the target score, so the integrated safety, occupational health, and environmental management for SMEs implementation results are acceptable. The limitation affects the results of the management system implementation is a safety, and environmental budget that consequence the delay of the achievement of safety, occupational health and environmental objectives. Once the problem of safety and environmental budget is addressed, the enterprise could implement the integrated safety, occupational health, and environmental management system successfully.

Additionally, the assessment of the integrated safety, occupational health, and environmental management system for SMEs has been carried out by the Management representative that is shown in Table 7.2.

Table 7.2 The Score of the Balanced Scorecard from the Implementation Results of Case Study 3 Enterprise by the Management Representative

Perspective	Result	Score
1. Effectiveness perspective		
1.1 Safety, occupational health and environmental management system implementation	Most of the requirements of the integrated management system have been implemented completely except the internal audit and the management review	2
1.2 The achievement of safety, occupational health and environmental objectives	Three of the five objectives had been achieved, but two objectives had been postponed	2
2. Stakeholder perspective		
2.1 Employee participation	50% of the target employees attend the training workshop on the implementation of the management system	2
2.2 Interested party satisfaction	All interested parties satisfy the integrated management system	3
3. Internal process perspective		
3.1 The achievement of action plan implementation	- Internal audit and management review were implemented behind the schedule - Two objectives delayed according to the budget constraint (60%)	2
3.2 Working team has been assigned	The implementation team has been assigned from the candidates of all departments	1
3.3 Budget	The enterprise faces with the budget constraint	1

Table 7.2 (Continued)

Perspective	Result	Score
3.4 Monitoring and Evaluation	The internal audit program and the management review meeting have been carried out, but not included the safety management system	1
4. Organization learning and growth		
4.1 The process to enhance safety and environmental performance has been developed	<ul style="list-style-type: none"> - Safety and environmental knowledge of the employees had been improved - The applicable safety and environmental legislation had been reviewed and added to the list of the safety, occupational health and environmental legislation and other requirements - The context of the organization and the need and expectation of the interested parties had been reviewed and updated - The good practice of machine guarding installation had been applied to the press machine 	2
Total Score		16

Source: Thepporn Jaroenroy, 2018.

The result shows that the scores of the integrated safety, occupational health, and environmental management system implementation in SMEs using the modified balanced scorecard are equivalent between the evaluation of the author and the management representative. The score can demonstrate the effectiveness of the designed management system according to the views of the author and the management representative of the enterprise. However, the safety and environmental budget is needed to fulfill the defined objectives of the enterprise.

CHAPTER 8

CONCLUSION AND RECOMMENDATIONS

8.1 Summary and Conclusion

As mentioned in chapter 1, the objectives of the study were undertaken to accomplish 4 objectives:

1) To identify the occupational health risks, environmental aspects, motivators, and barriers to adopting the integrated safety, occupational health and environmental management system in small and medium enterprises of metal product manufacturer in Thailand.

2) To identify the factors related to the adoption of the integrated safety, occupational health and environmental management system by SMEs.

3) To design Integrated safety, occupational health and environmental management system from the integration of ISO 14001: 2015, OHSAS 18001: 2007 and ISO 45001: 2018 for small and medium-sized enterprises of metal product manufacturer in Thailand.

4) To trial an integrated safety, occupational health and environmental management system in pilot SMEs and evaluate the implementing results.

This research was undertaken in two main parts; the quantitative and the qualitative part, to study the occupational health risks, environmental aspect, the motivators and barriers to adopting integrated safety, occupational health and environmental management system in SMEs, while the qualitative part study the point of view of the environmental, occupational health and safety expert to design

integrated safety, occupational health, and environmental management system for small and medium-sized enterprises of metal product manufacturer in Thailand. According to quantitative research, the questionnaires were returned from 88 SMEs, 9.9 percent of the total of 887 sets that were distributed. The data were screened to ascertain that they were valid for further analysis. While 14 experts had been interviewed to provide the point of view of professionals who work in the field with the question “What is the appropriate integrated safety, occupational health and environmental management system’s model for the small and medium-sized enterprise of metal product manufacturer in Thailand?”. The research results, with respect to the objectives of this study, are summarized as follows.

8.1.1 The Occupational Health Risks, Environmental Aspects, Motivators, and Barriers to Adopting the Integrated Environmental, Occupational Health and Safety Management System in Small and Medium Enterprises of Metal Product Manufacturer in Thailand.

With regard to the second objective, it was revealed that the main of a safety problem in SMEs is an unsafe machine, physical hazard and chemical hazard that represent 70.5 percent, 51 percent, and 44.3 percent respectively. Additionally, the environmental aspect is waste, noise, and wastewater that represent 67 percent, 47.7 percent, and 33 percent respectively.

The barrier of SMEs to implement the safety, occupational health and environmental management system can be defined as follows:

- 1) Lack of experts to implement safety, occupational health and environmental management system in the organization,
- 2) The limitation to access the technology related to health, safety, and environment,
- 3) Lack of financial resource,
- 4) Lack of information related to safety, occupational health and environmental management system,
- 5) Limitation of time,
- 6) No specific management system for SMEs,

7) SMEs cannot create the documents to comply with the international management system such as ISO 14001 and ISO 45001,

8) The existing safety, occupational health, and environmental management system is difficult to adoption in SMEs.

On the other hand, the motivator to encourage SMEs to implement the safety, occupational health and environmental management system is defined as follows:

1) The flat organization that easy to implement the management system,

2) The communication among all employees is good and can be done quickly,

3) The decision making can be done by the owner-manager without any stakeholder,

4) The good relationship among employer, employee and colleague can enhance the management system implementation, and finally

5) The informal characteristic of SMEs influences the informal control and documentation in their organizations.

8.1.2 The Factors Related to The Adoption of The Integrated Safety, Occupational Health and Environmental Management System by SMEs

With regard to the third objective, it was revealed that the only one factor that relates to the interesting of the integrated safety, occupational health, and environmental management system implementing is Safety, Health, and Environment (SHE) policy, while other factors are not significant. Regarding the objective of the study, 12 hypotheses were tested as shown in Table 8.1.

Table 8.1 Summary of Factors that Related to Adoption of the Integrated Safety, Occupational Health, and Environmental Management System by SMEs

Hypothesis	Results
H ₁ : Business size has a relationship with the interesting of the management system adoption	Not significant
H ₂ : SHE policy has a relationship with the interesting of the management system adoption	Significant
H ₃ : Safety problem – machine hazard has a relationship with the interesting of the management system adoption	Not significant
H ₄ : Safety problem – biological hazard has a relationship with the interesting of the management system adoption	Not significant
H ₅ : Safety problem – physical hazard has a relationship with the interesting of the management system adoption	Not significant
H ₆ : Safety problem – ergonomics hazard has a relationship with the interesting of the management system adoption	Not significant
H ₇ : Safety problem – chemical hazard has a relationship with the interesting of the management system adoption	Not significant
H ₈ : Safety problem – stress hazard has a relationship with the interesting of the management system adoption	Not significant
H ₉ : Environmental problem – waste has a relationship with the interesting of the management system adoption	Not significant
H ₁₀ : Environmental problem – wastewater has a relationship with the interesting of the management system adoption	Not significant
H ₁₁ : Environmental problem – noise has a relationship with the interesting of the management system adoption	Not significant
H ₁₂ : Environmental problem – air emission has a relationship with the interesting of the management system adoption	Not significant

Source: Thepporn Jaroenroy, 2018.

8.1.3 Integrated Safety, Occupational Health and Environmental Management System

With regard to the third and fourth objectives, and to answer the research question, a conceptual framework was constructed on a literature review and the point of view of all experts through the expert interview and the focus group discussion. Subsequently, the designed integrated safety, occupational health, and environmental management system implementing was carried out to find out the fit of such a management system with the metal product manufacturer SMEs in practice. Additionally, the balanced scorecard had been used to evaluating the effectiveness of the designed integrated safety, occupational health and environmental management system for SMEs.

The study revealed that the concept of the Plan-Do-Check-Act (PDCA) cycle is strongly recommended for developing the Integrated Safety, Occupational Health and Environmental management system for SMEs considering the simplicity and less effort to implement. Moreover, the limitations of SMEs in terms of human resources, budget and time were considered in developing the management system as well.

The designed integrated safety, occupational health and environmental management system that was created from ISO 45001:2018, ISO 14001:2015 and OHSAS 18001:2007 will be effective, although OHSAS 18001:2007 will be obsolete and replaced by ISO 45001:2018. The designed management system was developed considering the PDCA cycle and followed the concept of high-level structure of the existing international standard.

The designed integrated safety, occupational health, and environmental management system is developed to minimize the complexity of ISO 45001:2018, ISO 14001:2015, OHSAS 18001:2007 with the simplest way and take less effort to implement in SME sites. Additionally, the integrated safety, occupational health, and environmental management system for SMEs is developed considering the characteristics of SMEs. The effectiveness of the designed management system has been proved by 3 SMEs that have implemented such a management system in their sites.

The self-assessment should be carried out first to define the internal and external issues which affect the business operation and the environment, occupational health

and safety performance of the organization. Furthermore, the organization shall identify all interested parties that affect or may affect to the Safety, Occupational Health and Environmental management system of the organization and identify what is the needs and expectations of these interested parties. The information gathering from the self-assessment and the needs and expectation of the interested parties shall be used to define the safety and environmental policy as the planning and implementation phase including the significant risks and opportunities from the self-assessment process will be addressed as properly to ensure that the business can operate smoothly and the organization can maintain the expected safety, occupational health, and environmental performance. All occupational health risks and environmental aspects must be identified with the appropriate risk assessment method. All significant occupational health risks and environmental aspects must be addressed by establishing the safety, occupational health and environmental objective with the mitigation plan to eliminate or mitigate such risks and environmental aspects.

The organization shall realize that what is the legal and other requirements in term of safety, occupational health and environment that applicable for their organization, the process to implement the applicable legal and other requirements shall be defined. The legal and other requirements compliance audit shall be done to ensure that the organization can operate their business complies with the applicable legal and other requirements. The training requirement is the support requirement that can strengthen the knowledge and awareness of all employees to realize the safety, occupational health and environmental policy, the hazards and environmental aspects including the way to manage those risks and environmental aspects. In addition, the employees must be trained the roles and responsibilities related to safety, occupational health, and environmental legal and other requirements. Additionally, The supported requirement that the organization needs to fulfill the management system is the document control requirement, all documents related to the management system implementation must be controlled to ensure that the documents have been approved prior use and all document are up to date and ready for accessing such documents.

The periodic internal audit is necessary for the organization to checking the compliance with the management system requirements, while the root causes of an accident that occurred in the organization must be investigated and corrected to prevent

the recurrence. Finally, the action for continual improvement of the integrated safety, occupational health and environmental management system for SMEs shall be established by the corrective action requirement, the organization must correct the mistake it makes whenever the nonconformity has been founded during the management system implementing. Furthermore, the last requirement of the action for continual improvement is the management review that should be carried out by the top management and make the decision that what is the issues that need to be improved to strengthen the existing management system.

In order to ensure the success of the integrated safety, occupational health and environmental management for metal product manufacturer SMEs, the key success from the point of view of all experts can be summarized as follows.

1) Resources: The essential resources should be provided by top management, especially the human resources that the top management must assign one employee who has the safety and environmental background to implement the integrated management system. The time for establishing and implementing shall be defined and allow the relevant employees to participate in the integrated management system implementing. Although, the designed integrated management system needs a fewer resource for implementation, however, the safety, occupational health, and environmental budget is still needed for the achievement of safety, occupational health and environmental objectives.

2) Method: SMEs need a simple and specific management system to improve their safety, occupational health and environmental performance with the concept of the PDCA cycle. The requirements should be trained to the assigned person who will implement the management system to ensure that they know how to implement the management system. The document in the management system must be generated as few as possible to prevent the workload for the employee who implementing. Finally, checking program like an internal audit should be conducted periodically to monitor the effectiveness of the management system implementation.

3) Employee participation and engagement: The participation and engagement of the employees is the key driver to guarantee the success of management system implementation. The benefits of the integrated management system should be communicated to all employees to remind them what is the benefits that they can obtain

individually if the organization implement the integrated safety, occupational health and environmental management system, they must realize that what is the benefits they can gain before they decide to participation and engagement will be taken place.

4) Monitoring: The monitoring program shall be carried out both internal and external audit to ensure the continual improvement of the integrated management system that finally the organization can improve their safety, occupational health and environmental performance to the sustainability. Figure 8.1 gives the design of integrated safety, occupational health and environmental management system to fit the characteristics of metal product manufacturer SMEs.

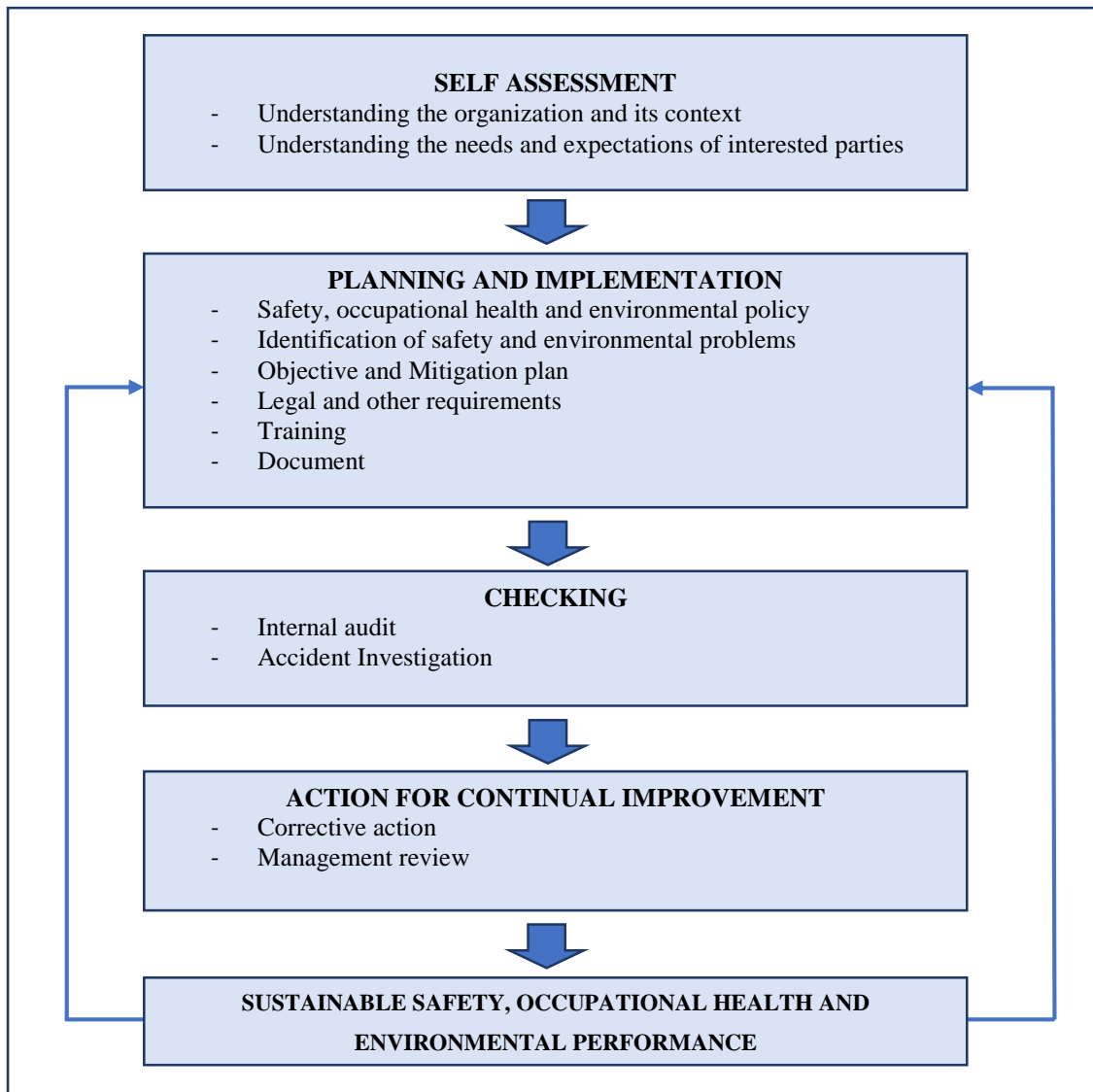


Figure 8.1 The Design Integrated Safety, Occupational Health and Environmental Management System for Metal Product Manufacturer SMEs.

Source: Thepporn Jaroenroy, 2018.

The balanced scorecard had been used to evaluate the success of the integrated safety, occupational health and environmental management system for metal product manufacturer SMEs in four perspectives that consist of 1) The effectiveness perspective, 2) The stakeholder perspective, 3) The internal process perspective, and 4) The organization learning and growth perspective. The implementation results of three voluntary SMEs can be summarized as follows;

8.1.4 The Results of Implementing Integrated Safety, Occupational Health and Environmental Management System's Model For Small And Medium Enterprise In The Pilot Enterprise: Case Study 1

The case study 1 enterprise is a Thai enterprise located in Chachoengsao province that produces the powertrain parts, interior parts, and chassis for an automobile. The organization applied to be a pilot enterprise to implement the integrated management system in their organization. Although the organization has implemented the ISO 14001 version 2004 for many years, however, the author found many opportunities to improve environmental performance during the initial review. The safety management system is the new requirement for the organization since it has never implemented the management system in term of safety and occupational health. The organization had been accepted to attend the voluntary implementation program with considering the limitation of the organization, especially the human resources and budget for safety and environmental improvement.

The evaluation results of the balanced scorecard can be concluded and discussed as follow:

8.1.4.1 The effectiveness perspective

The criteria of the effectiveness perspective are the achievement of integrated safety, occupational health and environmental objectives including all requirement of the integrated management system must be implemented. The results show that the organization can implement most of the designed requirements except the internal audit and the management review requirement. According to the short time of implementing in five months, the organization cannot integrate the safety management system requirement to the existing internal audit program, however, the integration plan had been done to include the safety requirement into the next internal audit plan. According to the establishment of safety, occupational health and environmental objectives that four objectives were created that consist of 1) Hearing conservation program, 2) Electrical hazard prevention program, 3) Lifting management program for warehouse, and 4) Wastewater improvement program, the organization can demonstrate the achievement of their safety, occupational health and environmental objectives with tangible evidence.

The organization faces the problem of financial resources that only small budget is provided for safety and environmental improvement project. The yearly safety and environmental budget has never been provided and the safety officer needs to propose the project for the budget approval for each project that may affect the progression of the action plan to the achievement of the objective.

8.1.4.2 The stakeholder perspective

The employee participation and the interested party satisfaction are the evaluation criteria for the stakeholder perspective. During the consultancy program at the site, the results show that the candidates from all department participate to implement integrated safety, occupational health and environmental management system via the training participation, hazard identification and risk assessment workshop, aspect identification, and the workshop to establish the safety and environmental objectives. The employee participation can enhance the safety and environmental knowledge of all employees through the training and workshops during the consultancy program. According to the interested party satisfaction, the results of satisfaction from the interview show that the implementation team, especially the safety and environmental officer appreciates the integrated safety, occupational health and environmental management system for SMEs since she feels that the management system is simple and not hard to understand as well as she believes that the management system implementation can prevent the accident and environmental impact of the organization. Moreover, the management representative appreciates the management system too with the simple and match the characteristics of SMEs. To emphasize the satisfaction of the interested party, the villager near the enterprise had been interviewed to obtain the satisfactory result and the villager confirms that the enterprises can operate the business without any safety and environmental issues for them.

The results from all interested parties show that the satisfaction of the integrated safety, occupational health and environmental management system is fulfilled their expectations, especially the accident and environmental impact prevention as well as the designed management system matches with the characteristics of SMEs.

8.1.4.3 Internal process perspective

To evaluate the internal process perspective, the achievement of action plan implementation, the sufficient of the implementation team, budget and monitoring and evaluation process had been evaluated after the end of the consultancy period. The results show that the enterprise can implement all requirements according to the implementation action plan, although the internal audit requirement is delayed, finally it was done completely. The implementation team has been assigned and announced with the clear roles and responsibilities by the top management, however, the top management should assign one safety and environmental officer to work full time at this site since the current safety and environmental officer must handle the safety and environment function for 2 sites. The monitoring and evaluation process had been carried out via the internal audit program and the management review. The nonconformity from the internal audit is the output of the monitoring and evaluation that verify the compliance of the implementation results versus the integrated management system requirements. Finally, the management review had been done in accordance with the requirements to review the effectiveness of the management system implementation with the decisions of the top management to improve and strengthen the existing integrated management system. All results show that the organization can fulfill the criteria of the internal process perspective.

8.1.4.4 The organization learning and growth

According to the training provided for the implementation team during the consultancy period by the author, the results show that the implementation team that consists of the candidates from all department gain more knowledge in term of safety, occupational health and environmental management system, especially, the knowledge of hazard identification, risk assessment and environmental aspect identification. Moreover, safety and environmental work instructions related to occupational health and risks including the environmental aspects were established to support the relevant employees that can help them to work safely and prevent the environmental problem.

The case study 1 enterprise has implemented the integrated safety, occupational health and environmental management system effectively, although the enterprise has the limitation in term of financial for safety and environmental improvement, the participation of all departments can support the success of the management system implementation.

The case study 1 enterprise should improve internal audit and management review process by integrating the safety requirements into the mentioned processes. The adequate budget for safety and environmental management should be provided annually to ensure the essential resources for implementing safety, occupational health and environmental management system for SMEs. Moreover, a designated person who will implement an integrated safety, occupational health and environmental management system should be assigned to each site to ensure the continual improvement.

8.1.5 The Results of Implementing Integrated Safety, Occupational Health and Environmental Management System's Model for Small and Medium Enterprise in the Pilot Enterprise: Case Study 2

The case study 2 enterprise is a Japanese enterprise that is located in Gateway City Industrial Estate, Chachoengsao province. The main product of the enterprise is copper alloy strips with a capacity of approximately 4,200 tons. The enterprise has been certified ISO 9001 version 2018 and ISO 14001 version 2015, however, the enterprise still interests to adopt the integrated safety, occupational health, and environmental management system for SMEs with the expectation to improve safety and environmental performance. Especially, the enterprise needs to identify the safety and occupational health risk as well as needs to find the simple way to identify the environmental aspect, so the author made the decision to implement the integrated management system with this organization although the enterprise had certified ISO 14001 version 2015. The evaluation results of the balanced scorecard can be concluded as follows.

8.1.5.1 The effectiveness perspective

According to the criteria that considering all requirements of the integrated safety, occupational health and environmental management system must be implemented, in addition, all safety and environmental objectives have been achieved. The results show that the enterprise can implement most of the safety, occupational health and environmental management system for SMEs except the internal audit and the management review requirements related to the safety management system. The enterprise plans to integrate the safety management requirements to the next internal

audit and next management review because those activities have been done prior to implementing the integrated safety, occupational health and environmental management system for SMEs only one month. The evaluation of the safety, occupational health and environmental objective achievement can be summarized that nine of all ten objectives had achieved the target while only one objective related to lockout and tagout the program is being implemented as plan. The output of the integrated management system is quite good, however, time limitation of the employee to attend the safety and environmental training is only one obstacle of the enterprise that may affect the knowledge in term of safety and environment of all employee in the future.

Finally, the results of the effectiveness perspective evaluation conclude that the enterprise can demonstrate the implementation most of the requirements while most of the safety, occupational health, and environmental objectives have been met that can improve the safety, occupational health and environmental performance of the enterprise. The motivator to drive the success of the management system implementation of the enterprise is the support of the top management that provides all essential resources for the implementation.

8.1.5.2 The stakeholder perspective

The result of the stakeholder perspective concluded that the employees have involved in the integrated safety, occupational health and environmental management system implementation via many activities such as hazard identification, risk assessment, energy saving and safety, environmental plans that were established to mitigate the safety and occupational health risks, and the environmental aspects. Additionally, the candidates from all department had been assigned to be the safety and environmental committee that they are the team to drive and improve the safety and environmental performance of the enterprise. The top management also has involved in the management system implementation by follow up the progression of the management system implementation plan that influences the output of the management system implementation very well. The satisfaction of the interested parties that consist of the management representative, the safety supervisor and the industrial estate officer that results can explain that all interested parties satisfy the output of the integrated management system implementation that can robust the safety practices of the

enterprise especially the enterprise can list all applicable safety legislation that relates to the operation of the business, while the industrial estate officer satisfies the performance of the enterprise in the compliance with safety and environmental legislation, the consistency of the safety and environmental report submission that reflects the commitment of the top management to manage safety and environmental along with the business operation.

The integrated safety, occupational and environmental management system has implemented and embedded in the enterprise with the good participation of all employees and can satisfy the needs and expectations in term of safety, occupational health and the environment of the interested parties.

8.1.5.3 Internal process perspective

The achievement of the action plan implementation, the quantity of the implementation team, the budget and monitoring and evaluation process were evaluated with the results as follows. The enterprise can achieve the action plan schedule that was established, however, the internal audit and the management review have been planned to include the safety requirements in the next round of the internal audit program and management review. The enterprise can urge the candidates from all department to be the member of the safety and environmental committee, all member have been trained to ensure that they realize their roles and responsibilities in safety and environmental management system as well as the essential safety and environmental knowledge. According to the annual safety and environmental plan, the enterprise has enough budget that can maintain and improve the safety, occupational health, and environmental management system. The essential budget for safety and environmental improvement has been planned annually that can enhance the enterprise to meet the continual improvement in accordance with the requirements.

The enterprise can achieve the internal process perspective of the balanced scorecard with the evidence from the achievement of the implementation plan, the essential safety, and environmental budget as well as the involvement of the implementation team from all departments.

8.1.5.4 Organization learning and growth perspective

The safety and environmental knowledge of the safety and environmental committee that consist of the member from all departments has been increased with the

training program that provided during the consultancy program, especially the hazard identification and risk assessment method as well as the simple way to identify the environmental aspects. Moreover, the safety supervisor can learn more about the applicable safety legislation that relates to the activities of the enterprises, including the context of the organization and need and expectation of the interested parties have been reviewed with the new perspective by considering the safety view that allows the enterprise can identify all risks and opportunities and manage it properly. Additionally, the new work instruction of energy isolation has been created to prevent the accident from all energy during operation and maintenance.

The integrated safety, occupational health and environmental management system for SMEs can elevate the organization learning in term of safety and environmental knowledge of all employees, moreover, can establish the new work instruction relates to the safety and occupational health risks.

The enterprise has implemented the integrated safety, occupational health and environmental management system for SMEs effectively with the great support from the top management that the enterprise can implement the integrated safety, occupational health and environmental management system for SMEs comply with the implementation plan. The related employees have good participation, while the output of the implementation satisfied the needs and expectations of the interested parties. Finally, the integrated management system can enhance the enterprise to improve the organizational learning and growth with the safety and environmental knowledge improvement and establishment of a new safety work instruction. The enterprise should improve the processes that cannot be implemented according to the requirements of the safety, occupational health, and environmental management system for SMEs that consist of internal audit and management review. The enterprise should integrate safety requirements into the existing internal audit program and management review. Additionally, the enterprise should improve the safety and environmental training process to ensure that everyone in the organization will be trained without time constraint.

8.1.6 The Results of Implementing Integrated Safety, Occupational Health and Environmental Management System's Model for Small and Medium Enterprise in The Pilot Enterprise: Case Study 3

The case study 3 enterprise is a Japanese enterprise located at Amata Nakorn Industrial Estate, Chonburi province with a total manpower 59 employees. The main product of the enterprise is press machine metalworking, multi-forming machine metalworking, and spring with a capacity of approximately 16 million pieces per year. The enterprise has been certified ISO 9001 version 2018 and ISO 14001 version 2015, however the top management of the enterprise would like to improve the safety and environmental performance that why the enterprise applied to be a pilot plant to implement the integrated safety, occupational health and environmental management system for SMEs. After the initial review process at the enterprise area and discuss with the safety and human resources manager, the author found that the enterprise still need to improve the safety and environmental management system, especially the safety and occupational health risk management to prevent the accident with the challenging of the limitation of resources i.e. budget, implementation team. The evaluation results of the balanced scorecard can be concluded as follows.

8.1.6.1 The effectiveness perspective

The evaluation results of the effectiveness perspective can be concluded that the enterprise has implemented most of the requirements of the integrated safety, occupational health and environmental management system for SMEs exclude the internal audit and management review requirement that cannot perform completely. The enterprise needs to integrate the safety management system into the internal audit program and include the safety performance to the input of the management review meeting, however the two remaining requirements will be carried out in the next schedule plan. The achievement of safety, occupational health and environmental objectives have been evaluated by considering the achievement of five established objectives. The results show that three of five of objectives have been done completely as planned, while two objectives have been postponed due to the limitation of the budget, however, the enterprise needs to ensure that the objectives relate to non-compliance of safety legislation has been addressed according to the plan. The output of safety, occupational health and environmental management system for SMEs implementation is acceptable, however, the enterprise has a limitation of finance for safety and environmental improvement. The safety and environmental participation of the employees is demonstrated as a low level, most of the operators cannot identify

what is the hazards and environmental aspects in their area without the assistance of the safety officer. Moreover, the enterprise has a few internal auditors that affect the effectiveness of the internal audit results.

The evaluation results of the effectiveness perspective are moderate since the enterprise cannot implement all the requirements of the integrated safety, occupational health and environmental management system for SMEs, and some objectives cannot be implemented as planned. Moreover, the enterprise still faces with the limitation of the essential resources, especially, the budget for safety and environmental improvement and the low level of participation of the employees in the integrated management system implementation.

8.1.6.2 The stakeholder perspective

The employee participation of employees relates to safety and environment is quite low, although the enterprise tries to urge the employees to involve in the integrated management system implementation such as the hazard identification and risk assessment workshop, waste management program and energy saving program. Most of the employees feel that the safety and environmental management system are the responsibility of the top management and the safety and environment team without any support from them. The results of interested party satisfaction from the management representative, the safety officer and the industrial estate officer concluded that all interested parties appreciate the output and the design of the integrated safety, occupational health and environmental management system for SMEs. The management representative and the safety officer feel that the designed management system is simple, create few documents, and the implementation manual providing assist the team to implement such a management system easily. Furthermore, the industrial estate officer agrees that the enterprise can operate the business comply with the local safety and environmental legislation without any complaint from the neighborhood and other companies that are located nearby.

All interested parties agree that the integrated safety, occupational health and environmental management system output contribute the benefits to the enterprise in term of safety and environment.

8.1.6.3 Internal process perspective

The enterprise can implement most of the activities according to the action plan implementation, the integration of the safety management system to the existing internal audit program and the management review is not done completely, while the safety and environmental objectives related to the non-compliance of the safety and environmental legislation have been postponed due to the financial constraint that preventing the enterprise from addressing all issues relating to the legislation. The implementation team has been established from all departments and announced to acknowledge all implementation team to understand their roles and responsibilities on the management system implementation. The budget is the main barrier of the enterprise to fulfill the achievement of the safety and environmental objectives as planned that the enterprise needs to provide the essential budget to support an ensure the achievement of the established objectives. The enterprise achieves to establish the monitoring and evaluation process to monitor the compliance with the environmental management system, but still not meet the requirement of the safety management system.

The enterprise partially achieved the internal process perspective, however, the budget providing for the safety and environment improvement need to be considered to ensure the continual improvement of the integrated safety, occupational health and environmental management system for SMEs. Moreover, the monitoring and evaluation must be done as a plan to ensure that the implementation of the management system will be maintained and improved to ensure continual improvement.

8.1.6.4 Organization learning and growth

The safety and environmental knowledge of the employees has been improved by the integrated management system implementation by emphasizing on the hazard identification and risk assessment, including the measures to addressing the hazards and the environmental aspects. Furthermore, the implementation team has more knowledge of the context of the organization review, needs, and expectations of the interested parties that they can learn more that is the internal and external issues relate to the safety and environmental performance, including the needs and expectation in term of safety from all interested parties. All applicable list of the safety and environmental legislation also reviewed to ensure that no missing of the related

legislation. The good practice of machine guarding also has been shared to apply with all unsafe machines.

The enterprise gains more knowledge from the integrated safety, occupational health and environmental management system that can elevate the safety and environmental performance of the enterprise.

The enterprise can implement the integrated safety, occupational health and environmental management system for SMEs appropriately. Although the significant barrier is the budget for safety and environmental improvement, however, the organization tries to manage their occupational health risks and environmental aspect with the administration method such as work instruction and training program. Recommendations for the enterprise to improve safety, occupational health, and environmental performance and comply with the integrated safety, occupational health, and environmental management system can be described as follows: 1) Provide a budget for safety, occupational health, and environmental improvement to ensure that all objectives will be implemented appropriately, 2) Conduct internal audit to ensure compliance to all requirements, and conduct a management review to consider the effectiveness of the management system that can promote continuous improvement.

8.1.7 The Evaluation of The Integrated Safety, Occupational Health and Environmental Management System Implementation among Three Case Study According to the Balanced Scorecard

The evaluation results of the integrated safety, occupational health, and environmental management system according to the balanced scorecard can be shown in Table 8.2 as follows.

Table 8.2 The Evaluation Results of the Integrated Safety, Occupational Health and Environmental Management System

Perspective	Case study 1	Case study 2	Case study 3
1. Effectiveness			
perspective			
1.1 Safety, occupational health and environmental management system implementation	Most of the requirements of the integrated management system have been implemented completely except the internal audit and the management review	Most of the requirements of the integrated management system have been implemented completely except the internal audit and the management review	Most of the requirements of the integrated management system have been implemented completely except the internal audit and the management review
1.2 The achievement of safety, occupational health and environmental objectives	All four objectives had been achieved	Nine of the ten objectives had been achieved	Three of the five objectives had been achieved, but two objectives had been postponed
2. Stakeholder			
perspective			
2.1 Employee participation	Good participation	Good participation	Fair participation
2.2 Interested party satisfaction	All interested parties satisfy the integrated management system	All interested parties satisfy the integrated management system	All interested parties satisfy the integrated management system

Table 8.2 (Continued)

Perspective	Case study 1	Case study 2	Case study 3
3. Internal process perspective			
3.1 The achievement of action plan implementation	Internal audit and management review were implemented behind the schedule	All activities comply with the action plan	- Internal audit and management review were implemented behind the schedule - Two objectives delayed according to the budget constraint
3.2 Working team has been assigned	The implementation team has been assigned from the candidates of all departments	The implementation team has been assigned from the candidates of all departments	The implementation team has been assigned from the candidates of all departments
3.3 Budget	The enterprise faces with the budget constraint	The sufficient budget has been provided	The enterprise faces with the budget constraint
3.4 Monitoring and Evaluation	The internal audit program and the management review meeting have been carried	The internal audit program and the management review meeting have been carried	The internal audit program and the management review meeting

Table 8.2 (Continued)

Perspective	Case study 1	Case study 2	Case study 3
	out, but not included the safety management system	out, but not included the safety management system	have been carried out, but not included the safety management system
4. Organization learning and growth	- Safety and environmental knowledge of the employees had been improved	- Safety and environmental knowledge of the employees had been improved	- Safety and environmental knowledge of the employees had been improved
	- Work instructions relate to the occupational health, safety risks and environmental aspects had been established	- The applicable safety legislation had been reviewed and added to the list of the safety, occupational health and environmental legislation and other requirements	- The applicable safety and environmental legislation had been reviewed and added to the list of the safety, occupational health and environmental legislation and other requirements

Table 8.2 (Continued)

Perspective	- Case study 1	- Case study 2	- Case study 3
4. Organization learning and growth		- The context of the organization and the need and expectation of the interested parties had been reviewed and updated	- The context of the organization and the need and expectation of the interested parties had been reviewed and updated
		- New work instruction of energy isolation had been established	- The good practice of machine guarding installation had been applied to the press machine

Source: Thepporn Jaroenroy, 2018.

8.2 Discussion and Implication of Findings

In this section, the main theories and bodies of literature that relate to the subject of this research are discussed in light of the findings described above. Subsequently, methodological implications are discussed.

The study indicates that unsafe machine, physical hazard and chemical hazard are major causes of occupational health problem in metal product manufacturing SMEs. Additionally, waste, noise, and wastewater are the significant aspects that most SMEs

could face. All safety problems and significant aspects are the specific problems faced by metal product manufacturer that may differ from other manufacturing industries.

Moreover, the study of the relationship between SME size, SHE policy, safety problems, environmental problems and the interest in adopting safety, occupational health and environmental management system found that only SHE policy has a relationship with the interest in safety, occupational health, and environmental management system adoption.

Normally, SHE policy is established by the top management who directs the organization in terms of safety, occupational health, and environment, that is in line with Vassie *et al.* (2000) who indicated that the involvement of senior manager in managing health and safety management system in safety issues is the key factor to ensure the achievement of health and safety performance.

The finding reveals that the first motivator to enhance the integrated safety, occupational health, and environmental management system in SMEs is the flat organization that this motivator is in line with Kheni *et al.* (2005). These authors indicate that the informal management style and flat structure of the organization of SMEs enhance the rapid decision-making without any obstruction for health and safety management. According to the size of SMEs affect the small number of workforce that affect to the good relationship between employer and employees as well as among the colleague. Moreover, the small number of a workforce enhance better communication within the organization, especially the communication relates to safety, occupational health, and environment. The findings were supported the findings of Masi *et al.* (2014), who indicated the main driver for safety implementation are a positive attitude of management and worker towards health and safety, available guidelines, management involvement in the production process, financial resources, good communication, the supporting from associations and consultant.

The findings of the barriers to implementing the safety, occupational health and environmental management system of SMEs according to this study corresponded to the findings of the researchers as follows. The limitation of resources that consist of human resources and financial resources, this finding is in line with Biondi *et al.* (1998) that indicated that limitation in human resources and financial resources of SMEs resulting SMEs hardly decide to invest in the environmental management system.

SMEs lack of information related the safety, occupational health, and environmental management system, the finding was supported in the study of Bist, M. (2007), which revealed that barriers for implementing of EMS in SMEs are lack of commitment, aversion to formalized systems/high costs of certification, lack of information about EMS, lack of financial resource, lack of necessary skills and the last barrier is risk adversity. In addition, the finding also in line with the study of Walters (2001), Champoux and Brun (2003), and Jingdong and Han (2012), which stated that SMEs have a constraint of resources resulting in difficulty to implement OH&S effectively. Moreover, the lack of time to contribute to safety and environmental management is consistent with the study of Natarajan and Wyrick (2012), who indicated SMEs in Europe lack of time to adopting environmental sustainable practices. According to the limitation of resources of SMEs, the additional barrier from the point of view of all safety and environmental experts is SMEs cannot implement the well-known management system such as ISO 14001 version 2015, ISO 45001 version 2018. Furthermore, the international management systems are not simple and need many documents, hence SMEs need specific safety and environmental management system, this finding consistent with the finding of Stamou (2003) who defined as SMEs need an assistance and specific guidance on how to implement an integrated management system.

Furthermore, it was found that the financial constraint affects the integrate safety, occupational health and environmental management system for SMEs of the voluntary enterprise that participate this study, especially in case study 1 and case study 3 that face the safety and environment budget constraint. According to the budget constraint consequent the achievement of safety, occupational health and environmental objectives, resulting in the delay of the action plans related to the objectives. The finding is in line with the finding of Walters (2001), Champoux and Brun (2003), and Jingdong and Han (2012), which stated that SMEs have a constraint of resources resulting the difficulty to implement OH&S effectively. Moreover, the finding also was supported the study of Arocena and Nunez (2010), who demonstrated that SMEs must face with restricted financial, manager lack of management skills, no commitment in occupational, safety and health from manager, no occupational, safety

and health representative by workforce, and no standard approaches to preventive action.

8.3 Recommendations

This section provides recommendations for small and medium-sized enterprises and the recommendations for parties providing consultation to these SMEs. In addition, recommendations are provided for the government sector in the supporting for SMEs in term of safety and environmental improvement for SMEs.

8.3.1 Recommendations for Small and Medium-Sized Enterprises

The commitment of the top management of SMEs is the significant factor that drives the integrated safety, occupational health and environmental management system in SMEs. Although the simple safety and environmental management system had been designed but low commitment of top management influence the failure of the management system implementation. Moreover, the safety and environmental knowledge of the staff who implements the integrated safety, occupational health, and environmental management system is very important, they should have a safety and environmental background on how to manage health, safety, and environment in their enterprises. The knowledge of implementing person can enhance the success of the management system implementation in SMEs.

Although SMEs has the limitation of the resources, the essential cost for safety, occupational health, and environmental management system is needed to fulfill the achievement of the management system implementation with longer a period of implementation time than the large enterprises. The recommendations on the steps to implementing the management system are the same for small and medium-sized enterprises that can be described as follows:

8.3.1.1 Conduct the initial review

This is the first thing of the management system implementing to identify what is the existing safety, occupational health and environment practices of the enterprise. In addition, the gap of the existing safety, occupational health and environmental management system must be identified and compare with the integrated

safety, occupational health and environmental management system. The output of this stage can be the input of the enterprise to establish the suitable implementation plan.

8.3.1.2 Conduct the self-assessment

The self-assessment assists the enterprise to realize that what is the internal and external issues that affect their business and safety, occupational health and environmental performance. Furthermore, the enterprise needs to identify all relevant interested parties including their needs and expectations. All significant issues from the self-assessment should be addressed to ensure the success of the management system implementation.

8.3.1.3 Planning and implementation

In this stage, the safety, occupational health and environmental policy must be defined according to the output of the self-assessment. All occupational health and safety risks must be identified and addressed. The environmental aspects also need to identify and address all significant aspects. Safety, occupational health and environmental objectives with the mitigation plan shall be established to ensure that all significant occupational health, safety risks and environmental aspects will be managed properly. The relevant safety, occupational health and environmental legal and other requirements must be provided and implemented to ensure the compliance with those legal and other requirements. In addition, the training program must be provided for all relevant employees to ensure that they can work safely and prevent the environmental impacts. Finally, all documents related to the planning and implementation must be provided and recorded.

8.3.1.4 Checking

The internal audit should be carried out after implementing all requirement of the management system for a while to monitor the compliance of the integrated safety, occupational health and environmental management system. Moreover, the accident investigation must be implemented to address the root causes of the accident and prevent the recurrence of such accident.

8.3.1.5 Action for continual improvement

All nonconformities which found during the management system implementation must be addressed appropriately to ensure the recurrence of all nonconformities. Furthermore, the management review must be carried out to review

the overall of the management system implementation and provided the actions for further improvements.

The implementation flowchart can be shown in Figure 8.2

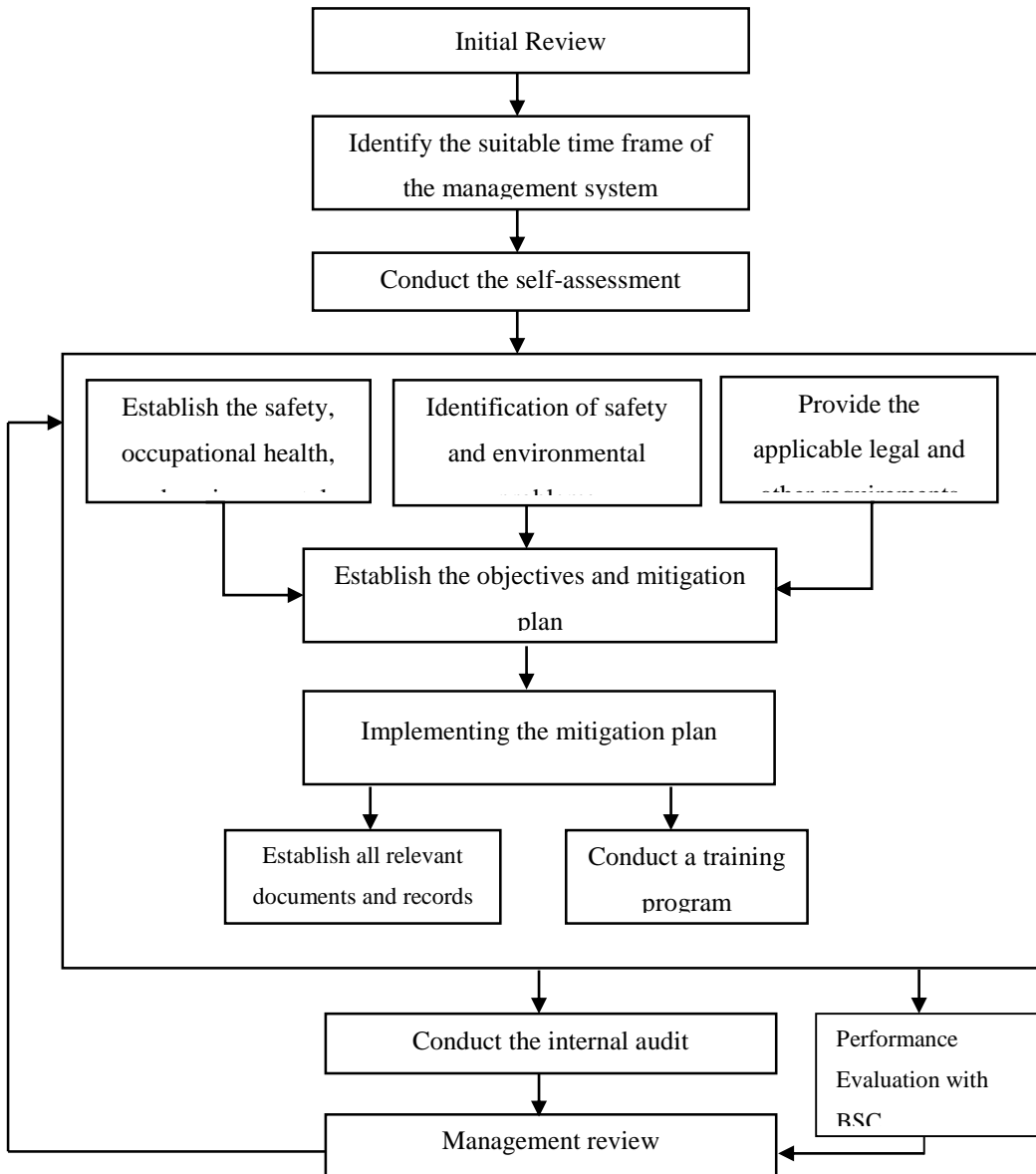


Figure 8.2 The Integrated Safety, Occupational Health, and Environmental Management System for SMEs Implementation Flowchart

Source: Thepporn Jaroenroy, 2018.

Although, the designed integrated safety, occupational health and environmental management system was designed for the metal product manufacturer SMEs, other SMEs can adopt such management system within their organization. The

area that needs to focus is the identification of occupational health and safety risks and the environmental aspects that may differ in each type of the business.

Regarding the injury and illness rates of SMEs in Thailand, they are still higher than large enterprise (Social Security Office, 2017) and SMEs are the significant sources of the pollution (Burke & Gaughran, 2007 as cited in Jamian *et al.*, 2012). SMEs should pay more attention to investing in safety, occupational health, and environmental management system. The safety, occupational health, and environmental management can offer great benefits to SMEs in terms of injury and illness reduction, minimizing the environmental problems, demonstrating the social responsibility and enhancing the global competitiveness of SMEs. The new design of integrated safety, occupational health, and environmental management system for SMEs from this study can be implemented in both small and medium-sized enterprises with the same steps for implementation.

8.3.2 Recommendations for Consultants

According to the limitation of SMEs, companies need a consultant because the lack of knowledge or know-how to address specific safety and environmental problems. SMEs always asks for help to set up systems especially, procedures and documentations as well as the suggestions to improve their safety and environmental performance. Consultants can guide the companies to identify their internal and external issues that affect their business, safety and environmental performance. Consultants can play a vital role in helping SMEs during the development of safety, occupational health and environmental strategies. Moreover, the consultants can provide the assistance with specific safety and environmental knowledge as well as the experience. The consultant should consider the limitation of SMEs, especially the safety and environmental knowledge, budget, time and human resources, so the consultancy plan should be provided with the appropriate timeline to ensure that SMEs can implement the management system effectively. The implementation timeline for SMEs should be at least 8 months with the total 5 man- days for consultancy program that consist of 1) Initial review 1 man- day, 2) Site Visit 1- 1 man- day, 3) Site visit 2- 1 man- day, 4) Internal audit training 1 man- day, and 5) Pre- assessment 1 man- day. Total cost of

consultancy fee was estimated around 55,000 Baht that lower than normal consultancy fee of existing international standard.

In addition, the consultants with the experience to work with the SMEs is needed to ensure that they can guide SMEs to implement the management system with a simple step. The consultancy program can be defined in Table 8.3

Table 8.3 Consultancy Program for Implementing the Integrated Safety, Occupational Health, and Environmental Management System in SMEs (As of 2018)

Consultancy program	Timeline								Man-day	Fee (THB)
	1	2	3	4	5	6	7	8		
Initial review and conduct the requirement training session	x								1	10,000
Site visit 1		x							1	10,000
1) Conduct the self-assessment, Identification of safety and environmental problems, 2) Establish the safety, occupational health, and environmental policy										
Site visit 2				x					1	10,000
1) Provide the applicable legal and other requirements, 2) Establish the objectives and mitigation plan, 3) Implementing the mitigation plan, 4) Establish all relevant documents and records										
Internal audit training						x			1	10,000
Pre-assessment								x	1	15,000
Total									5	55,000

Source: Thepporn Jaroenroy, 2018.

8.3.3 Recommendations for Government Sector

According to the limitation of SMEs in the resources to implementing the Safety and Environmental management system, the government sector should provide the assistance in terms of financial incentive and technical support. The financial incentive for the integrated safety, occupational health, and environmental management system

should be provided with the training program, consultant fees, surveillance audit fees, and the budget for safety and environmental improvements. The technical support should be supported by the government sector to motivate SMEs and make them feel confident in implementing the management system. In addition, the audit program is necessary to ensure the continual improvement of the management system implementation. The audit program to certify the management system compliance should be carried out with the certification. Surveillance audit should be done periodically with the defined period to monitor the compliance of the management system of SMEs that can guarantee the consistency of the implementation and urge them to improve their safety and environmental performance. The related government sector such as TOSH should provide technical support for the management system implementing that should serve the mission of the organization.

8.4 Directions for Future Research

This study was unable to implement the designed integrated safety, occupational health and environmental management system for SMEs in small-sized enterprise because only five medium-sized enterprises applied to participate in the study without the small-sized enterprise. Therefore, there are the room for the future research to fill in the gap to see the results of the integrated management system implementing in the small-sized enterprise. Moreover, according to the study centers on the metal product manufacturer SMEs, the study to identify the safety and occupational health risk in another type of the industries should be conducted, including the environmental aspects should be studied also. The safety, occupational health risks, and environmental aspects are the important information that contribute the benefit to SMEs, and assist them to aware and manage those risks and environmental aspects appropriately. The effectiveness of the integrated safety, occupational health, and environmental management system using the BSC should be carried out by the interested parties at least 3 persons to ensure their satisfaction of the management system implementation.

Finally, since the study focuses on the integrated safety, occupational health and environmental management system that not cover the quality management system, future research on the construction of the integrated quality, safety, occupational health

and environmental management system for SMEs should be carried out to make the research more complete and meaningful by contribute the great benefits to SMEs in term of their business growth, and improve their safety, occupational health and environmental performance.

BIBLIOGRAPHY

- Arewa, A. O., & Farrell, P. 2012. A Review of Compliance with Health and Safety Regulations and Economic Performance in Small and Medium Construction Enterprises. In **The 28th Annual ARCOM Conference, 3-5 September 2012**. Smith, S.D, Ed. Edinburgh, UK: Association of Research in Construction Management. Pp. 423-432.
- Arocena, P., & Núñez, I. 2010. An Empirical Analysis of the Effectiveness of Occupational Health and Safety Management Systems in SMEs. **International Small Business Journal**. 28(4): 398- 419.
- Beheshti, A. R., Kamali, K., Arghami, S., & Mohammadi, A. 2018. Assessing the Performance of the Health, Safety and Environment Management System (HSE) Using the Modified Balanced Scorecard Model. **Journal of Iranian Medical Council**. 1(2): 87-95.
- Department of Business, Enterprise and Regulatory Reform. 2011. **Improving Outcomes from Health and Safety**. A Report present to Government by the Better Regulation Executive. London: Department for Business Enterprises and Regulatory Reform.
- Biondi, V., Frei, M., & Iraldo, F. 1998. Environmental Management System Implementation by SMEs: EU Experience and Perspectives. In **7th International Conference of the Greening of Industry Network, November 15-18**. Rome, Italy: Greening of Industry Network. Pp. 15-18.
- Bist, M. 2007. ISO 14001 and EMAS in Small and Medium-sized Enterprises Obstacles to Implement these Environmental Management Approaches in SMEs and how to Improve the Potential of these Approaches for the Usage in SMEs. **The IMRE Journal**. 1(2): 1-11.
- Granly, B. M., & Welø, T. 2014. EMS and Sustainability: Experiences with ISO 14001 and Eco-Lighthouse in Norwegian Metal Processing SMEs. **Journal of Cleaner Production**. 64): 194-204.

- Bostan, I., & Grosu, V. 2011. Contribution of Balance Scorecard Model in Efficiency of Managerial Control. **Journal of Economic Forecasting**. 14(3): 178-199.
- British Standard Institute. 2007. **Occupational Health and Safety Management Systems-Requirements. (OHSAS 18001:2007)**. UK: British Standard Institute.
- Chamlong Poboon. 2011. Local Authority and Global Warming Mitigation: A Case Study of Muangklang Municipality. **Journal of Environmental Management**. 7(1). Retrieved February 12, 2018 from <https://www.tci-thaijo.org/index.php/JEM/article/view/29057> (in Thai)
- Champoux, D., & Brun, J.-P. 2003. Occupational Health and Safety Management in Small Size Enterprises: An Overview of the Situation and Avenues for Intervention and Research. **Safety Science**. 41(4): 301-318.
- Chavan, M. 2009. The Balanced Scorecard: A New Challenge. **Journal of Management Development**. 28(5): 393-406.
- Commission for Environmental Cooperation. 2005. **Successful Practices of Environmental Management Systems in Small and Medium-size Enterprises: A North America Perspective**. Retrieved March 25, 2018 from <http://www.google.co.th>
- Darnall, N., & Edwards, D. 2006. Predicting the Cost of Environmental Management System Adoption: The Role of Capabilities, Resources and Ownership Structure. **Strategic Management Journal**. 27(4): 301-320.
- Djorjevic, D., & Bogetic, S. 2008. Implementation of Integrated Management Systems in the Sector of Small and Medium Enterprises. In **2nd International Quality Conference, 13-15 May**. Kragujevac, Serbia: AOS
- Dorman, P. 2000. The Economics of Safety, Health and Well-Being at Work: An Overview. In **Focus Program on Safe Work, International Labour Organisation**. Washington, D.C.: The Evergreen State College. Pp. 1-41.
- Duijm, N. J., Fiévez, C., Gerbec, M., Hauptmanns, U., & Konstandinidou, M. 2008. Management of Health, Safety and Environment in Process Industry. **Safety Science**. 46(6): 908-920.

- European Commission. 2003. Commission Recommendation of 6 May 2003 Concerning the Definition of Micro, Small and Medium - Sized Enterprises. **Official journal of the European Union**. 123/26. Retrieved March 25, 2018 from <https://publications.europa.eu/en/publication-detail/-/publication/6ca8d655-126b-4a42-ada4-e9058fa45155/language-en>
- The Organisation for Economic Co-operation and Development. 2018. **Environmental Policy Toolkit for SME Greening in EU Eastern Partnership Countries**. Paris: OECD. Retrieved from <https://doi.org/10.1787/9789264293199-en>
- Figge, F., Hahn, T., Schaltegger, S., & Wagner, M. 2002. The Sustainability Balanced Scorecard—Linking Sustainability Management to Business Strategy. **Business strategy and the Environment**. 11(5): 269-284.
- Floyde, A., Lawson, G., Shalloe, S., Eastgate, R., & D’Cruz, M. 2013. The Design and Implementation of Knowledge Management Systems and E-Learning for Improved Occupational Health and Safety in Small to Medium Sized Enterprises. **Safety science**. 60: 69-76.
- National Federation of Self Employed & Small Businesses. 2006. **Health Matters: The Small Business Perspective**. London: National Federation of Self Employed & Small Businesses (FSB).
- Ganapathy Natarajan. 2012. **Developing an Environmental Sustainability Index (EnvSI) for Small and Medium-Sized Enterprises (SMEs) in the United States: The case of West Texas**. Retrieved February 12, 2018 from <https://ttu-ir.tdl.org/ttu-ir/handle/2346/50765>
- Granly, B. M., & Welo, T. 2014. EMS and Sustainability: Experiences with ISO 14001 and Eco-Lighthouse in Norwegian Metal Processing SMEs. **Journal of Cleaner Production**. 64: 194-204.
- Hasle, P., & Limborg, H. J. 2006. A Review of the Literature on Preventive Occupational Health and Safety Activities in Small Enterprises. **Industrial Health**. 44(1): 6-12.

- Hillary, R. 1999. **Evaluation of Study Reports on the Barriers, Opportunities and Drivers for Small and Medium Sized Enterprises in The Adoption of Environmental Management Systems.** London: Network for Environmental Management and Auditing.
- Lancaster, R., Ward, R., Talbot, P., & Brazier, A. (2003). **Costs of Compliance with Health and Safety Regulations in SME's.** (Report no.147). Present at Health and Safety Executive.
- Heras, I., & Arana, G. 2010. Alternative Models for Environmental Management in SMEs: The Case of Ekoscan vs. ISO 14001. **Journal of Cleaner Production.** 18(8): 726-735.
- Hitchens, D., Clausen, J., Trainor, M., Keil, M., & Thankappan, S. 2003. Competitiveness, Environmental Performance and Management of SMEs. **Greener Management International.** (44): 45-57.
- Hudson, J., & Orviska, M. 2013. Firms' Adoption of International Standards: One Size Fits All?. **Journal of Policy Modeling.** 35(2): 289-306.
- International Organization for Standardization (ISO). 2015. **Environmental Management Systems-Requirements with Guidance for Use.** Retrieved April 10, 2016 from <https://www.iso.org/obp/ui/#iso:std:iso:14001:ed-3:v1:en>
- International Organization for Standardization (ISO). 2018. **Occupational Health and Safety Management Systems-Requirements with Guidance for Use.** (ISO/45001:2018(E)). Switzerland: ISO.
- Jaiswal, J. 2014. Environmental Impact on SMEs Growth and Sustainability Challenges and Opportunities. **Journal of Studies in Dynamics and Change.** 1(2): 101-112.
- Jamian, R., Ab Rahman, M. N., Deros, B. M., & Ismail, N. Z. N. 2012. A Conceptual Model Towards Sustainable Management System Based Upon 5s Practice for Manufacturing SMEs. **Asia Pacific Journal of Operations Management.** 1(1): 19-31.

- Jingdong, Z., & Han, Z. 2012. Occupational Health Management Research on Small & Medium-sized Enterprises Together with Large & Medium-sized State-owned Enterprises- A Case Study in Hubei Province. **Procedia Engineering**. 43: 288-292.
- Jutharat Hongchinda. 2012. **Factors Affecting the Success of an Implementation of Environmental Management Standard (ISO 14001) in Enterprises in Map Ta Phut, Industrial Estate, Thailand**. Master's thesis, National Institute of Development Administration.
- Kaplan, R. S., & Norton, D. P. 1997. **Balanced Scorecard**. Leverkusen, Germany: Schäffer-Poeschel.
- Kheni, N. A., Dainty, A. R., & Gibb, A. G. 2005. Health and Safety Management Practices of Small Subcontractors. In **21st Annual ARCOM Conference, 7-9 September**. London: University of London, Association of Researchers in Construction Management.
- Kheni, N; Gibb, A.G.F. & Dainty, A.R.J. 2010. Health and Safety Management within Small- and Medium-Sized Enterprises (SMEs) in Developing Countries: A Study of Contextual Influences. **Journal of Construction Engineering and Management**. 136(10): 1104-1115.
- Krivokapic, Z., & Jovanovic, J. 2009. Using Balanced Scorecard to Improve Environmental Management System. **Strojniški vestnik Journal of Mechanical Engineering**. 55(4): 262-271.
- Legg, S. J., Olsen, K. B., Laird, I. S., & Hasle, P. 2015. Managing Safety in Small and Medium Enterprises. **Safety Science**. 71: 189-196.
- Mayhew, C. 1997. Small Business Occupational Health and Safety Information Provision. **Journal of Occupational Health and Safety Australia and New Zealand**. 13: 361–373.
- Mayhew, C., & Quinlan, M. 1997. The Management of Occupational Health and Safety Where Subcontractors are Employed. **Occupational Health and Industrial Medicine**. 2(37): 49.
- Masi, D., & Cagno, E. 2015. Barriers to OHS Interventions in Small and Medium-Sized Enterprises. **Safety Science**. 71: 226-241.

- Masi, D., Cagno, E., & Micheli, G. J. 2014. Developing, Implementing and Evaluating OSH Interventions in SMEs: A Pilot, Exploratory Study. **International Journal of Occupational Safety and Ergonomics**. 20(3): 385-405.
- McKeiver, C., & Gadenne, D. 2005. Environmental Management Systems in Small and Medium Businesses. **International Small Business Journal**. 23(5): 513-537.
- Micheli, G. J., & Cagno, E. 2010. Dealing with SMEs as a Whole in OHS Issues: Warnings from Empirical Evidence. **Safety Science**. 48(6): 729-733.
- Ministerial regulation on the prescribing of employment standard and fixed asset value of small and medium enterprises B.E. 2545. **Royal Thai Government Gazette**. 119, 93A (20 September 2002). (in Thai)
- Ministerial regulation on the prescribing of standard for administration and management of occupational safety, health and environment B.E. 2553 (A.D. 2010). **Royal Thai Government Gazette**. 129, 43A (9 July 2010) (in Thai)
- Monteiro, S. and Ribeiro, V. (2017), "The balanced scorecard as a tool for environmental management", *Management of Environmental Quality*, Vol. 28 No. 3, pp. 332-349. <https://doi.org/10.1108/MEQ-11-2015-0201>
- Monteiro, S. 2017. The Balanced Scorecard as a Tool for Environmental Management. **Management of Environmental Quality: An International Journal**. 28(3): 332-349.
- Mudavanhu, N., Zhou, T., & Dzomba, P. 2014. An Assessment of Small and Medium Enterprise Owners' Occupational Safety and Health Efforts: The Case of Southerton, Harare, Zimbabwe. **Journal of Scientific Research & Reports**. 3(3): 407- 418.
- Legg, S., Battisti, M., Harris, L.-A., Laird, I., Lamm, F., Massey, C., & Olsen, K. 2009. **Occupational Health and Safety in Small Businesses**. (NOHSAC Technical Report 12). Wellington: National Occupational Health and Safety Advisory Committee.
- Office of Small and Medium Enterprises Promotion. 2017. **SMEs White Paper 2017**. Bangkok: Office of Small and Medium Enterprises Promotion.

- Olaru, M., Pirnea, I. C., Hohan, A., & Maftai, M. 2014. Performance Indicators Used by SMEs in Romania, Related to Integrated Management Systems. **Procedia-Social and Behavioral Sciences**. 109: 949-953.
- Pollution control department. 2017. **Thailand State of Pollution Report 2016**. Bangkok: Pollution control department.
- Rajkovic, D., Aleksic, M., Milicevic, R., & Cudic, S. 2008. IMS in SMES-Reasons, Advantages and Barriers on Implementation. **International Journal for Quality Research**. 2(3): 207-216.
- Rebelo, M. F., Santos, G., & Silva, R. 2014. A Methodology to Develop the Integration of the Environmental Management System with Other Standardized Management Systems. **Computational Water, Energy, and Environmental Engineering**. 3(4): 170-181.
- Rigby, M., Lawlor, T. 2001. Health and Safety in Small Firms with Particular Reference to Spain. **International Small Business Journal: Researching Entrepreneurship**. 19(2): 31-48.
- Santos, G., Mendes, F., & Barbosa, J. 2011. Certification and Integration of Management Systems: The Experience of Portuguese Small and Medium Enterprises. **Journal of Cleaner Production**. 19(17): 1965-1974.
- Smallman, C and John, G. 2001. British Directors Perspectives on the Impact of Health and Safety on Corporate Performance. **Safety Science Journal**. 38(3): 227-239.
- Small and Medium Enterprises Promotion Act B.E. 2543. **Royal Thai Government Gazette**. 117, 9A (17 February 2000). (in Thai)
- Sørensen, O. H., Hasle, P., & Bach, E. 2007. Working in Small Enterprises—is there a Special Risk? **Safety Science**. 45(10): 1044-1059.
- Surienty, L. 2012. **Management practices and OSH implementation in SMEs in Malaysia**. School of Management, USM Minden, Pulau Pinang. Retrieved February 12, 2018 from <http://ilera2012.wharton.upenn.edu/refereedpapers/surientylilisilera.pdf>

- Lammin, S. 2003. Safety Management in Small Business: Promoting Good Practice in SME's. **Journal of Environmental Health Research**. 2(1): 22-31
Retrieved February 12, 2018 from http://www.cieh.org/JEHR/safety_management_small_businesses.html
- Social Security Office. 2017. **Injury and Illness Report 2017**, Bangkok: Social Security Office.
- Unnikrishnan, S., Iqbal, R., Singh, A., & Nimkar, I. M. 2015. Safety Management Practices in Small and Medium Enterprises in India. **Safety and Health at Work**. 6(1): 46-55.
- Vassie, L., J. M., & Oliver, A. 2000. Health and Safety Management in UK and Spanish SMEs: A Comparative Study. **Journal of Safety Research**. 31(1): 35-43.
- Walters, D., Lamm, F. 2003. **OHS in Small Organisations: Some Challenges and Ways Forward**. (Working Paper 15). Retrieved November 10, 2018 from <https://openresearch-repository.anu.edu.au/handle/1885/41224>
- Zorpas, A. 2010. Environmental Management Systems as Sustainable Tools in the Way of Life for the SMEs and VSMEs. **Bioresource Technology**. 101(6): 1544-1557.

APPENDICES

Appendix A

Questionnaire

Safety, Occupational Health and Environmental management system model for small and medium-sized enterprises

This questionnaire aims to study barriers and motivators to implementing the Safety, Occupational Health and Environmental Management System in an enterprise. Additionally, to define the suggestions to establish the Integrated Safety, Occupational Health and Environmental Management System for small and medium enterprises. This questionnaire contains 5 sections, 9 pages as follows.

Part 1: General information of SME

Part 2: Occupational Health, Safety and Environment management in the organization

Part 3: Barriers and Motivators to implementing Occupational Health, Safety and Environmental management system in SMEs

Part 4: Barriers and Motivators to implementing Integrated occupational health, Safety and Environmental management system in SMEs

Part 5: Suggestion for establishing Integrated occupational health, Safety and Environmental management system in SMEs

Thank you for your cooperation to answer all the questions in the questionnaire. Your answers will be kept confidentially and use only for this study.

Part 1: General information of SME

1. According to the Ministerial regulation on the prescribing of employment standard and fixed asset value of small and medium enterprises B.E. 2545, What is the category of the enterprise according to the law?
 1. Small-sized enterprise (A manufacturer with 50 employees or fewer or has total fixed assets of no more than fifty million baht)
 2. Medium-sized enterprise (A manufacturer with more than 50 employees but fewer than 200 employees or has fixed assets more than fifty million baht but fewer than two hundred million baht)
 3. Large-sized enterprise (A manufacturer with more than 200 employees or has fixed assets more than two hundred million baht)
2. How long of the business operation (identify)_____years
3. Has the organization gotten an award or certify of safety and occupational health?
 1. Yes, Please identify award or certification_____
 2. No
4. Has the organization gotten an award or certify of the environment?
 1. Yes, Please identify award or certification

 2. No
5. Did your organization implement the integrated management system?
 1. Yes, Please identify

 2. No

Part 2: Occupational Health, Safety and Environment management in the organization

6. Did your organization establish the safety, occupational health and environmental policy?
 1. Yes, Please identify_____

2. No

7. What is the safety issues in your organization and how to address such problems? You can select more than 1 topic.

1. Hazard from machine, equipment, working at height and confined space (Please identify)_____

How to address the problem (Please identify)

2. Biological hazard i.e. venomous animals, viruses etc. (Please identify)

How to address the problem (Please identify)

3. Physical hazard i.e. radioactive, temperature, noise etc. (Please identify)

How to address the problem (Please identify)

4. Ergonomics hazard (Please identify)

How to address the problem (Please identify)

5. Chemical hazard (Please identify)

How to address the problem (Please identify)

6. Stress (Please identify)

How to address the problem (Please identify)

7. Other hazards (Please identify)

How to address the problem (Please identify)

8. What is the environment issues in your organization and how to address such problems? You can select more than 1 topic.

1. Waste (Please identify)

How to address the problem (Please identify)

2. Wastewater (Please identify)

How to address the problem (Please identify)

3. Noise (Please identify)

How to address the problem (Please identify)

4. Air Pollution (Please identify)

How to address the problem (Please identify)

5. Other pollutants (Please identify)

How to address the problem (Please identify)

Part 3: Barriers and Motivators to implementing Occupational Health, Safety and Environmental management system in SMEs

9. Please rank the barrier to implementing the Occupational Health and Safety management system (1 means slight barrier and 9 means extreme barrier)

Barrier	Slight								Extreme
	1	2	3	4	5	6	7	8	9
No specific management system for SMEs									

Please rank the motivator to implementing Environmental management system (1 means slight motivator and 9 means extreme motivator)

Motivator	Slight								Extreme
	1	2	3	4	5	6	7	8	9
Internal Motivator									
Cost-saving									
Fulfill customer satisfaction									
Strengthen the business competitive									
Top management focuses on environmental performance									
External Motivator									
Customer need									
Environmental legislation and requirements									
Build up a good relationship with the community									
The agreement of the trade organization									
Policy from the stakeholder									

Part 4: Barriers and Motivators to implementing Integrated occupational health, Safety and Environmental management system in SMEs

12. Please rank the barrier to implementing the Integrated Safety, Occupational Health and Environmental management system (1 means slight barrier and 9 means extreme barrier)

Motivator	Slight								Extreme
		→							
	1	2	3	4	5	6	7	8	9
Policy from the stakeholder									

Part 5: Suggestion for establishing Integrated occupational health, Safety and Environmental management system in SMEs

14. What is the essential requirement of the integrated safety, occupational health and environmental management system? (You can select more than 1 requirement).

- Context of the organization
- Understanding the needs and expectations of interested parties
- Safety, Occupational Health and Environmental policy
- Safety, Occupational Health, Environmental Objectives and programs
- Legal and other requirements
- Resources
- Competence, training, and awareness
- Communication, participation, and consultation
- Control of documents
- Operational control
- Procurement management
- Contractor
- Change management
- Emergency preparedness and response
- Performance measurement and monitoring
- Evaluation of compliance
- Incident investigation, nonconformity, corrective action, and preventive action
- Internal audit
- Management review
- Other.....

Appendix B

Semi-structured interview form for Safety, Occupational Health and Environmental expert

Interviewer		
Date		
Location		Time

Part 1: General information of an expert

Interviewee _____

Job Title _____

Work experience _____

Work experience related to safety and environmental management system _____

Part 2: How to design integrated safety, occupational health and environmental management system for SMEs in your point of view?

1. What is the factor that should consider to design an integrated safety, occupational health and environmental system for SMEs?

Barrier

- Lack of skilled staff to implement the management system
- Limitation to access to the safety and environment technology
- Lack of budget
- Lack of information of the management system
- Lack of time
- No specific management system for SMEs
- Many documents required by the management system
- The complexity of the management system

Other (Please identify)_____

Motivator

Flat organization

Good communication within the organization due to a small number of employees

The decision making can be done by the owner-manager

The good relationships among employers, employees and colleagues

Informal control and informal documentation

Other (Please identify)_____

2. What is your idea to design the safety, occupational health and environmental management system that is practical for SMEs in your point of view?

2.1 Does the Deming cycle (Plan-Do-Check-Act) need for the management system? Please explain. _____

2.2 What is the essential requirement of the integrated safety, occupational health and environmental management system?

Context of the organization

Understanding the needs and expectations of interested parties

Safety, Occupational health and Environmental policy

Safety, Occupational Health, Environmental Objectives and programmes

Legal and other requirements

Resources

Competence, training and awareness

Communication, participation and consultation

Control of documents

Operational control

Procurement management

Contractor

Change management

Emergency preparedness and response

Performance measurement and monitoring

Evaluation of compliance

- Incident investigation, nonconformity, corrective action and preventive action
- Internal audit
- Management review
- Other_____

2.3 Another suggestion, Please identify _____

3. How to implement safety, occupational health and environmental management system in SMEs?
4. How to encourage SMEs to implement safety, occupational health and environmental management system?
5. Which support from the government can encourage SMEs to implement safety, occupational health and environmental management system effectively?

Appendix C

Summaries of Expert Interviews

Chaitana Chaimongkol

Discussion with Chaitana Chaimongkol, Director at Thailand Institute of Occupational Safety and Health (TOSH)

The conversation took place on February 23, 2018.

How to design integrated safety, occupational health and environmental management system for SMEs?

The important things that should consider designing the new integrated safety, occupational health and environmental management system are 1) SMEs lack of staff who implement the safety, occupational health, and environmental management system, so the designed management system should take less time and focus on how to prevent accidents and injuries as well as to prevent the environmental issues. 2) Budget is the significant barrier to impede SMEs to implement safety and environmental management system because SMEs always face the business competition and how to survive the highly competitive market. 3) The new design management system for SMEs should take a low cost to implement. 4) Additionally, Time consumable for the new design management system implementation should be considered seriously, the management system should allow SMEs to take a longer time to implement than the larger enterprises. 5) According to the limitation of SMEs in many dimensions, SMEs need specific safety, occupational health, and environmental management system because they cannot implement the existing international management system such as ISO 14001 and ISO 45001. The mentioned management system is hard to implement with limited resources. 6) Finally, the newly designed management system should simple and not complicated that will motivate SMEs to interest and adopt it in their sites.

The advantages of SMEs that can motivate them to implement safety and environmental management system are 1) Decision making can be done by the owner-manager only that is good when he or she would like to implement safety, occupational health, and environmental management system, and no need any permissions from any shareholder. Additionally, the good relationship between the owner and employees can encourage a positive atmosphere when the owner-manager would like to implement the safety and environmental management system. Especially, the safety management system, it can reflect the intention of the owner-manager to protect the employees from any injuries and illness.

In my opinion, the requirement of the integrated safety, occupational health, and environmental management system should consist of:

- 1) Context of the organization
- 2) Need and expectation of the interested party
- 3) Safety, occupational health, and environmental policy
- 4) Objective
- 5) Legal and other requirements
- 6) Resources
- 7) Competence, Training, and Awareness
- 8) Communication
- 9) Control of documents
- 10) Operational control
- 11) Procurement control
- 12) Contractor control
- 13) Management of change
- 14) Emergency preparedness and response
- 15) Monitoring and measurement
- 16) Evaluation of compliance
- 17) Incident investigation, nonconformity, and corrective action
- 18) Internal audit
- 19) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

Large enterprises should participate to force SMEs to improve their safety, occupational health, and environmental performance via the supply chain, large enterprises should have the criteria to select their business partner by considering safety, occupational health, and environmental performance of SMEs. Government sector should encourage SMEs to improve their safety and environmental performance in term of financial support, consultancy program to motivate SMEs to adopt the safety, occupational health, and environmental management system. A surveillance audit program should be done periodically to ensure that SMEs will implement the safety, occupational health, and environmental management system continuously and urge them to improve their performance in term of safety and environment.

How to urge SMEs to aware of the benefits of safety, occupational health, and environmental management system?

The government sector should educate an owner-manager of SMEs to understand how safety, occupational health, and environmental management system can improve their business and how it can enhance the business growth, moreover, the integrated management system can improve the reputation of SMEs in term of safety and environment.

Benefits in term of tax benefit for SMEs that implemented safety, occupational health and environmental management system should be done to makes them feel that the management system implementation make a big positive consequence to their business.

Jutapanit Boondekul

Discussion with Jutapanit Boondekul, Deputy director at Thailand Institute of Occupational Safety and Health (TOSH)

The conversation took place on April 11, 2018.

How to design integrated safety, occupational health and environmental management system for SMEs?

In my opinion, designing of the integrate safety, occupational health and environmental management system should consider the following factors. 1) Limited manpower in SMEs, as we know one staff in SMEs always handle many roles and responsibilities that can be a barrier to implement a new management system in SMEs, 2) Safety and environmental budget is another barrier that has a high consequence to impede SMEs to implement the safety, occupational health, and environmental management system, so the newly designed management system for SMEs should take a low cost of implementation. 3) SMEs always focuses on their business and look like that they do not have more time to adopt safety, occupational health and environmental management system. They worry about how their business will be survived in the competitive market. 4) SMEs need specific safety, occupational health, and environmental management system because of the existing international management system such as ISO 14001, ISO 45001 hard to implement in their site with the limited resources, so the specific management system that suits the characteristic of SMEs will be better.

The strengths of SMEs that can be the internal motivator to implement the safety, occupational health, and environmental management system are consist of 1) the organization structure of SMEs is a flat organization that the owner-manager has a full authorization to do everything by themselves. 2) The communication in SMEs is quite good because the small number of employees that allow the manager to communicate new information to all employees quickly via any channel such as group meeting, monthly meeting. The rapid communication is an advantage of SMEs that easy to communicate safety, occupational health, and environmental management system among employees.

The main requirements the integrated safety, occupational health, and environmental management for SMEs should be as follows:

- 1) Context of the organization
- 2) Safety, occupational health, and environmental policy
- 3) Legal and other requirements
- 4) Competence, Training, and Awareness
- 5) Communication
- 6) Operational control

- 7) Monitoring and measurement
- 8) Evaluation of compliance
- 9) Internal audit
- 10) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

Government sector should give the information on safety and environmental management system to SMEs and make them understand the benefits of the management system that can help the organization in term of growth and sustainability. The owner or top management should be the target group to obtain the information that can make them feel confidence and trust in the safety, occupational health, and environmental management system. Safety and environmental management system communication should be done with all employees in the organization to ensure that everyone understands the intention of the management system implementation, especially, benefits that they can get from safety, occupational health and environmental management system.

All employees should be asked to participate in safety and environmental management system in all process of the management system establishment according to the PDCA (Plan-Do-Check-Action) cycle. Newly designed safety, occupational health, and environmental management system should be simple and effortless to implement by SMEs by reducing the implementation time, the management system should focus on hazard identification, risk assessment, and environmental aspect identification. A simple management system can urge SMEs to accept safety, occupational health, and environmental management system. Additionally, employee participation of employee should be activated by awards, especially employees who suggest their ideas to improve safety and environmental performance.

Narutchai Chomputhep

Discussion with Narutchai Chomputhep, Senior Occupational Health and Safety Consultant at NPC Safety and Environmental Service Co., Ltd.

The conversation took place on April 7, 2018.

How to design integrated safety, occupational health and environmental management system for SMEs?

The barriers that should consider designing the integrated safety, occupational health and environmental management system consist of 1) SMEs lack of staff who has the experience to implement safety and environmental management system, Many SMEs do not hire the safety and environmental officer, 2) SMEs lack of time to implement safety and environmental management system because they concentrate on their business and they would like to ensure that their business must be survived. Limitation of time in SMEs should be considered in the case of designing the safety and environmental management system for SMEs. 3) Currently, Thailand has no specific safety and environmental management system for SMEs that is the one barrier to obstruct Thai SMEs to adopt safety and environmental management system in their enterprises. The last barrier for SMEs is 4) the existing international management systems such as ISO 45001: 2018, ISO 14001: 2015 need to create many documents to fulfill its requirements and it's hard for SMEs to create such documents.

The motivator to lead SMEs to implement the safety and environmental management are 1) A decision making can be done solely by the owner-manager that easy to implement the management system within their site if he or she feels that the management system can make a benefit for their business. 2) The relationship among the people in the organization of SMEs can help SMEs to implement the safety and environmental management system rapidly. The owner-manager can discuss with all employees and let them know what is the roles and responsibilities that all employees need to support and work together to ensure the achievement of the safety and environmental management system implementation. 3) According to the culture of SMEs, Informal work process is the most comfortable way for the employees in SME enterprises, the informal safety and environmental management system should be one motivator that makes the owner-manager and the employee interest in the safety and environmental management system.

The main requirements of integrated safety, occupational health, and environmental management system should consist of:

- 1) Safety, occupational health, and environmental policy
- 2) Objective

- 3) Legal and other requirements
- 4) Resources
- 5) Competence, Training, and Awareness
- 6) Communication
- 7) Control of documents
- 8) Operational control
- 9) Procurement control
- 10) Contractor control
- 11) Management of change
- 12) Emergency preparedness and response
- 13) Monitoring and measurement
- 14) Evaluation of compliance
- 15) Incident investigation, nonconformity, and corrective action
- 16) Internal audit
- 17) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

Top management should aware of the benefits of the safety, occupational health and environmental management system that can motivate the top management to make a decision to implement the safety, occupational health, and environmental management system. Resources in term of budget, time and manpower are the essential resources that can support the safety, occupational health and environmental management system implementation, top management should provide the essential resources to ensure the success of the management system implementation. Top management should assign one staff who has a knowledge of safety and environment to implement the safety and environmental management system, moreover, the working team should be assigned and work together with the safety and environmental officer.

SMEs need a longer time to implement the safety, occupational health, and environmental management system than large enterprises because SMEs always focuses on their business survival. One staff needs to handle many tasks that make them have a limited time to create documents related to the safety, occupational health, and

environmental management system. An appropriate time for SMEs to implement the safety, occupational health and environmental management system should be at least one year.

To ensure the continual improvement of SMEs to elevate their safety, occupational health and environmental management system, the periodic audit should be carried out by third-party organization with the free of charge auditing fee. The free audit program should motivate all SMEs to implement the safety, occupational health and environmental management system continuously.

How to urge SMEs to aware of the benefits of safety, occupational health, and environmental management system?

The safety, occupational health and environmental management system for SMEs should be simple and easy to implement in their organization, additionally, the designed management system should match the characteristics of SMEs. The designed management system should focus on how to reduce the work-related accident cases in SMEs, that can encourage SMEs to aware of the positive consequence from the safety, occupational health, and environmental management system implementation. Moreover, the new design management system should reduce the loss in term of financial loss and non-financial loss. The last thing that should urge SMEs to implement the new design safety, occupational health and environmental management system is the implementation cost. The low cost of the management system implementation should be the first thing that can motivate SMEs to make a decision to implement the new design safety, occupational health, and environmental management system.

Which support from the government can encourage SMEs to implement safety, occupational health, and environmental management system effectively?

The government sector should provide the consultant with no expense to support SMEs that would like to improve their safety, occupational health and environmental performance of their sites. The surveillance audit program must be provided too to monitor the effectiveness of the safety, occupational health, and environmental management system implementation of SMEs. The surveillance audit should be carried out every year or every two years.

Both the consultant and surveillance audit program should be supported by the government sector with financial support.

Pornthip Sarnchua

Discussion with Pornthip Sarnchua, Occupational Health and Safety Consultant at NPC Safety and Environmental Service Co., Ltd.

The conversation took place on April 7, 2018.

How to design integrated safety, occupational health and environmental management system for SMEs?

The barriers that should consider designing the integrated safety, occupational health and environmental management system consist of 1) Most of the staff in SMEs always faces the busy task in their routine work, especially the office staff. It is difficult to assign more tasks to the office staff that why it's hard to implement the safety, occupational health, and environmental management system in SMEs. 2) As we know that the owner-manager does not familiar with safety, occupational health, and environmental management system because it's hard to access to the information and knowledge of safety, occupational health, and environmental management system, as well as technology to improve safety and environmental performance of their site. 3) Safety and environmental budget is another barrier that has a high consequence to impede SMEs to implement the safety, occupational health, and environmental management system, so the newly designed management system for SMEs should take a low cost of implementation. 4) SMEs cannot implement an existing safety, occupational health, and environmental management system because it takes more effort and resources. SMEs need a specific safety, occupational health, and environmental management system that suit them. 5) Moreover, the existing international management systems such as ISO 45001: 2018, ISO 14001: 2015 need to create many documents to fulfill its requirements and it's hard for SMEs to create such documents.

The motivator to lead SMEs to implement the safety and environmental management are 1) the organization structure of SMEs is a flat organization that the owner-manager has a full authorization to do everything by themselves. 2) The

communication in SMEs is quite good because the small number of employees that allow the manager to communicate new information to all employees quickly via any channels such as group meeting, monthly meeting. The rapid communication is an advantage of SMEs that easy to communicate safety, occupational health, and environmental management system among employees. 3) Additionally, the good relationship between the owner and employees can encourage a positive atmosphere when the owner-manager would like to implement the safety and environmental management system. Especially, the safety management system, it can reflect the intention of the owner-manager to protect the employees from any injuries and illness.

In my opinion, the requirement of the integrated safety, occupational health, and environmental management system should consist of:

- 1) Safety, occupational health, and environmental policy
- 2) Legal and other requirements
- 3) Objective
- 4) Competence, Training, and Awareness
- 5) Communication
- 6) Operational control
- 7) Contractor control
- 8) Emergency preparedness and response
- 9) Monitoring and measurement
- 10) Evaluation of compliance
- 11) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

The newly designed safety, occupational health and environmental management system for SMEs should not complex and need small effort to implement by SMEs. The requirements should be easy to understand and consider to avoid the creation of formal documents to fulfill the requirements of the management system. According to the limitation of SMEs in term of the internal expert who can implement the safety, occupational health, and environmental management system, if the management system needs many documents and hard to understand it will be the big problem to SMEs to implementing it.

How to urge SMEs to aware of the benefits of safety, occupational health, and environmental management system?

The government sector should promote a safety, occupational health and environmental management system proactively to ensure that SMEs will get the advantage information. The campaign and communication can be done via free seminar, invitation letter and many more channels. Especially, the government sector should give information about the advantages of safety, occupational health, and environmental management that SMEs can gain when they implemented such a management system. With the proactive communication should help SMEs to access to the new world of business development by using the safety, occupational health and environmental management system to enhance their business growth.

Which support from the government can encourage SMEs to implement safety, occupational health, and environmental management system effectively?

The government sector should provide the consultant with no expense to support SMEs that would like to improve their safety, occupational health and environmental performance of their sites. The training program should be included in the consultancy program to motivate the owner-manager and related employees to have good knowledge in safety and environment, moreover, the training program can change the employee's attitude to aware of the benefits of the safety, occupational health, and environmental management system. A timeframe of the management system implementation should take a longer time than the usual implementation time that should not less than one year.

Piyawun Jaroenroy

Discussion with Piyawun Jaroenroy, Freelance - Occupational Health, and Safety Consultant

The conversation took place on April 8, 2018.

How to design integrated safety, occupational health and environmental management system for SMEs?

In my opinion, designing of the integrate safety, occupational health and environmental management system should consider the following factors. 1) Limited manpower in SMEs, as we know one staff in SMEs always handle many roles and responsibilities that can be a barrier to implement a new management system in SMEs, 2) Most of the staff in SMEs always faces the busy task in their routine work, especially the office staff. It is difficult to assign more tasks to the office staff that why it's hard to implement the safety, occupational health, and environmental management system in SMEs. 3) SMEs always lack of budget to implement the safety, occupational health, and environmental management system that is the significant barrier to improve their safety and environmental performance. 4) SMEs lack of time to implement safety and environmental management system because they concentrate on their business and they would like to ensure that their business must be survived. Limitation of time in SMEs should be considered in the case of designing the safety and environmental management system for SMEs. 5) SMEs need specific safety, occupational health, and environmental management system because of the existing international management system such as ISO 14001, ISO 45001 hard to implement in their site with the limited resources, so the specific management system that suits the characteristic of SMEs will be better.

The advantages of SMEs that can motivate them to implement safety and environmental management system are 1) the organization structure of SMEs is a flat organization that the owner-manager has a full authorization to do everything by themselves. 2) The communication in SMEs is quite good because the small number of employees that allow the manager to communicate new information to all employees quickly via any channels such as group meeting, monthly meeting. The rapid communication is an advantage of SMEs that easy to communicate safety, occupational health, and environmental management system among employees. 3) According to the culture of SMEs, Informal work process is the most comfortable way for the employees in SME enterprises, the informal safety and environmental management system should be one motivator that makes the owner-manager and the employee interest in the safety and environmental management system.

The main requirements of integrated safety, occupational health, and environmental management system should consist of:

- 1) Safety, occupational health, and environmental policy
- 2) Objective
- 3) Legal and other requirements
- 4) Resources
- 5) Competence, Training, and Awareness
- 6) Communication
- 7) Control of documents
- 8) Operational control
- 9) Emergency preparedness and response
- 10) Monitoring and measurement
- 11) Incident investigation, nonconformity, and corrective action
- 12) Internal audit
- 13) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

The concept of PDCA (Plan-Do-Check-Action) cycle should be considered to design an integrated safety, occupational health, and environmental management system for SMEs. The new model should be simple and not complicated that can motivate SMEs to adopt such management system in their sites.

How to urge SMEs to be aware of the benefits of safety, occupational health, and environmental management system?

The government sector should provide the active communication to promote safety, occupational, and environmental management system to SMEs and make them aware of the positive consequence of the management system that can help to reduce accidents, illness, and property damage. Additionally, other benefits that can enhance their business such as a good reputation.

Which support from the government can encourage SMEs to implement safety, occupational health, and environmental management system effectively?

The government sector should provide the consultant with no expense to support SMEs that would like to improve their safety, occupational health and environmental

performance of their sites. The safety, occupational health, and environmental management system implementation in SMEs should be forced by law.

Surachai Sangkapong

Discussion with Surachai Sangkapong, Occupational Health and Safety Consultant at NPC Safety and Environmental Service Co., Ltd.

The conversation took place on April 9, 2018.

How to design integrated safety, occupational health and environmental management system for SMEs?

The barriers that should consider designing the integrated safety, occupational health and environmental management system consist of 1) SMEs lack of staff who has the experience to implement safety and environmental management system, Many SMEs do not hire the safety and environmental officer, 2) SMEs lack of budget to implement the safety, occupational health, and environmental management system, so the newly designed management system for SMEs should take a low cost of implementation, 3) Lack of information center to share the information about the safety, occupational health, and environmental management system for SMEs, 4) SMEs always focuses on their business and look like that they do not have more time to adopt safety, occupational health and environmental management system. They worry about how their business will be survived in the competitive market, 5) SMEs need specific safety, occupational health, and environmental management system because of the existing international management system such as ISO 14001, ISO 45001 hard to implement in their site with the limited resources, so SMEs need the specific management system. Additionally, 6) SMEs need the management system that generates less documents and they feel that the creation of new documents is the barrier to implement the safety, occupational health, and environmental management system.

The strengths of SMEs that can be the internal motivator to implement the safety, occupational health, and environmental management system are consist of 1) the organization structure of SMEs is a flat organization that the owner-manager has a full authorization to do everything by themselves. 2) The communication in SMEs is quite good because the small number of employees that allow the manager to

communicate new information to all employees quickly via any channels such as group meeting, monthly meeting. The rapid communication is an advantage of SMEs that easy to communicate safety, occupational health, and environmental management system among employees.

The main requirements the integrated safety, occupational health, and environmental management for SMEs should be as follows:

- 1) Needs and expectation of the interested parties
- 2) Safety, occupational health, and environmental policy
- 3) Objective
- 4) Legal and other requirements
- 5) Competence, Training, and Awareness
- 6) Communication
- 7) Operational control
- 8) Contractor control
- 9) Management of change
- 10) Emergency preparedness and response
- 11) Incident investigation, nonconformity, and corrective action
- 12) Internal audit
- 13) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

The newly designed integrated safety, occupational health, and environmental management system for SMEs should avoid the complexity of the requirements and reduce the quantity of the documents that need to generate to fulfill the management system. A simple safety, occupational health, and environmental management system can allow the small-sized enterprises to accept and adopt the management system in their sites.

How to urge SMEs to aware of the benefits of safety, occupational health, and environmental management system?

The government sector should educate SMEs to make them aware of the benefits that they can gain from the safety, occupational health, and environmental

management system, especially, the accident rate will be reduced, preventing the property damage, and improve the reputation from the point of view of the interested parties.

Which support from the government can encourage SMEs to implement safety, occupational health, and environmental management system effectively?

Thailand Institute of Occupational Safety and Health (TOSH) and the government sector should provide financial support via the consultancy program for SMEs to implementing the safety, occupational health, and environmental management system. The first target group of SMEs should be the high occupational health risk. The government should encourage a high-risk SMEs to attend the consultancy program, additionally, if the encouraged program cannot urge SMEs to attend the program the law should be applied to force them to implement the safety, occupational health, and environmental management system.

Theerayoot Kiatthavornchai

Discussion with Theerayoot Kiatthavornchai, Senior Safety and Occupational health consultant at NPC Safety and Environmental Service Co., Ltd.

The conversation took place on April 9, 2018

How to design integrated safety, occupational health and environmental management system for SMEs?

The barriers that should consider designing the integrated safety, occupational health and environmental management system consist of 1) SMEs lack of staff who has the experience to implement safety and environmental management system, Many SMEs do not hire the safety and environmental officer, 2) SMEs lack of time to implement safety and environmental management system because they concentrate on their business and they would like to ensure that their business must be survived. Limitation of time in SMEs should be considered in the case of designing the safety and environmental management system for SMEs.

The motivator to lead SMEs to implement the safety and environmental management the organization structure of SMEs is the flat organization that the owner-manager has a full authorization to do everything by themselves.

The essential requirements the integrated safety, occupational health, and environmental management for SMEs should be as follows:

- 1) Safety, occupational health, and environmental policy
- 2) Hazard identification and Risk assessment
- 3) Environmental aspect identification
- 4) Legal and other requirements
- 5) Competence, Training, and Awareness
- 6) Communication
- 7) Operational control
- 8) Monitoring and measurement
- 9) Evaluation of compliance
- 10) Internal audit
- 11) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

Participation of employees in the organization is the important factor that can drive the success of the safety, occupational health, and environmental management system implementation in SMEs. Participation of the employees can be encouraged by a training program that will introduce all employees to understand the benefits that they can gain from the management system implementation. Furthermore, the employees who implement the management system should have knowledge on how to implement such management system properly to ensure that the management system will be implemented continuously.

How to urge SMEs to aware of the benefits of safety, occupational health, and environmental management system?

The government sector should promote a safety, occupational health and environmental management system proactively to ensure that SMEs will get the advantage information. Moreover, the government sector should make the SMEs feels that the safety, occupational health, and environmental management system can pay

them back benefits such as a chance to do new business with a big partner, good reputation, reduce energy consumption, etc. Safety, occupational health, and environmental management system should embed into their business to enhance their business growth.

Which support from the government can encourage SMEs to implement safety, occupational health, and environmental management system effectively?

The government sector should provide the consultant with no expense to support SMEs that would like to improve their safety, occupational health and environmental performance of their sites. The training program should be included in the consultancy program to motivate the owner-manager and related employees to have good knowledge in safety and environment, moreover, the training program can change the employee's attitude to aware of the benefits of the safety, occupational health, and environmental management system.

Mujalin Saikliang

Discussion with Mujalin Saikliang, Lecturer- Occupational Health and Safety at Walailak University

The conversation took place on April 19, 2018.

How to design integrated safety, occupational health and environmental management system for SMEs?

In my opinion, designing of the integrate safety, occupational health and environmental management system should consider the following factors: 1) Limited manpower in SMEs, as we know one staff in SMEs always handle many roles and responsibilities that can be a barrier to implement a new management system in SMEs, 2) SMEs does not familiar with safety, occupational health, and environmental management system because it's hard to access to the information and knowledge of safety, occupational health, and environmental management system, as well as technology to improve safety and environmental performance of their site, 3) Lack of budget is another barrier that has a high consequence to impede SMEs to implement the safety, occupational health, and environmental management system, 4) Most of

SMEs cannot access to the information center that provided by the government sector, especially, the information in term of safety and environment, 5) SMEs lack of time to implement safety and environmental management system because they concentrate on their business and they would like to ensure that their business must be survived, 6) SMEs need specific safety, occupational health, and environmental management system because the existing international management system such as ISO 14001, ISO 45001 hard to implement in their site, and 7) The existing international standards such as ISO 45001 and ISO 14001 need many documents that SMEs cannot generate to fulfill the requirement, so the newly designed management system should generate fewer documents.

The advantages of SMEs that can motivate them to implement safety and environmental management system are 1) the organization structure of SMEs is flat organization that the owner-manager has a full authorization to do everything by themselves, 2) Close relationship among everyone in SMEs can enhance the participation of employees to implement the safety, occupational health, and environmental management system.

The main requirements of integrated safety, occupational health, and environmental management system should consist of:

- 1) Context of the organization
- 2) Safety, occupational health, and environmental policy
- 3) Hazard identification and risk assessment
- 4) Aspect identification
- 5) Objectives
- 6) Legal and other requirements
- 7) Resources
- 8) Competence, Training, and Awareness
- 9) Communication
- 10) Operational control
- 11) Monitoring and measurement
- 12) Evaluation of compliance
- 13) Internal audit
- 14) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

The government sector should force all SMEs strictly to hire professional safety officer at least 1 position in each site according to the Thai safety law that can help SMEs to implement safety, occupational health, and environmental management system appropriately. The specific safety, occupational health, and environmental management system should be designed and introduced to SMEs. Finally, the periodic monitoring program should be established to monitor the safety and environmental performance of SMEs.

How to urge SMEs to aware of the benefits of safety, occupational health, and environmental management system?

The program of safety, occupational health, and environmental campaign should be conducted by the government sector to educate the owner of SMEs and top management to understand the safety and environmental law, including the safety, occupational health, and environmental management system. Additionally, the competition program in term of safety and environment should be done by the government sector to motivate SMEs to improve their safety and environmental performance.

Which support from the government can encourage SMEs to implement safety, occupational health, and environmental management system effectively?

The cooperation among the government sectors should be done, especially, the cooperation with the local authority office and encourage the local authority officer to work closely with SMEs to improve safety and environmental performance. The local authority officer should take a role to supervise and monitor to ensure that SMEs comply with local safety and environmental law. The government sector should establish the safety and environmental club for SMEs to allow them to share safety and environmental information among SMEs, moreover, this club can promote the safety and environmental leader of SMEs.

Kannika Kamsrikaew

Discussion with Kannika Kamsrikaew, Safety, health, and environmental manager

The conversation took place on April 20, 2018.

How to design integrated safety, occupational health and environmental management system for SMEs?

The barriers that should consider designing the integrated safety, occupational health and environmental management system consist of 1) SMEs lack of staff who has the experience to implement safety and environmental management system, Many SMEs do not hire the safety and environmental officer, 2) SMEs cannot access to safety and environmental technology that can solve the safety and environmental problem, 3) SMEs lack of budget to implement the safety, occupational health, and environmental management system, so the newly designed management system for SMEs should take a low cost of implementation, 4) SMEs always focuses on their business and look like that they do not have more time to adopt safety, occupational health and environmental management system.

The strengths of SMEs that can be the internal motivator to implement the safety, occupational health, and environmental management system are consist of 1) the organization structure of SMEs is flat organization that the owner-manager has a full authorization to do everything by themselves, 2) The communication in SMEs is quite good because the small number of employees that allow the manager to communicate new information to all employees quickly. 3) A good relationship between employer and employee is another strength of SMEs that is an advantage to help SMEs to implement safety, occupational health and environmental management system successfully.

The main requirements the integrated safety, occupational health, and environmental management for SMEs should be as follows:

- 1) Safety, occupational health, and environmental policy
- 2) Hazard identification and risk assessment
- 3) Environmental aspect
- 4) Objective
- 5) Legal and other requirements
- 6) Resources
- 7) Competence, Training, and Awareness

- 8) Communication
- 9) Control of documents
- 10) Operational control
- 11) Procurement control
- 12) Contractor control
- 13) Management of change
- 14) Emergency preparedness and response
- 15) Monitoring and measurement
- 16) Evaluation of compliance
- 17) Incident investigation, nonconformity, and corrective action
- 18) Internal audit
- 19) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

Prior to adopting integrated safety, occupational health, and environmental management system in SMEs, the implementation plan should be established with the agreement of the relevant persons in the organization of SMEs. The follow-up program should be done periodically to ensure that all implementation plan has been done properly. The consultancy plan should be provided by the government sector to support SMEs without consultancy fee.

How to urge SMEs to aware of the benefits of safety, occupational health, and environmental management system?

The government sector should announce that SMEs must implement safety, occupational health, and environmental management system by law enforcement. The government sector should educate an owner-manager of SMEs to understand how safety, occupational health, and environmental management system can improve their business and how it can enhance the business growth, moreover, the integrated management system can improve the reputation of SMEs in term of safety and environment. Benefits of the safety, occupational health, and environmental management system should be offered to SMEs in term of tax benefit, reducing the insurance premium, etc.

Which support from the government can encourage SMEs to implement safety, occupational health, and environmental management system effectively?

A special fund for safety and environmental improvement in SMEs should be provided by the government sector that can urge SMEs to address any problems in term of safety and environment, and improve their work safely. Moreover, the information of fund for safety and environment improvement should be communicated to all SMEs because many SMEs do not know that the government supports the loan with a special interest for SMEs.

Prakaiwan Jitsopakul

Discussion with Prakaiwan Jitsopakul, Senior Safety and Occupational health consultant at NPC Safety and Environmental Service Co., Ltd.

The conversation took place on April 10, 2018

How to design integrated safety, occupational health and environmental management system for SMEs?

In my opinion, designing of the integrate safety, occupational health and environmental management system should consider the following factors. 1) Limited manpower in SMEs, as we know one staff in SMEs always handle many roles and responsibilities that can be a barrier to implement a new management system in SMEs, 2) SMEs does not familiar with safety, occupational health, and environmental management system because it's hard to access to the information and knowledge of safety, occupational health, and environmental management system, as well as technology to improve safety and environmental performance of their site, 3) SMEs lack of budget to implement the safety, occupational health, and environmental management system, so the newly designed management system for SMEs should take a low cost of implementation, 4) SMEs always concentrates on the business operation and have no time to implement new requirements that why the newly designed management system should consume a little time, 5) SMEs need specific safety, occupational health, and environmental management system because of the existing

international management system such as ISO 14001, ISO 45001 hard to implement in their site with the limited resources, so SMEs need the specific management system.

The strengths of SMEs that can be the internal motivator to implement the safety, occupational health, and environmental management system are consist of 1) the organization structure of SMEs is flat organization that the owner-manager has a full authorization to do everything by themselves, 2) The communication in SMEs is quite good because the small number of employees that allow the manager to communicate new information to all employees quickly via any channels such as group meeting, monthly meeting. The rapid communication is an advantage of SMEs that easy to communicate safety, occupational health, and environmental management system among employees, 3) Close relationship among everyone in SMEs can enhance the participation of employees to implement the safety, occupational health, and environmental management system, and 4) SMEs do not need a formal document to control their work, only essential documents will be generated and controlled.

The main requirements of integrated safety, occupational health, and environmental management system should consist of:

- 1) Context of the organization
- 2) Needs and expectations of the interested parties
- 3) Safety, occupational health, and environmental policy
- 4) Hazard identification and risk assessment
- 5) Aspect identification
- 6) Objectives
- 7) Legal and other requirements
- 8) Resources
- 9) Competence, Training, and Awareness
- 10) Communication
- 11) Control of document
- 12) Operational control
- 13) Procurement
- 14) Contractor control
- 15) Management of change

- 16) Incident investigation, nonconformity, and corrective action
- 17) Monitoring and measurement
- 18) Evaluation of compliance
- 19) Internal audit
- 20) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

Prior to implementing an integrated safety, occupational health, and environmental management system in SMEs, a gap analysis should be done to define the status of SMEs in term of their safety and environmental performance. The implementation plan should be established with the agreement of SMEs. The government sector should educate SMEs to know that an integrated safety, occupational health, environmental management system can identify all hazards and other risks of the organization that if all hazards and risks have been addressed it can ensure that the business will be operated smoothly. All information about the management system benefits should be communicated to SMEs that can motivate them to accept the new management system.

How to urge SMEs to aware of the benefits of safety, occupational health, and environmental management system?

The benefits integrated safety, occupational health, and environmental management system should be communicated to SMEs that motivate them to adopt the management system in their site. The benefits that should motivate SMEs can be defined as follows:

- 1) Reduce an accident
- 2) Reduce work-related illness
- 3) Legal compliance
- 4) Good reputation
- 5) Can integrate with other management systems (ISO 9001, ISO 14001)
- 6) Prevent the business interruption

Which support from the government can encourage SMEs to implement safety, occupational health, and environmental management system effectively?

The government sector should provide a consultancy program with financial support and consultation to SMEs. A candidate who takes a role of implementation person should be trained to ensure that they understand the requirements and can implement it by themselves. A loan with a low interest should be provided for SMEs to improve safety and environmental problems in case of budget needed. The surveillance audit program should be established to monitor the progress of the management system implementation. Finally, special benefits should be provided for SMEs such as tax reduction, special training fee, etc.

Wattana Promlai

Discussion with Wattana Promlai, Occupational Health and Safety Consultant at NPC Safety and Environmental Service Co., Ltd.

The conversation took place on April 20, 2018.

How to design integrated safety, occupational health and environmental management system for SMEs?

In my opinion, designing of the integrate safety, occupational health and environmental management system should consider the following factors. 1) Limited manpower in SMEs, as we know one staff in SMEs always handle many roles and responsibilities that can be a barrier to implement a new management system in SMEs, 2) SMEs does not familiar with safety, occupational health, and environmental management system because it's hard to access to the information and knowledge of safety, occupational health, and environmental management system, as well as technology to improve safety and environmental performance of their site, 3) SMEs lack of budget to implement the safety, occupational health, and environmental management system, 4) SMEs always concentrates on the business operation and have no time to implement new requirements that why the newly designed management system should consume a little time, 5) SMEs need specific safety, occupational health, and environmental management system because of the existing international

management system such as ISO 14001, ISO 45001 hard to implement in their site with the limited resources, so SMEs need the specific management system.

The strengths of SMEs that can be the internal motivator to implement the safety, occupational health, and environmental management system are consist of 1) the organization structure of SMEs is flat organization that the owner-manager has a full authorization to do everything by themselves, 2) The communication in SMEs is quite good because the small number of employees that allow the manager to communicate new information to all employees quickly via any channels such as group meeting, monthly meeting. The rapid communication is an advantage of SMEs that easy to communicate safety, occupational health, and environmental management system among employees, 3) Close relationship among everyone in SMEs can enhance the participation of employees to implement the safety, occupational health, and environmental management system, and 4) SMEs do not need a formal document to control their work, only essential documents will be generated and controlled.

An essential requirement that should be considered to design an integrated safety, occupational health, and environmental management system for SMEs should consist of:

- 1) Context of the organization
- 2) Needs and expectations of the interested parties
- 3) Safety, occupational health, and environmental policy
- 4) Hazard identification and risk assessment
- 5) Aspect identification
- 6) Objectives
- 7) Legal and other requirements
- 8) Resources
- 9) Competence, Training, and Awareness
- 10) Communication
- 11) Control of document
- 12) Operational control
- 13) Procurement
- 14) Contractor control
- 15) Management of change

- 16) Incident investigation, nonconformity, and corrective action
- 17) Monitoring and measurement
- 18) Evaluation of compliance
- 19) Internal audit
- 20) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

A gap analysis should be done to define the status of SMEs in term of their safety and environmental performance firstly. The implementation plan should be established with the agreement of SMEs. The government sector should educate SMEs to know that an integrated safety, occupational health, environmental management system can identify all hazards and other risks of the organization that if all hazards and risks have been addressed it can ensure that the business will be operated smoothly. All information about the management system benefits should be communicated to SMEs that can motivate them to accept the new management system.

How to urge SMEs to aware of the benefits of safety, occupational health, and environmental management system?

All benefits of the integrated safety, occupational health, and environmental management system for SMEs implementation should be communicated to the owner of SMEs that can make SMEs to interest to adopt new management system to their sites. The benefits of the management system should be focused as follows: 1) Reduce an accident, 2) Reduce work-related illness, 3) The compliance of legal and other requirements, 4) Good reputation in the point of view of the interested parties, 5) An integration with other management systems (ISO 9001, ISO 14001), and 6) Prevent the business interruption.

Which support from the government can encourage SMEs to implement safety, occupational health, and environmental management system effectively?

Financial support should be provided to SMEs that interested to adopt an integrated safety, occupational health, and environmental management system. A consultant is a key person who can guide and suggest SMEs implementing the

management system correctly. A training program should be provided to educate all relevant persons to understand all requirements. The surveillance audit program should be established to monitor the progress of the management system implementation. Finally, special benefits should be provided for SMEs such as tax reduction, special training fee, etc.

Haruetai Thaiyatham

Discussion with Haruetai Thaiyatham, Senior environmental consultant at NPC Safety and Environmental Service Co., Ltd.

The conversation took place on April 21, 2018

How to design integrated safety, occupational health and environmental management system for SMEs?

The barriers that should consider when designing the new integrated management system are consist of 1) SMEs lack of a staff who have a knowledge in safety and environment term, so new management system should simple and easy to implement, 2) SMEs cannot access information of safety and environmental management system, as well as the technologies related to safety and environment. Implementation manual should be established and provided to SMEs, 3) SMEs lack of budget to implement the safety, occupational health, and environmental management system, so the newly designed management system for SMEs should take a low cost of implementation.

The internal motivators that should be an advantages for SMEs are consist of 1) the organization structure of SMEs is flat organization that the owner-manager has a full authorization to do everything by themselves, 2) The communication in SMEs is quite good because the small number of employees that allow the manager to communicate new information to all employees quickly via any channels such as group meeting, monthly meeting. The rapid communication is an advantage of SMEs that easy to communicate safety, occupational health, and environmental management system among employees.

The main requirements of integrated safety, occupational health, and environmental management system should consist of:

- 1) Context of the organization
- 2) Needs and expectations of the interested parties
- 3) Safety, occupational health, and environmental policy
- 4) Hazard identification and risk assessment
- 5) Aspect identification
- 6) Objectives
- 7) Legal and other requirements
- 8) Resources
- 9) Competence, Training, and Awareness
- 10) Communication
- 11) Control of document
- 12) Operational control
- 13) Procurement
- 14) Contractor control
- 15) Management of change
- 16) Incident investigation, nonconformity, and corrective action
- 17) Monitoring and measurement
- 18) Evaluation of compliance
- 19) Internal audit
- 20) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

New designed integrated safety, occupational health, and environmental management system should reduce a document because SMEs always has a problem to generate many documents since they have many things to do in their business. Additionally, SMEs need a longer time to implement safety and environmental management system than large enterprise, so the implementation plan should be extended.

How to urge SMEs to aware of the benefits of safety, occupational health, and environmental management system

The government sector should educate an owner-manager of SMEs to understand how safety, occupational health, and environmental management system can improve their business and how it can enhance the business growth, moreover, the integrated management system can improve the reputation of SMEs in term of safety and environment. Benefits of the safety, occupational health, and environmental management system should be offered to SMEs in term of tax benefit, reducing the insurance premium, etc.

Which support from the government can encourage SMEs to implement safety, occupational health, and environmental management system effectively?

The government sector should provide a consultancy program with financial support and consultation to SMEs. A candidate who takes a role of implementation person should be trained to ensure that they understand the requirements and can implement it by themselves. A loan with a low interest should be provided for SMEs to improve safety and environmental problems in case of budget needed. The surveillance audit program should be established to monitor the progress of the management system implementation. Finally, the government sector should ensure that all essential resources have been supported for SMEs.

Suchart Juntavimaluang

Discussion with Suchart Juntavimaluang, Independent consultant-Occupational health, and safety

The conversation took place on April 21, 2018.

How to design integrated safety, occupational health and environmental management system for SMEs?

In my opinion, designing of the integrate safety, occupational health and environmental management system should consider the following factors: 1) Limited manpower in SMEs, as we know one staff in SMEs always handle many roles and responsibilities that can be a barrier to implement a new management system in SMEs, 2) Lack of budget is another barrier that has a high consequence to impede SMEs to implement the safety, occupational health, and environmental management system, 3)

SMEs lack of time to implement safety and environmental management system because they concentrate on their business.

The advantages of SMEs that can motivate them to implement safety and environmental management system are: 1) The flat organization of SMEs allow the owner-manager to make a decision to implement safety, occupational health, and environmental management system easily, 2) The flat organization is an advantage of the internal communication of SMEs that can be done quickly and ensure that everyone in the organization will be obtained all messages.

The main requirements of integrated safety, occupational health, and environmental management system should consist of:

- 1) Context of the organization
- 2) Needs and expectations of the interested parties
- 3) Safety, occupational health, and environmental policy
- 4) Hazard identification and risk assessment
- 5) Aspect identification
- 6) Objectives
- 7) Legal and other requirements
- 8) Resources
- 9) Competence, Training, and Awareness
- 10) Communication
- 11) Control of document
- 12) Operational control
- 13) Procurement
- 14) Contractor control
- 15) Management of change
- 16) Incident investigation, nonconformity, and corrective action
- 17) Monitoring and measurement
- 18) Evaluation of compliance
- 19) Internal audit
- 20) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

SMEs should set their target to implement an integrated safety, occupational health, and environmental management system, the first target is the certification of an integrated management system. Additionally, Surveillance audit programs should be done periodically to ensure that SMEs can maintain the management system and finally improve overall safety and environmental performance.

How to urge SMEs to aware of the benefits of safety, occupational health, and environmental management system?

The government sector should offer the special benefits for SMEs that implement safety, occupational health, and environmental management system in term of tax reduction, a special loan with low interest that could motivate SMEs to aware of the special benefits that they can get from safety and environmental management system implementation.

Which support from the government can encourage SMEs to implement safety, occupational health, and environmental management system effectively?

A special fund for safety and environmental improvement in SMEs should be provided by the government sector that can urge SMEs to address any problems in term of safety and environment, and improve their work safely. All benefits of the integrated safety, occupational health, and environmental management system for SMEs implementation should be communicated to the owner of SMEs that can make SMEs to interest to adopt new management system to their sites. The surveillance audit program should be established to monitor the progress of the management system implementation.

Kulisara Kralam

Discussion with Kulisara Kralam, Safety, Health and Environmental Manager at Senior Aerospace Co., Ltd.

The conversation took place on April 23, 2018

How to design integrated safety, occupational health and environmental management system for SMEs?

The barriers that should consider designing the integrated safety, occupational health and environmental management system consist of 1) SMEs lack of staff who has the experience to implement safety and environmental management system, Many SMEs do not hire the safety and environmental officer, 2) SMEs always focuses on their business and look like that they do not have more time to adopt safety, occupational health and environmental management system, 3) SMEs lack of budget to implement the safety, occupational health, and environmental management system, so the newly designed management system for SMEs should take a low cost of implementation.

The strengths of SMEs that can be the internal motivator to implement the safety, occupational health, and environmental management system are consist of 1) the organization structure of SMEs is a flat organization that the owner-manager has a full authorization to do everything by themselves that easy to decide to adopt new management system.

The main requirements the integrated safety, occupational health, and environmental management for SMEs should be as follows:

- 1) Context of the organization
- 2) Needs and expectations of the interested parties
- 3) Safety, occupational health, and environmental policy
- 4) Hazard identification and risk assessment
- 5) Environmental aspect
- 6) Objective
- 7) Legal and other requirements
- 8) Resources
- 9) Competence, Training, and Awareness

- 10) Communication
- 11) Control of documents
- 12) Operational control
- 13) Procurement control
- 14) Contractor control
- 15) Management of change
- 16) Emergency preparedness and response
- 17) Monitoring and measurement
- 18) Evaluation of compliance
- 19) Incident investigation, nonconformity, and corrective action
- 20) Internal audit
- 21) Management review

How to adopt integrated safety, occupational health and environmental management system in SMEs?

Newly design management system should be designed in a simple way and suited the context of SMEs by considering all limitation of SMEs. The timeframe of the implementation plan should be identified clearly and flexible for SMEs because SMEs need more time than larger enterprises. Additionally, an implementation plan should be accepted by the working team that can guarantee the success of the management system implementation.

How to urge SMEs to aware of the benefits of safety, occupational health, and environmental management system?

The benefits integrated safety, occupational health, and environmental management system should be communicated to SMEs that motivate them to adopt the management system in their site. The benefits that should motivate SMEs can be defined as follows: 1) Reduce an accident, 2) Reduce work-related illness, 3) The compliance of legal and other requirements, 4) Good reputation in the point of view of the interested parties, 5) An integration with other management systems (ISO 9001, ISO 14001), and 6) Prevent the business interruption that can maintain the business growth.

Which support from the government can encourage SMEs to implement safety, occupational health, and environmental management system effectively?

A training program should be provided for SMEs to educate SMEs about the safety, occupational health, and environmental management system that could make them understand and aware of the benefits that they can get from such management system. Moreover, the safety tour should be done to share a good safety and environmental practices of the site that can achieve to implement safety, occupational health, and environmental management system. The real experience of the achievement site could be the great motivator to urge other sites to implement such management system.

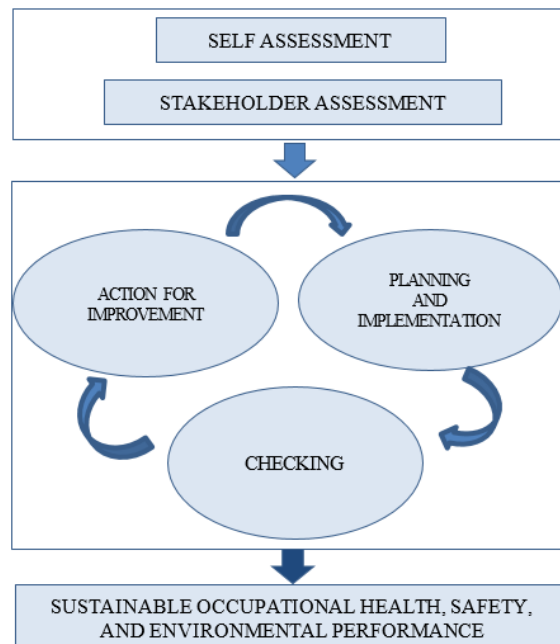
Appendix D

A manual for implementing an Integrated Safety, Occupational health and Environmental Management System for Small and Medium

A manual for implementing an Integrated Safety, Occupational health and Environmental Management System for Small and Medium

An Integrated Safety, Occupational Health and Environmental Management System for SMEs was designed by considering the limitation of SMEs in term of manpower, budget and time. An integrated management system can be adopted in SMEs to prevent an accident, work-related illness, and prevent environmental problems from the activities of the organization that can prevent the business disruption from a serious accident or any environmental issues. Additionally, an integrated management system can enhance the global competitive performance of SMEs that adopted such a management system.

1. The conceptual framework of safety, occupational health and environmental management system for SMEs



2. Definition

2.1 Safety, Occupational Health and Environmental Management System for SMEs:

Part of the management system for the organization to define and implement safety, occupational health and environmental policy and to cope with the business risks.

2.2 Interested party: person or group of people either working inside or outside the organization that can get the consequence from activities of the organization in term of safety, occupational health and environment.

2.3 Safety, occupational health, and environmental policy: intention and direction of the organization on safety, occupational health, and environmental management that is identified by top management

2.4 Top management: person or group of people who directs and controls an organization

2.5 Hazard: source with a potential to cause injury and ill health (ISO 45001:2018)

2.6 Hazard identification: a process of recognizing that a hazard exists and defining its characteristics (OHSAS 18001:2007)

2.7 Risk assessment: a process of evaluating the risk(s), taking into account the adequacy of any existing controls, and deciding whether or not the risk(s) is acceptable (OHSAS 18001:2007)

- 2.8 Environmental aspect: element of an organization's activities or products or services that interacts or can interact with the environment (ISO 14001:2015)
- 2.9 Environmental impact: change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects (ISO 14001:2015)
- 2.10 Environment: surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans and their interrelationships (ISO 14001:2015)
- 2.11 Occupational health and safety: conditions and factors that affect, or could affect, the health and safety of employees or other workers (including temporary workers and contractor personnel), visitors, or any other person in the workplace (OHSAS 18001:2007)
- 2.12 Safety, occupational health, and environmental legislation: safety, occupational health and environmental legislation related to an organization's activities
- 2.13 Safety, occupational health, and environmental objective: safety, occupational health and environmental goal that an organization sets itself to achieve
- 2.14 Document: information and its supporting medium (OHSAS 18001:2007)
- 2.15 Audit: systematic, independent and documented process for obtaining "audit evidence" and evaluating it objectively to determine the extent to which "audit criteria" are fulfilled (OHSAS 18001:2007)
- 2.16 Accident: an incident which has given rise to the injury, ill-health or fatality (OHSAS 18001:2007)
- 2.17 Nonconformity: non-fulfillment of a requirement (OHSAS 18001:2007)
- 2.18 Corrective action: action to eliminate the cause of nonconformity and to prevent a recurrence
- 2.19 Continual improvement: recurring activity to enhance performance
- 2.20 Self-assessment: process to understand the organization by identifying either positive or negative issues that affect the business and safety, occupational health and environmental management system.

3 Safety, Occupational Health and Environmental Management System for Small and Medium Enterprises - requirements

3.1 Self-assessment

1) Understanding the organization and its context

The organization shall define internal and external issues which affect business operation either positive or negative, as well as the issues which affect safety, occupational health and environmental management system.

2) Understanding the needs and expectations of interested parties

The organization shall define the interested parties that are relevant to safety, occupational health, and environmental management system, and what are the needs and expectations of these interested parties

3.2 Planning and implementation

1) Safety, occupational health, and environmental policy

Top management shall establish, implement and maintain the safety, occupational health and environmental management system and ensure that it;

(1) Is appropriate to the status of an organization, hazards and environmental aspects

(2) Provides a framework for safety, occupational health, and environmental objectives

(3) Includes a commitment to injury and illness prevention as well as pollution prevention from all activities of an organization

(4) Includes a commitment to fulfilling safety, occupational health and environmental legislation and related requirements

(5) Includes a commitment to continual improvement of the safety, occupational health and environmental management system

(6) Communicates the safety, occupational health and environmental policy within the organization

(7) Documents the safety, occupational health and environmental policy which is signed by top management

2) Identification of safety and environmental problems

(1) Hazard identification and risk assessment

The organization shall identify the hazards from all activities of the organization and activities of contractors and visitors inside the organization vicinity.

The organization shall determine the criteria for risk assessment.

The organization shall document and keep records of hazard identification and risk assessment

(2) Environmental aspects

The organization shall identify environmental aspects of its activities, products, and services that it can influence; the environmental impacts arising from normal, abnormal and emergency conditions.

The organization shall determine the criteria to clarify significant environmental aspects.

The organization shall document and keep the results of environmental aspect identification and assessment.

3) Objective and Mitigation plan

The organization shall establish safety, occupational health and environmental objectives to address significant aspects and hazards (4.4.3.2), issue referred to self-assessment (4.4.3.1) The environmental objectives shall be:

(1) Consistent with safety, occupational health, and environmental policy

(2) Measurable

(3) Communicated within the organization

When planning to achieve its safety, occupational health and environmental objectives, the organization shall determine:

(1) What will be done;

(2) Responsible person

(3) Time frame to achieve that objective

(4) Required resources

The organization shall follow up and monitor those objectives in the defined period.

4) Legal and other requirements

The organization shall identify a safety, occupational health and environmental legal and other requirements that are applicable to it and keep information up-to-date.

The organization shall periodically evaluate the compliance with applicable legal and other requirements and address the nonconformity to those applicable legal and other requirements.

The organization shall document and keep records of legal and other requirements identification and the results of the periodic evaluations.

5) Training

The organization shall provide safety, occupational health, and environmental training to ensure that workers will recognize the hazards, environmental aspects related to their works and on how to prevent that hazards and mitigate the environmental impacts. The topics of training shall be determined as follows:

- (1) Safety, occupational health, and environmental policy
- (2) Hazards and environmental aspects of their works and how to manage and control those hazards and environmental aspects
- (3) Roles and responsibilities related to safety, occupational health and environmental legal and other requirements

The effectiveness of the training shall be evaluated.

The organization shall document and keep records of the training.

6) Document

The organization shall establish the document control process to ensure that the documents in safety, occupational health and environmental management system for SMEs will be updated and ready to use according to the intention of such documents. The organization shall ensure that:

- (1) Documents have been approved prior to use
- (2) Changes and the current revision of documents are identified
- (3) Documents are reviewed and updated as necessary
- (4) Retention periods for all records are identified.

3.3 Checking

1) Internal audit

The organization shall conduct an internal audit. An audit frequency, audit method, the responsibilities of the auditors, audit reporting and audit criteria shall be defined. The organization shall establish an internal audit team.

The organization shall document and keep records of the internal audit programs.

2) Accident Investigation

The organization shall provide accident reports and identify a root cause if an accident takes place. The root causes must be addressed to prevent the recurrence of the accident. The results of the investigation shall be communicated with related employees. The organization shall document and keep the records of accident investigation as defined retention period.

3.4 Action for continual improvement

1) Corrective action

In case nonconformity has been found while implementing safety, occupational health and environmental management system for SMEs, the root cause of nonconformity shall be identified and addressed to prevent the recurrence. The organization shall document and keep the record of nonconformity.

2) Management review

Management review of the management system shall be carried out by top management at least once a year to ensure the effectiveness and continual improvement of such a management system. Inputs to management reviews shall include:

- (1) Follow-up actions from previous management reviews;
- (2) Safety, occupational health, and environmental policy;
- (3) Needs and expectations from stakeholders;
- (4) Significant hazards and environmental aspects;
- (5) Business risks;
- (6) Achievement of the action plan for risks and impacts

mitigation;

(7) Safety, occupational health, and environmental performance of the organization;

(8) Adequacy of resources;

(9) Recommendations for improvement.

The outputs of the management review shall be used to make a decision for the improvement of such a management system.

The organization shall document and keep the record of management review.

Implementation step of an Integrated Safety, Occupational Health, and Environmental Management System for SMEs

The implementation of an Integrated Safety, Occupational Health, and Environmental Management System can be defined as the following steps:

No.	Step of implementation
1	Conduct the self-assessment
2	Define safety, occupational health, and environmental policy
3	Hazard identification and hazard assessment
4	Environmental aspect identification and the impact assessment
5	Provide the list of safety, occupational health, and environmental legal and other requirements, and the evaluation of compliance
6	The establishment of the mitigation plan and the plan for the achievement
7	Safety, Occupational Health, and Environmental Training program
8	Conduct an internal audit of An Integrated Safety, Occupational Health, and Environmental Management System for SMEs
9	Corrective action of non-conformity
10	Management review and the improvement of An Integrated Safety, Occupational Health, and Environmental Management System for SMEs

Step 1: Conduct the self-assessment

Self-assessment

1) Understanding the organization and its context

The organization shall define internal and external issues which affect business operation either positive or negative, as well as the issues which affect safety, occupational health and environmental management system.

2) Understanding the needs and expectations of interested parties

The organization shall define the interested parties that are relevant to safety, occupational health and environmental management system, and what are the needs and

In this step, the self-assessment should be carried out first to define the internal and external issues which affect the business operation and the environment, occupational health and safety performance of the organization. Furthermore, the organization shall identify all interested parties that affect or may affect to the Safety, Occupational Health and Environmental management system of the organization and identify what is the needs and expectations of these interested parties.

In this manual, SWOT Analysis has been used to identify internal and external issues affect the purpose of the organization. According to the SWOT analysis, the organization can identify strengths and weaknesses of the organization, moreover, threats and opportunities of the organizations shall be defined also with the details as follow.

Strengths: An advantage of the internal issues of the organization such as financial status, production, and manpower that the organization can use the advantages to establish organization strategies.

Weaknesses: A disadvantage of the internal issues of the organization such as lack of financial, unclear policy and business direction, unqualified manpower in the organization that the organization needs to eliminate those internal issues for the business improvement.

Opportunities: Opportunities are classified as external elements that might be helpful in achieving the goals set for the organization. The opportunities should be considered from an external element, such as economic, social, political, technology

and the market competition that the organization can take advantage of those external elements.

Threats: These external factors could gravely affect the success of the business. The possible threats that are critical to any SWOT analysis include increasing gasoline price and economic crisis. Some other threats include trend changes, new regulations, and new substitute products.

Internal issues identification

The organization should analyze the existing resources and all capabilities to identify the strengths and weaknesses. Data for the analysis should consist of all resources, organizational structure, procedure, organization culture, and the previous of organization performance.

External issues identification

According to the external element that is the threats and opportunities that affect the organization. The external issues include economic expansion, country policy, social, and political issues.

An Example of SWOT Analysis

Strengths

Strong brand names	High technology of quality checking
The skill of organization staff	A high portion of market share
The modern style of packaging	Cost advantage
Good location	Fulfillment of customer satisfaction
Good reputation	Sole manufacturer
Good campaign	High technology of production system

Weaknesses

No variety of product	Small production line
The product price is higher than a competitive manufacturer	The high cost of production

The product cannot meet customer satisfaction	Lack of manpower
Insufficient financial	Selling channel is not enough
The low capability of production	Lack of budget for product promotion

Opportunities

Low competitive in the market	Good attitude of the customer to the brand
The competitor stops to run the business	Economic growth
The increasing of customers	Many distributors in the market
Market expansion	New technology is an advantage for the business
Promotion of the government sector	

Threats

The raw material cost increase	Price of the products is limited by the dealer
A new competitor in the market	Economic crisis
New rules and regulations	Customers change their tastes
The competitor pays a big budget for product advertisement	The number of customers decreased
Substitution product in the market	

SWOT analysis form for self-assessment has been created as form No. 1 below.

Form 1 Organization self-assessment

	Strengths		Weaknesses
<input type="checkbox"/>	Good quality of product	<input type="checkbox"/>	Product price higher than the competitor
<input type="checkbox"/>	Good skill of employees	<input type="checkbox"/>	Lack of finance
<input type="checkbox"/>	Strong brand names	<input type="checkbox"/>	Lack of manpower
<input type="checkbox"/>	Good location	<input type="checkbox"/>	Old machine

	Strengths		Weaknesses
<input type="checkbox"/>	A good quality checking process	<input type="checkbox"/>	Low production capacity
<input type="checkbox"/>	Good reputation	<input type="checkbox"/>	The high cost of production
<input type="checkbox"/>	High technology of machine	<input type="checkbox"/>	The low skill of employees
<input type="checkbox"/>	Low cost of production	<input type="checkbox"/>	A lot of customer complaints
<input type="checkbox"/>	High market share	<input type="checkbox"/>	Lack of safety and environmental specialist
<input type="checkbox"/>	Fulfill customer satisfaction	<input type="checkbox"/>	A high rate of accident
<input type="checkbox"/>	The strong commitment of the top management in safety and environment improvement	<input type="checkbox"/>	Lack of budget for safety and environmental improvement
<input type="checkbox"/>		<input type="checkbox"/>	
<input type="checkbox"/>		<input type="checkbox"/>	
	Opportunities		Threats
<input type="checkbox"/>	Low competition in the business	<input type="checkbox"/>	The raw material cost increased
<input type="checkbox"/>	The number of customers increased	<input type="checkbox"/>	Economic crisis
<input type="checkbox"/>	Business promotion from the government	<input type="checkbox"/>	New rules and regulations
<input type="checkbox"/>	Economic growth	<input type="checkbox"/>	The number of customers decreased
<input type="checkbox"/>	Market expansion	<input type="checkbox"/>	A new competitor in the market
<input type="checkbox"/>	New production technology	<input type="checkbox"/>	Substitution product in the market
<input type="checkbox"/>	Competitors stop their business	<input type="checkbox"/>	Gasoline price increased
<input type="checkbox"/>	The government provides a loan with low interest for safety and environmental improvement	<input type="checkbox"/>	
<input type="checkbox"/>	The government promotes safety and environmental management system	<input type="checkbox"/>	
<input type="checkbox"/>		<input type="checkbox"/>	

	Strengths		Weaknesses
<input type="checkbox"/>		<input type="checkbox"/>	
<input type="checkbox"/>		<input type="checkbox"/>	
<input type="checkbox"/>		<input type="checkbox"/>	

Identify the needs and expectations of interested parties in term of safety, occupational health, and environment

To ensure the sustainable safety, occupational health, and environment, as well as fulfills the needs and expectation of all interested parties, the organization needs to identify the interested parties related to its purpose and its safety, occupational health and environmental management system. Additionally, the organization needs to identify the needs and expectations of all interested parties. The example of interested parties and their needs and expectations can be shown in form 2.

Form 2 Needs and expectations of the interested party identification

	Interested party	Need and expectation
<input type="checkbox"/>	Internal interested party	
<input type="checkbox"/>	Top management	Well risk management and business growth
<input type="checkbox"/>	Employee	A safe workplace and good wage
<input type="checkbox"/>	Union representative	Safe workplace
<input type="checkbox"/>	Contractor	Safe workplace
<input type="checkbox"/>	Business owner/Shareholder	Well risk management and business growth
<input type="checkbox"/>		
<input type="checkbox"/>		
<input type="checkbox"/>		
	External interested party	
<input type="checkbox"/>	Government sector	The organization complies with the regulations
<input type="checkbox"/>	Customer	Good product and on-time delivery, Protect all employees from an accident, Environmental friendly
<input type="checkbox"/>	Distributor	Need good product
<input type="checkbox"/>	Insurance	Well risk management

	Interested party	Need and expectation
<input type="checkbox"/>	Business partner	Good reputation, well risk management, and continuous growth
<input type="checkbox"/>	Chamber of commerce	Compliance with the agreement of the chamber of commerce
<input type="checkbox"/>	Community	No bad odor and noise
<input type="checkbox"/>		

Step 2: Safety, Occupational Health, and Environmental Policy Establishment

Planning and implementation

1) Safety, occupational health and environmental policy

Top management shall establish, implement and maintain a safety, occupational health and environmental management system and ensure that it;

- (1) Is appropriate to the status of an organization, hazards and environmental aspects
- (2) Provides a framework for safety, occupational health and environmental objectives
- (3) Includes a commitment to injury and illness prevention as well as pollution prevention from all activities of an organization
- (4) Includes a commitment to fulfilling safety, occupational health and environmental legislation and related requirements
- (5) Includes a commitment to continual improvement of the safety, occupational health and environmental management system
- (6) Communicates the safety, occupational health and environmental policy within the organization
- (7) Documents the safety, occupational health and environmental policy which is signed by top management

The information of self-assessment will be used to identify the safety, occupational health, and environmental policy.

Example of a Safety, Occupational Health, and Environmental Policy

Safety, Occupational Health, and Environmental Policy Rak Thai Co., Ltd

Rak Thai Company Limited has a commitment to manage safety, occupational health, and environmental protection by adopting the integrated safety, occupational health and environmental management system in the organization with the following commitment:

1. Comply with safety, occupational health, and environmental legal and other requirements
2. Prevent work related injury and illness of all employees
3. Prevent pollution from the organization activities
4. Improve safety, occupational health, and environmental management system continuously

To ensure the achievement of the safety, occupational health, and environmental policy above, the organization needs a good cooperation from all employees to follow and implement a policy strictly.

(Mr. Rak Plodpai)
Managing Director
12 June 2018

Step 3: Hazard Identification and Hazard Assessment

Planning and implementation

2) Identification of safety and environmental problems

(1) Hazard identification and risk assessment

The organization shall identify the hazards from all activities of the organization and activities of contractors and visitors inside the organization vicinity.

The organization shall determine the criteria for risk assessment.

The organization shall document and keep records of hazard identification and risk assessment

Provide the list of all tasks of each position according to the job description, and find the unsafe conditions in the workplace.

The organization provides the list of all positions and list the tasks for each position with the following steps:

1. Identify the job position and all tasks
 - (1) List the position of your organization
 - (2) Identify all tasks of the position
2. Survey all areas to find the unsafe condition that can be a source of hazard.

Example Task identification and workplace survey

Job position and task form

Position	Task
1.Operator	1. Chemical transfer
	2. Operate machine
	3. Machine cleaning
	4. Drive forklift
	5. Record the data by computer
	6. Machine daily inspection

Workplace survey form

Area	Unsafe Condition
1.Production area	<ol style="list-style-type: none"> 1. Machine lubricant dropped on the floor 2. No label and safety data sheet for chemical storage 3. Wood pallet obstructed the exit door 4. Dust in the workplace
2.Raw material building	<ol style="list-style-type: none"> 1. Unsecured materials on rack 2. A fire extinguisher is not working 3. Chemical spilled on the floor 4. Pallet stacking higher than the standard criteria
3.Maintenance shop	<ol style="list-style-type: none"> 1. No machine guarding 2. The gas cylinder was not secured to prevent the falling 3. Flammable liquid was kept in the welding area 4. The fire extinguisher is not working

The first step of hazard identification and risk assessment is identifying a source of hazards.

1. Machine, Equipment, and Vehicle
 - Fixed machine
 - Movable machine
 - Tool
 - Forklift
 - Hand lift
 - Truck
2. Chemical
 - Lube oil
 - Coolant
 - Solvents such as Toluene, Methyl ethyl ketone
3. Physical
 - Heat from a furnace, oven
 - Noise from the press machine
 - Light from welding
 - Insufficient light intensity
4. Energy
 - Electrical
 - Hydraulic
 - Air
 - Steam
5. Biological hazard
 - Poisonous animal
 - Poultry
 - Vectors such as mice and cockroach
 - Virus, bacteria, and fungi
6. Ergonomics
 - Awkward position
 - Badly designed workstation
 - Improper tools
7. Compressed gas cylinder
 - Acetylene
 - Argon
 - Carbon dioxide
 - Oxygen
 - LPG

Identify the description of hazards from each source of hazards

Source of hazard	Description of hazard
1. Machine, Equipment, and Vehicle <input type="checkbox"/> Fixed machine <input type="checkbox"/> Movable machine <input type="checkbox"/> Tool <input type="checkbox"/> Forklift <input type="checkbox"/> Hand lift <input type="checkbox"/> Truck	Cut, amputation, hit Cut, amputation, hit Cut, hit Hit by forklift Hit by hand lift Hit by truck
2. Chemical <input type="checkbox"/> Lube oil <input type="checkbox"/> Coolant <input type="checkbox"/> Solvents such as Toluene, Methyl ethyl ketone	Chemical splashes into the eye and cause irritation
3. Physical <input type="checkbox"/> Heat from a furnace, oven <input type="checkbox"/> Noise from the press machine <input type="checkbox"/> Light from welding <input type="checkbox"/> Insufficient light intensity	Burn, Heatstroke Hearing loss Eye irritation Eye pain
4. Energy <input type="checkbox"/> Electrical <input type="checkbox"/> Hydraulic <input type="checkbox"/> Air <input type="checkbox"/> Steam	Electrical shock Lack of energy isolation cause unintended machine working Air pressure hit the body Burn
5. Biological hazard <input type="checkbox"/> Poisonous animal <input type="checkbox"/> Poultry <input type="checkbox"/> Vectors such as mice and cockroach <input type="checkbox"/> Virus, bacteria, and fungi	Bite by a poisonous animal Infection Infection Infection
6. Ergonomics <input type="checkbox"/> Awkward position <input type="checkbox"/> Badly designed workstation <input type="checkbox"/> Improper tools	Neck pain, backache from an awkward position Neck pain, backache from an awkward position Hand and Wrist pain
7. Compressed gas cylinder <input type="checkbox"/> Acetylene <input type="checkbox"/> Argon <input type="checkbox"/> Carbon dioxide	Fire from gas leakage Asphyxiation Asphyxiation

Source of hazard	Description of hazard
<input type="checkbox"/> Oxygen <input type="checkbox"/> LPG	Fire from gas leakage Fire from gas leakage

Risk Assessment

The hazards from all sources will be assessed to identify the level of hazard by considering the likelihood and severity as follows.

1. Likelihood ratings

Likelihood of hazard can be classified into 3 levels

- (1) High (3)
Likely to be experienced once or twice a year by an individual
- (2) Medium (2)
May be experienced once every five years by an individual
- (3) Low (1)
May occur once during a working lifetime

2. Severity ratings

- (1) High (3)
Major fracture, poisoning, significant loss of blood, serious head injury, or fatal disease
- (2) Medium (2)
Sprain, strain, localized burn, dermatitis, asthma, an injury requiring days off work
- (3) Low (1)
An injury that requires first aid only; short-term pain, irritation, or dizziness

Risk ranking can be identified by using the risk matrix as follows.

Risk Matrix

Likelihood	Severity		
	High (3)	Medium (2)	Low (1)
High (3)	Unacceptable risk (9)	High risk (6)	Medium risk (3)
Medium (2)	High risk (6)	Medium risk (4)	Acceptable risk (2)
Low (1)	Medium risk (3)	Acceptable risk (2)	Low risk (1)

The cells in the risk matrix correspond to a risk level, as shown as bellows.

Low level	Score 1
Acceptable risk	Score 2
Medium risk	Score 3-4
High risk	Score 6
Unacceptable level	Score 9

Hazard identification and risk assessment form has been created as form No. 3 in this manual.

Example of hazard identification and risk assessment

Hazard identification			Risk Assessment		
Task/Area	Source of hazard	Description of hazard	Likelihood	Severity	Risk Ranking
Task					
Metal stamping	Press machine	Press machine presses an operator's finger	1	3	Medium risk
	Noise from the press machine	Hearing loss from noise exposure for a long time	1	2	Acceptable risk
	Badly designed workstation	A high workstation that makes an operator lift his shoulder all the time and induce a shoulder pain	2	1	Acceptable risk
Area					
Warehouse	Forklift	Forklift condition is not ready to use	2	2	Medium risk
	Good pallet	Stack the pallet higher than the standard level tend to fall	1	3	Medium risk
Maintenance shop	Shop floor	Wet floor and easy to slippery	1	2	Acceptable risk
	Flammable container	Flammable liquid has been kept in the welding area and has the potential to fire accident	1	3	Medium risk

Step 4: Environmental Aspect Identification and Impact Assessment

Planning and implementation

2) Identification of safety and environmental problems

(2) Environmental aspects

The organization shall identify environmental aspects of its activities, products and services that it can influence; the environmental impacts arising from normal, abnormal and emergency conditions.

The organization shall determine the criteria to clarify significant environmental aspects.

The organization shall document and keep the results of environmental aspect identification and assessment.




The organization identifies the environmental aspect by drawing an environmental layout mapping and identify an environmental aspect in each area according to the process flow and other supporting activities.

1. Environmental layout: Water consumption and wastewater
 - 1) A major area of water consumption
 - 2) A leak of piping and drainage system
 - 3) Chemical spillage area
 - 4) Discharge point of wastewater
 - 5) Washing area
2. Environmental layout: Soil and storage
 - 1) Underground fuel and chemical storage
 - 2) Outside storage of drums and bins
 - 3) Soil contamination
3. Environmental layout: Air, odors, noise, dust
 - 1) The high concentration of vapor area
 - 2) Dust area
 - 3) Noise area
4. Environmental layout: Energy consumption
 - 1) Location of heavy machinery
 - 2) Useless lighting

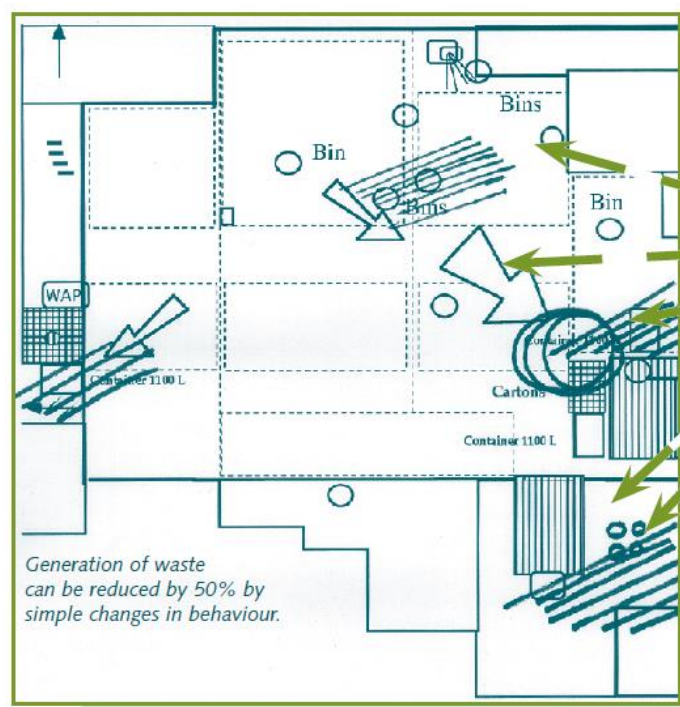
- 3) Area of heat loss
5. Environmental layout: Waste producing and recycling
 - 1) Bins and containers
 - 2) Areas of wrong waste separation
 - 3) Old useless machinery

Draw the outline of the site to scale, showing the interior spaces. This map should be copied (5 times) and will be the basis for the work to be done.

In terms of environmental management and impact, those symbols also mean:

	Frequency	Severity
	Happen occasionally	Small impact
	Happens regularly	Can be diminished
	Happens every day	Bad and irreversible

Example of environmental layout: waste



Identify the cause of impact

Identify all activities of each department with reference to the environmental layout by fill form 3 (Environmental aspect identification and impact assessment form), next identify the input and output of each activity. The organization shall take into account:

- An event in the past, present and in the future
- Direct (D) and indirect (I) activities
- An event occurs in Normal (N), Abnormal (A), and Emergency (E)
- Such an event impact on air, water, organism, and resources

Identify the causes of the impact of input (raw material, energy, etc.), output (product, by-product, waste), and identify the environmental impact.

Environmental impact assessment

The organization needs to identify the severity of impact and occurrence of impact and using the environmental risk matrix.

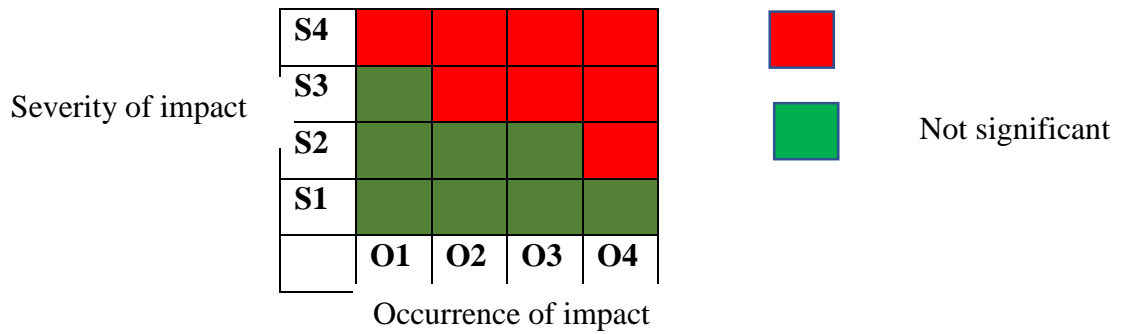
Occurrence of Impact

Level	Occurrence	Resource
O1	In case of an emergency only	Less amount of use with a good control program
O2	In case of abnormal only	Less amount of use without control program
O3	Lack of training for the operator, No preventive maintenance of equipment	A high amount of use with a good control program
O4	Normally occur	A high amount of use without control program

Severity of Impact

Level	Severity	Resource
S1	Low impact, hard to detect, No legal and other requirement concerning	Recyclable
S2	Short term impact on a limited area, legal and other requirements concerning but comply with legal and other requirements	Renewable resources that can substitute within 10 years such as electricity

S3	Short term impact on a limited area, legal and other requirements concerning but lack of compliance audit process	Renewable resources that can substitute within 10-30 years such as tree
S4	The high impact of health and safety of the community, legal and other requirement concerning but the environmental measurement result is not complying with the requirements, or get a complaint from an interested party	Cannot substitute within 50 years such as fuel oil, natural gas, mineral, etc.



ทะเบียนสาเหตุที่ก่อให้เกิดผลกระทบสิ่งแวดล้อม																			
S4					ส่วนงาน	Administration							จัดทำโดย	วันที่					
S3					ฝ่าย	Power Plant Office							อนุมัติโดย	วันที่					
S2					กิจกรรม	ทำความสะอาดโรงงาน							Rev. No. 2	หน้า 1					
S1	5			1	สาเหตุที่ก่อให้เกิดผลกระทบ			มีผลกระทบต่อ				นัยสำคัญ		การควบคุมการดำเนินงาน	วัตถุประสงค์และเป้าหมาย, โครงการ				
	O1	O2	O3	O4	Direct	Indirect	Normal	Abnormal	Emergency	อากาศ	น้ำ	ดิน	เสียง	สิ่งมีชีวิต	ทรัพยากร	ความรุนแรง (Severity 1-4)	โอกาส (Occurrence 1-4)	(เลขที่อ้างอิง)	(เลขที่อ้างอิง)
Input					Output														
ไม่กวด					D		N								x	S1	O1		
ที่โดยยะ					D		N								x	S1	O1		
ถึงใส่ยะ					D		N								x	S1	O1		
ถุงดำ					D		N								x	S1	O1		
น้ำ					D		N								x	S1	O1		
					D		N									S3	O2	EI-001	EMP-001
					D			A			x	x				S4	O3	EI-001	EMP-001
					D			A						x		S2	O2	EI-001	EMP-001
					D		N				x	x				S1	O4	EI-001	EMP-001

Source to update safety, occupational health, and environmental legal and other requirements;

- <http://www.oshthai.org/>
- <http://www.diw.go.th/>
- <http://www.krisdka.go.th>
- <http://www.ratchakitcha.soc.go.th>

Example of legal and other requirements list

ทะเบียนกฎหมายความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานสำหรับสถานประกอบกิจการขนาดกลางและขนาดเล็ก พระราชบัญญัติความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔							
ลำดับ	ประเภท	รายชื่อกฎหมาย	วันที่ประกาศ ในราชกิจจานุ เบกษา	สิ่งที่ต้องปฏิบัติตาม	ผู้รับ ผิดชอบ	การประเมินการปฏิบัติ ตามกฎหมาย	
						ปฏิบัติตาม	ไม่ปฏิบัติตาม
1	พระราชบัญญัติ	พระราชบัญญัติความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔	๑๗ มกราคม พ.ศ. ๒๕๕๔	จัดและดูแลสถานประกอบกิจการและลูกจ้างให้มีสภาพการทำงานและสภาพแวดล้อมในการทำงานที่ปลอดภัยและถูกสุขลักษณะ รวมทั้งส่งเสริม สนับสนุนการปฏิบัติงานของลูกจ้างมิให้ลูกจ้างได้รับอันตรายต่อชีวิต ร่างกาย จิตใจและสุขภาพอนามัย ในกรณีที่พระราชบัญญัตินี้กำหนดให้นายจ้างต้องดำเนินการอย่างหนึ่งอย่างใดที่ ต้องเสียค่าใช้จ่ายให้นายจ้างเป็นผู้ออกค่าใช้จ่าย ให้นายจ้างบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัยและ สภาพแวดล้อมในการทำงาน ให้เป็นไปตามมาตรฐานที่กำหนดในกฎกระทรวง ให้ลูกจ้างมีหน้าที่ปฏิบัติตามหลักเกณฑ์ด้านความปลอดภัย อาชีวอนามัยและ สภาพแวดล้อมในการทำงานตามมาตรฐานที่กำหนด			
1.1	กฎกระทรวง	กฎกระทรวงกำหนดมาตรฐานในการบริหารและการจัดการ ด้าน ความปลอดภัย อาชีว อนามัย และ สภาพแวดล้อมในการทำงาน ในที่ อับอากาศ พ.ศ. ๒๕๔๗ [ออกตาม ความในพระราชบัญญัติคุ้มครอง แรงงาน พ.ศ. ๒๕๔๑]	๑๐ มิถุนายน พ.ศ. ๒๕๔๗	- จัดทำป้ายแจ้งข้อความว่า “ที่อับอากาศ อันตราย ห้ามเข้า” ให้มีขนาดมองเห็น ได้ชัดเจน ติดตั้งไว้โดยเปิดเผยบริเวณทางเข้าออกของที่อับอากาศทุกแห่ง ห้ามอนุญาตให้ลูกจ้างหรือบุคคลใดเข้าไปในที่อับอากาศหากู้หรือควรรู้ว่า ลูกจ้างหรือบุคคลนั้นเป็นโรคเกี่ยวกับทางเดินหายใจ โรคหัวใจ หรือโรคอื่นซึ่ง แพทย์เห็นว่า การเข้าไปในที่อับอากาศอาจเป็นอันตรายต่อบุคคลดังกล่าว			

Step 6: The Establishment of the Mitigation Plan and the Plan for the Achievement

Objective and Mitigation plan

The organization shall establish safety, occupational health and environmental objectives to address significant aspects and hazards, issue referred to self-assessment. The environmental objectives shall be:

- (1) Consistent with safety, occupational health and environmental policy
- (2) Measurable
- (3) Communicated within the organization

When planning to achieve its safety, occupational health and environmental objectives, the organization shall determine:

- (1) What will be done;
- (2) Responsible person
- (3) Time frame to achieve that objective
- (4) Required resources

The organization shall follow up and monitor those objectives in the defined period.

Form No.6 Objective and Mitigation plan

Project: Accident prevention of NaOH transfer	Project owner: Production Manager
Objective: Prevent an accident from NaOH transfer	Target: No accident case from NaOH transfer
KPI: Number of accident case	Date: Revision :

No	Activity	Responsible person	Resource	Due date	Time frame								Remark	
					1	2	3	4	5	6	7	8		
1	Provide the lift equipment for NaOH drum	Maintenance supervisor	100,000 THB	28/02/2018	←	→								
2	Establish lifting work instruction	Production supervisor	-	30/03/2018			←	→						
3	Conduct training session for lifting work instruction	Production supervisor	1,000 THB	30/04/2018				←	→					
4	Conduct chemical safety training	Safety officer	5,000 THB	30/04/2018				←	→					
5	Provide personal protective equipment	Safety officer	30,000 THB	30/05/2018					←	→				
6	Monitoring NaOH transfer activity	Production supervisor	-	30/06/2018						←	→			
7	Project conclusion	Production manager	-	31/08/2018								←	→	

Step 7: Establish Safety, Occupational Health, and Environmental Training program

Training

The organization shall provide safety, occupational health and environmental training to ensure that workers will recognize the hazards, environmental aspects related to their works and on how to prevent that hazards and mitigate the environmental impacts. The topics of training shall be determined as follows:

- (1) Safety, occupational health and environmental policy
- (2) Hazards and environmental aspects of their works and how to manage and control those hazards and environmental aspects
- (3) Roles and responsibilities related to safety, occupational health and environmental legal and other requirements

The effectiveness of the training shall be evaluated.

The organization shall document and keep records of the training.

The organization shall establish safety, occupational health, and environmental training plan according to form No.7

Form No.7 Safety, occupational health, and environmental training plan

Safety, Occupational Health, and Environmental training plan	
Company :	Date :
Prepared by :	Revision :
Approved by :	Page : _1_/_1_

Training course	Frequency	Participant	Training method	Plan			
				1	2	3	4
Safety and environment for newcomer	Before starting work	Newcomer	Classroom				
Environmental issues and how to address the issues	Before starting work	Newcomer	Classroom				

Step 8: Conduct an Internal Audit of An Integrated Safety, Occupational Health, and Environmental Management System for SMEs

Checking

1) Internal audit

The organization shall conduct an internal audit. An audit frequency, audit method, the responsibilities of the auditors, audit reporting and audit criteria shall be defined. The organization shall establish internal audit team.

The organization shall document and keep records of the internal audit

Form No.10 Internal audit plan

Rak Thai Co., Ltd		Management system : An Integrated safety, occupational health, and environmental management system for SMEs		
		Scope: Plant 1		
Date	Time	Team 1	Team 2	Team 3
11/12/2018	8.30-8.45 a.m.	Opening meeting		
	8.45-12.00 p.m.	- Understanding the organization and its context - The needs and expectations of interested parties - Safety, occupational health, and environmental policy	- Identification of safety and environmental problems - Objective and Mitigation plan	- Internal audit - Accident investigation
	1.00-4.00 p.m.	- Legal and other requirements	- Training - Document	- Corrective action - Management Review
	4.00-4.30 p.m.	Conclusion by auditor		
	4.30-4.45 p.m.	Closing meeting		

Form No.11 Internal audit form

Audit Checklist				Page _____ / _____		
Procedure/WI : Document Code :		Auditee : Department :		Audit date : Auditor :		
Audit checklist	Evidence	Audit Finding	C	NC	OBS	
<u>Remark</u> : C = CONFORMANCE NC = NON-CONFORMANCE OBS= OBSERVATION						

Form No.12 Internal Audit Report

Internal Audit Report	No _____
<p>To _____</p> <p>Part 1 : General Information</p> <p>1. Type of internal audit</p> <p style="padding-left: 40px;"> <input type="checkbox"/> According to the plan <input type="checkbox"/> Special audit__ </p> <p>2. Objective of the audit _____</p> <p>3. Scope of the audit _____</p> <p>4. Audit item _____</p> <p>5. Procedure/WI related to the audit _____</p> <p>6. Department _____</p> <p>7. Auditee name _____ Position _____</p> <p>8. Audit date Time _____</p> <p>9. Lead audit name _____ Position _____</p> <p>10. Auditor name _____</p>	
<p>Part 2: The conclusion of the audit</p> <p>1. The audit result shows that</p> <p style="padding-left: 40px;"> <input type="checkbox"/> Conformity <input type="checkbox"/> Non-conformity _____ items (As the details in the attachment) <input type="checkbox"/> Observation _____ items (As the details in the attachment) </p> <p>2. The attachment consists of :</p> <p style="padding-left: 40px;"> <input type="checkbox"/> Audit checklist _____ pages <input type="checkbox"/> Non-conformity/Observation _____ items <input type="checkbox"/> Other _____ </p> <p style="text-align: right;">Lead Auditor</p> <p style="text-align: right;">()</p> <p style="text-align: right;">Date _____ / _____ / _____</p>	

Step 9: Corrective Action of Non-Conformity

Action for continual improvement

1) Corrective action

In case nonconformity has been found while implementing safety, occupational health and environmental management system for SMEs, the root cause of nonconformity shall be identified and addressed to prevent the recurrence.

The organization shall document and keep the record of nonconformity.

Form No.13 Non-conformity Report

Non-conformity report form	
Non-conformity	<p>Department/Location/Activity :</p> <p>Auditor : Date of issue :</p>
Corrective action	<p>Root causes :</p> <p>Correction :</p> <p>Corrective action :</p> <p>Completion date :</p> <p>Person in charge :</p>
Follow up	<p><input type="checkbox"/> All corrective actions have been done completely</p> <p><input type="checkbox"/> Corrective actions have not been completed</p> <p style="margin-left: 40px;">() New verification date.....</p> <p style="margin-left: 40px;">() Issue new non-conformity report.....</p> <p>Auditor : Date:</p>

Step 9: (Continued)**Action for continual improvement**

2) Accident Investigation

The organization shall provide accident reports and identify a root cause if an accident takes place. The root causes must be addressed to prevent the recurrence of the accident. The results of the investigation shall be communicated with related employees.

The organization shall document and keep the records of accident investigation as

Accident investigation guideline

The main processes of accident investigation consist of:

1. Once the accident occurs, the witness should report to the supervisor immediately. The supervisor report to the safety officer and his/her manager.
2. The supervisor goes to the accident area for the primary investigation. The first aid should be done by the first aider only. The supervisor collects all necessary data of accident by an interview the witness, take a photo and other necessary evidence. The interview process should be done with the following question:

WHAT	-	What happened?
WHO	-	Who gets hurt? Who is the witness of the accident?
WHERE	-	Where is the area that accident occurs?
WHEN	-	What time?
WHY	-	Why the accident occur?
HOW	-	How the employee gets hurt? And how to prevent it?
3. Take a photo of the accident and keep all information to support the investigation process.
4. Provide additional evidence such as a work instruction, safety inspection report, maintenance record, and training record.
5. The supervisor records a primary accident report in the accident investigation form.
6. The primary accident report will be used to identify the root causes of an accident by the investigation team, including the corrective actions.
7. All corrective actions of an accident must be implemented accordingly with the plan.
8. All corrective actions should be followed up by the responsible person to ensure that it will be addressed completely.

Step 10: Management Review and the Improvement of An Integrated Safety, Occupational Health, and Environmental Management System for SMEs

Action for continual improvement

3) Management review

Management review of the management system shall be carried out by top management at least once a year to ensure the effectiveness and continual improvement of such management system. Inputs to management reviews shall include:

- (1) Follow-up actions from previous management reviews;
- (2) Safety, occupational health, and environmental policy;
- (3) Needs and expectations from stakeholders;
- (4) Significant hazards and environmental aspects;
- (5) Business risks;
- (6) Achievement of action plan for risks and impacts mitigation;
- (7) Safety, occupational health, and environmental performance of the organization;
- (8) Adequacy of resources;
- (9) Recommendations for improvement.

The outputs of the management review shall be used to make a decision for the improvement of such management system.

The organization shall document and keep the record of management review.

.....

BIOGRAPHY

NAME

Thepporn Jaroenroy

ACADEMIC BACKGROUND

Bachelor's Degree with a major in
Occupational Health and Safety from
Khon Kaen University, Thailand

Master's Degree in Industrial
Environmental Management at
Sukhothai Thammathirat Open
University, Thailand

POSITION AND OFFICE

Division Manager, QSHE Consultancy
Operation Division
NPC Safety and Environmental Service
Co.,Ltd