AN EVALUATION OF THE SAFETY MANAGEMENT SYSTEM COMPLIANCE AMONGST MALAYSIAN MAJOR HAZARD INDUSTRIES

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DEDICATION

This project is dedicated to my wife, Normala Abd Rahman and my children; Azfar Syahiran, Azril Syazwan, Azmin Syarhan, Azrin Syazani and Azlin Syazwina. Your sacrifices have made this Master of Science in Emergency Response and Planning programme possible for me.

ABSTRACT

An evaluation of the Malaysian major hazard industries (MHI) compliance towards the OSHA requirement on Safety Management System (SMS) was undertaken. The research was carried out via documentary reviews on the individual company Safety Reports submitted to the Department of Occupational Safety and Health (DOSH) under the Control of Industrial Major Accident Hazards (CIMAH) Regulation of the Occupational Safety and Health Act (OSHA) 1994. Out of the available one hundred fourteen (114) Safety Reports containing the SMS information, forty (40) MHI reports were sampled.

Given that MHIs have the potential to cause potential major accident hazards within and outside their boundaries, one of the main objectives of this evaluation is to assess the MHI compliance towards the SMS requirement. The evaluation revealed that the level of compliance meets the minimum requirement. However, the overall mean score of 2.75 at standard deviation of 1.6 barely passes the median value of 2.5. Of the sampled assessed, only 48% data falls within 1 standard deviation, thus the samples chosen were almost representative of the MHI population.

The compliance is based on six main Management System Information (MSI) elements against twelve main Installation Demographic Information (IDI) categories. The high levels of compliance were exhibited by;

- LPG storage plants as compared to other oil, gas, chemical, insecticides manufacturing plants.

- Manufacturing industry involved in the use of flammable as compared to toxic, reactive or explosive substances.
- Organisation having worker population of between 300 to 500.
- Organisation having expatriate management but with local operations personnel
- Multinational companies with foreign technology.
- Organisation that have been in operations between 6 to 10 years ago.
- Organisations that are certified to the ISO quality system.

Some of the sample assessed did exhibit a structured management system approach as required, however others only have disjointed safety programme and procedures to manage their safety and health issues. The next step forward for these organisations to formally structure these practices into a coherent and holistic system approach as required.

The evaluation had also revealed that there were many approaches in the development of SMS ranging from codes, standards, industry practices, legislation and international safety organisations. It was recognised that every organisation is unique in its own ways, as such there is no hard and fast rule on what would be the best SMS model for the respective organisation. The main aim is to have a SMS that is simple yet comprehensive to meet all foreseeable circumstances specific to the organisation and at the same time be flexible enough to be verified and accredited to an internationally accepted standards, where possible.

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LIST OF ABBREVIATIONS/NOTATIONS/GLOSSARY OF TERMS

AICHE	American Institute of Chemical Engineers
BSI	British Standards Institute
CIMAH	Control of Industrial Major Accident Hazards, 1996 A subsidiary Regulation under the OSHA
CMA	Chemical Manufacturers' Association, Unites States
DG	Director General of DOSH
DOSH	Department of Occupational Safety and Health, Ministry of Human Resources
EPMI	Esso Production Malaysia Inc.
ERP	Emergency Response Plan
ESM	Enhanced Safety Management
FMA	Factories and Machinery Act, 1967 (Act 139)
HSE	Health, Safety and Environment
HSE-MS	Health, Safety and Environment Management System
IDI	Installation Demographic Information
ILO	International Labour Organisation
ISO	International Standards Organisation
JASANZ	Joint Australian New Zealand Standards Register
JSA	Job Safety Analysis
MHI	Major Hazard Industry, classified under CIMAH Regulations
MSI	Management System Information
OHSAS	Occupational Health and Safety Assurance System
OHSMS	Occupational Health and Safety Management System
OSHA	Occupational Safety and Health Act, 1994 (Act 514)
PETRONAS	Petroliam Nasional Berhad
PSM	Process Safety Management standard, United States Occupational Safety and Health Authority
PTW	Permit-to-Work System
SAS	Statistical Analysis Package
SHO	Safety and Health Officer
SIRIM	Standards and Research Institute of Malaysia
SMS	Safety Management System
SoP	Standard Operating Practices
TQM	Total Quality Management
UK	United Kingdom
UK HSE	United Kingdom Health and Safety Executive
US	United States of America
USA OSHA	The Occupational Safety and Health Authority of the United States of America
USECHH	Use and Standard Exposure of Chemicals Hazardous to Health Regulation, 2000. A subsidiary Regulation under the OSHA

CHAPTER 1

INTRODUCTION

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1.1 Introduction

Accidents at work happen almost every day. Despite the many programmes and initiatives introduced by both the regulatory bodies and professional institution, the accident trend is still quite alarming. Based on the Department of Occupational Safety and Health (DOSH) statistics, the number of reported industrial accidents in Malaysia has been averaging more than 1,000 cases every year since 1995 as detailed in the following Table 1.1.

Table 1.1: Industrial Accident Cases in Malaysia

Year	1995	1996	1997	1998	1999
Number of Cases	1346	1115	1241	1193	1331

Source: Department of Occupational Safety and Health, Malaysia

In the United States, however, there has been a trend that these accident, injury and illness rates declining over the past 30 years. Since the gazette of the Occupational Safety and Health Act in 1970 in the United States, the incidence rate of occupational fatalities has reduced by 76 percent, and total injury/illness case rate by 27 percent (ILO, 1998).

Among the other prevailing factors, the decline was brought about by the many safety initiatives and programmes that have been introduced and put in place to minimise or eliminate the accident rates amongst industries. Though some of these initiatives contributed to the reduction in accident rates, these are however very

focused specifically towards the operational and employee levels such as the Job Safety Analysis (JSA), Permit-to-Work (PTW) System, Standard Operating Practices (SOP), etc. A better approach involving the management is required to further improve the accident rates.

1.2 Background

Compared to those operational level initiatives and programmes, a more systematic and holistic approach would be to involve the employee and the whole organisation under a common business management system. Deming (1994) stated that only 15 percent of a company's problems could be controlled by employees, while 85 percent are controlled by management. In other words, most safety problems and accidents are indirectly management problems.

The International Labour organisation (ILO, 1988) recognised the current situation and had advocated for a more holistic approach to safety between management and employees to be undertaken. One such approach is the adoption of the Safety Management System (SMS), which represents the framework and structure for both management and employees to work together in eliminating potential hazards and its subsequent consequences.

The requirements of SMS have long been established in developed countries since the 80's. According to Kozak and Krafcisin (1997), many companies in the US had adopted the idea that managing safety and health for employees was identical to

managing any other aspect of their business. These companies had achieved accident rates far below the industry averages.

Many disasters involving the oil, gas, chemical and petrochemical industries within the last 50 years have attracted growing public concern over the terrible costs of human life as well as property and environmental damages. Among some of the notable ones are;

- The 1984 Union Carbide's Methyl Isocyanate plant leakage in Bhopal, India causing over 2,000 deaths and over 22,000 injuries.
- The 1988 Occidental's Piper Alpha oil rig fire and explosion in the North Sea waters causing 167 deaths of the 266 personnel onboard.
- The 1989 Phillip's Houston Chemical Complex (HCC) explosion and fire in Pasadena, Texas involving 23 fatalities.

The failure in Bhopal resulted in the Chemical Manufacturers Association (CMA) to establish the Community Awareness & Response Program while the American Institute of Chemical Engineers (AICHE) advocated the implementation of the Chemical Process Safety Program for its members (Stover, 1985). Both these efforts require that a coherent safety management system be developed and implemented.

The Piper Alpha disaster brought about the formulation of the Offshore Installation (Safety Case) Regulations in 1992 by the UK government. This Regulation requires the offshore oil and gas operations to submit their Safety Cases to the Department of HSE, UK for approval. As part of the Safety Case submission, a comprehensive safety management system is required (Cox & Tait, 1998).

The Phillips's accident and others prompted the United States Occupational Safety and Health Authority to establish its Process Safety Management (PSM) standard in 1992, a regulation given much of the credit for improved chemical plant safety organised within a business management system framework. Barret (1999) stated that the PSM has helped reduce accidents rate by 8 percent from 1996 to 1998 and decrease the number of equipment or operational failures from 61 percent to 48 percent during the same period.

Due to the increased regulatory oversight and the voluntary adoption of the PSM by the Chemical Manufacturers' Association (CMA) members, the industry and regulators alike deemed that the workers from the chemical industries are safer than their counterparts in other manufacturing segments. Terry (1999) in his research noted that the injury and illness rates dropped 49 percent among CMA members in the last decade, to 1.86 incidents for 200,000 work hours. The rate for other manufacturing segments during the same period only fell 22 percent to 10 incidents for the same 200,000 work hours.

However, the ILO report in 1988 stated that despite these positive changes and the continued initiatives, these injury and illness rates have generally reached a plateau over the last decade. The unchanging frequencies of the occupational safety and health related fatality and illness rates continue to affect adversely the lives of workers in the United States as well as present a substantial burden on the cost of health care in the United States. Leigh (1997) estimated that there will be approximately 6,500 job-related fatalities from injuries, 60,300 fatalities from disease, and 862,200 illnesses are estimated to occur annually amongst the American

workforce. The total direct and indirect costs are estimated to be US $171 billion to the American economy.

Given the enormous cost involved and the employees safety and value of human life at stake, it is essential that a newer and better system be implemented. The desire for this improvement not only comes from the business entities, but employees alike are advocating for such a reform. Petersen (2000) in his Minnesota safety programme perception survey within fifty-six companies in the United States had revealed a score below 70 percent positive for the hourly employee category. Such score indicates that three out of ten employees do not believe such safety programs and initiatives are working well, which suggested that the organisation's safety management needed to be examined.

Though these statistics are for the Unites States, a similar problem could also be found in many other developed and developing countries including Malaysia. The failure to manage health and safety effectively continues to cause a series of ill health and injury at work.

1.3 Safety Management System

A 'system' is defined in the Oxford English dictionary as 'a whole composed of parts in an orderly arrangement according to some scheme or plan'. A system can be treated as interacting and interdependent sets of components forming a network for fulfilling some safety objectives.

Cox and Tait (1998) described the three most important characteristics of a 'system'.

- The components are connected in an organised way and changes in one component affect the others.
- The behaviour of the system changes if any one component is excluded from the system.
- The organised assembly of the components operates to a common system goal.

Safety has been defined by the International Standards Organisation (ISO) as 'a state of freedom from unacceptable risks of personal harm'. Safety management may then be considered the management of this 'state'. In this context of system thinking, 'safety management' is concerned with designing and maintaining reliable 'systems', which function in an expected and safe manner. It requires 'management' to make the informed decisions in order to meet the acceptable criteria and requirements.

Thus, a simplistic definition of Safety Management System (SMS) is a holistic and orderly arrangement of the state of freedom from personal harm and injury at workplace.

Below are some other definitions of SMS by other leading professionals.

- ✓ Is a part of the overall management system which includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for managing the health and safety risks associated with the business of the organisation. A basic consideration for any organisation, large or small, should be the degree of risk associated with its operations. The higher the

risks to health and safety the more extensive the management systems needed to maintain a safe workplace – Nan Austin (1999), WorkSafe Australia

- ✓ Is the framework to combine all safety initiatives in order to avoid the numerous disjointed initiatives into a solid approach that places safety responsibility, accountability and performance with line management and enables the workforce to perform work in a safe and environmentally sound manner. - Kruger and Humphreys (1997), Environment, Safety and Health division, United States Department of Environment.

The SMS is the objective setting for the management of safety and occupational health at workplace. Cox and Tait (1998) elaborated that SMS represents a sequence of processes involved from the design stages to the operational phases. Implicit in the SMS, is the requirement to analyse the system, to set objectives and standards in line with corporate policy, to create the organisation and arrangements necessary to meet these objectives and to establish meaningful methods of monitoring.

1.4 Requirements

1.4.1 International

There are numerous Safety Management System standards, codes of practice and guidance documents available at the international level. ILO (1998) has evaluated 24 such systems from 15 different countries. The authorities of these systems are mainly from the national and state governments, national standards organisations and professional safety and health organisations.

The listings of these available systems are presented in Table 1.2 below.

Table 1.2: Listing of International Safety Management System Standards

Item	*Country/Region*	*Authorities*
1	Australia/New Zealand	Standards Australia and Standards New Zealand
2	Australia, Victoria	Health and Safety Organisation (HSO) Victoria
3	Brazil	Ministry of Labour
4	European Union	The Council of European Communities
5	India	Ministry of Labour
6	International	Oil Industry International Exploration and Production Forum (E&P Forum)
7	International – ISO	ISO 14001
8	International – ISO	ISO OHSMS (suspended)
9	Ireland	The National Standards Authority of Ireland
10	Jamaica	Jamaica Bureau of Standards
11	Japan	Japan Industrial Safety and Health Association
12	Korea	Ministry of Labour
13	The Netherlands	Netherlands Normalisatie-Institut
14	Norway	Norwegian Standards Institute
15	Poland	Polish National Labour Inspectorate
16	South Africa	National Occupational Safety Association
17	Spain	Asociasion Espanola de Normalizacion y Certificacion
18	United Kingdom	British Standards Institute
19	United Kingdom	Chemical Industries Association
20	United States	American Industrial Hygiene Association
21	United States	Chemical Manufacturers Association
22	United States	Occupational Safety and Health Administration; Voluntary Protection Program
23	United States	Occupational Safety and Health Administration; Proposed OHS Standards
24	United States, California	Department of Labour and Industrial Relations

Source: International Occupational Safety and Health Information Centre, International Labour Organisation, Geneva (1998), page 7.

The ILO 1998 report revealed that the documents were generally strong in addressing the traditional occupational health and safety matters such as risk assessment, hazard evaluation, control and training. However, there was a general weakness in areas often considered central to management system approaches such

as management commitment, continual improvement, integration with other business systems, management organisational processes and management review.

In addition, it had also acknowledged that there are varied approaches to employee participation especially in the areas of safety and medical surveillance as well as health programmes. However, the main concern is that these documents being developed in many different parts of the world are causing confusion and misunderstanding amongst the labour force.

1.4.2 National

The early legislation on employee and facility safety is stipulated in the Factories and Machinery Act (FMA), 1967. Rahmat (1996) describes the FMA and its subsidiary Regulations represent the traditional prescriptive approach for safety and health issues. This traditional approach is now being replaced by goal setting or self-regulatory type regulations, the Occupational Safety and Health Act (OSHA), enacted in 1994.

The requirements of a safety management system for Malaysia is defined in OSHA Section 16 as well as in the Control of Industrial Major Accident Hazards (CIMAH) Regulation 1996, a subsidiary Regulation under the OSHA under sub regulation 5(1)(c). The respective excerpts are reproduced below.

'Except in such cases as may be prescribed, it shall be the duty of every employer and every self-employed person to prepare and as often as may be appropriate revise a written statement of his ***general policy*** *with respect to the safety and health*

*at work of his employees and the **organisation** and **arrangements** for the time being in force for carrying out that policy, and to bring the statement and any revision of it to the notice of all his employees.'*

'Every manufacturer who undertakes an industrial activity shall establish and maintain a good management system for controlling any major accident...'

In a nutshell, both these legislation requires that all organisations and industries having more than five employees to establish a formal management system that at minimum contains the safety policy, organisation and the arrangements for the management of occupational and safety issues within their activities. The management system shall be implemented and maintained as one of the means for controlling any potential major accidents arising from its business activities.

The relationship of OSHA's requirement is depicted in Figure 1.1 below.

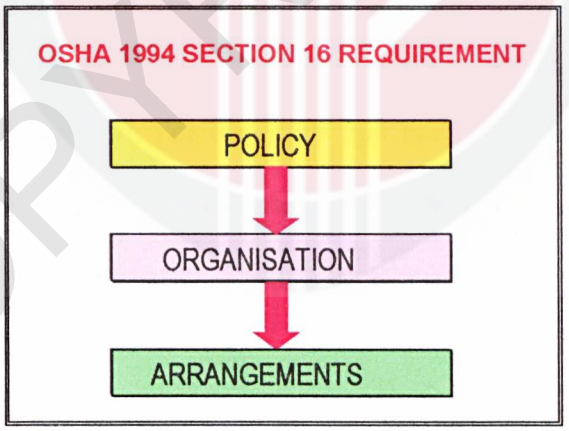

Figure 1.1: OSHA Safety Management System Structure

The formal demonstration and submission of the safety management system is specified in Section 14 of the CIMAH Regulation. The affected industries classified

as Major Hazard Industries (MHI) specified under this Regulations are required to submit to the Department of Occupational Safety and Health (DOSH) a Safety Report, which requires updating in a three years cycle. The formal industry's safety management system is summarised and provided under Part C of the CIMAH Safety Report requirement.

Besides the legislative requirement, the Standards and Research Institute of Malaysia (SIRIM) has recently introduced the Occupational Health and Safety Assurance System (OHSAS) 18000 standards. The standard provides a framework for which any organisation could have their SMS be audited and certified against a modern specification standard. The OSHAS 18000 is however, an almost direct replica of the one adopted under the British Standards Institute (BSI, 1996) BS 8800.

1.5 Research Framework

The project research framework is limited to the SMS information available in the MHI CIMAH Safety Report. For the MHIs that have complied with the CIMAH requirement, their Safety Reports are readily available at the Major Hazard Division of DOSH in Kuala Lumpur.

'Major Hazard Installation' - an industrial activity which produces, processes, handles, uses, disposes of or store category of hazardous substances which quantity exceed the stipulated threshold quantity - *the Control of Industrial Major Accident Hazards (CIMAH) Regulations, subsidiary of the OSHA 1994*

Due to the proprietary nature of these Reports, an approval was obtained from the highest authority of DOSH for this research work. The research activities were limited to the facilities and system available within DOSH office and it was carried out at certain selected working days and hours convenient to DOSH.

A qualitative research and document review using a specially developed checklist was carried out on these reports subject to the sampling criteria developed.

The checklist contains essential data on Installation Demographic Information (IDI) as well as the Management system Information (MSI). The compliance level was ranked using a point system developed for this research. The analyses were carried out using the Statistical Analysis System (SAS) package and the results were presented in form of the MHI compliance level, relationship and interdependencies of the variables analysed.

1.6 Objectives

The main intention of this project is to assess the level of compliance for the Safety Management System as required under the Occupational Safety and Health Act (OSHA) enacted in 1994.

This project however only concentrates on the compliance level of the Malaysian Major Hazard Industries classified under the Control of Industrial Major Accident Hazards (CIMAH) gazetted in 1996, a subsidiary Regulation under the same Act.

The main objectives of this project are;

- To confirm that the MHI companies do have a formal safety management system as required by OSHA.
- To verify that the multinational companies SMS compliance level is better than local companies.
- To propose a guide for a Safety Management System approach for the major hazard industry.

1.7 Hypotheses

The hypotheses for this project are;

1. The chemical and petrochemical companies have highest compliance.
2. Companies that use toxic substances have the lowest compliance.
3. Companies with expatriate management have better compliance than locally managed companies.
4. The level of compliance is a function of the type of industry and the substance used.
5. The SMS compliance of the ISO quality certified companies is directly correlated to the technology employed.
6. The level of compliance in terms of the 'policy' element with respect to the water treatment and glove manufacturing industries is low.

1.8 Importance of Project

Apart from the industrial disaster that took place around the world as previously described in Section 1.1, the Malaysian industry has also not been spared of major industrial disasters. Some of the most recent dark reminders of such disasters involving MHIs are;

- ✓ The 1991 Bright Sparklers firework factory fire and explosion in Sungai Buloh, Selangor involving 22 fatalities and 103 injuries
- ✓ The 1992 Matan Maju firework factory fire and explosion in Beranang, Selangor causing 2 fatalities and 3 injuries.
- ✓ The 1992 Shell Tiram Kimia hydrocarbon bulk storage facilities fire and explosion in Port Klang, Selangor claiming 13 lives.
- ✓ The 1997 Shell MDS natural gas processing plant fire and explosion in Bintulu, Sarawak resulting in 12 injuries of which 7 was offsite personnel.

Given the fast development of Malaysia's industrialisation, it will be impossible for the authorities and government agencies, especially DOSH to keep pace and police all industrial activities to ensure compliance to the safety and health regulatory requirements. The industries would have to adopt their own safety standards through a formal safety management system in identifying, managing, controlling and preventing any possible unwanted events. Given that OSHA has been formulated and enforced through a self-regulatory approach, the results of this project would assist the DOSH in benchmarking the compliance level and thus take the necessary actions.

Ever since the introduction of the OSHA in 1994, a documented guideline for the Safety Management System has yet to be developed. It is hoped that the results of this project may lead to some preliminary framework that will be usable for both DOSH and the industries alike.

1.9 Research Limitation

An approach in undertaking this research would be to assess the actual SMS documentation of each of the affected companies. Given that these are company's proprietary documents, the relevant companies may not readily grant such approval. Furthermore, such an undertaking would require tremendous resources that may not be practical for this Master of Science programme. In addition, the data to be obtained within this approach may also not represent a true reflection of the actual SMS implementation and practices.

In circumventing these obstacles and uncertainties, the author has opted to assess the SMS documentation based on the Safety Reports of the individual MHI, which were submitted formally to DOSH under the requirements of the CIMAH regulations. Since this is a legally binding requirement, the data obtained from such Safety Report would represent the companys' actual SMS practices.

Naturally, given the proprietary nature of the report as well as the company's SMS information, the author had to secure the approval from the Director General of DOSH in order to embark on this research.

CHAPTER 2

LITERATURE REVIEW

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