CHEMICAL SAFETY AND RISK ASSESSMENT IN A MANUFACTURING ENVIRONMENT

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Management) (Hons.)

by

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **Chemical Safety and Risk Assessment in a Manufacturing Environment**

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I hereby, declared this report entitled “Chemical Safety and Risk Assessment in a Manufacturing Environment” is the results of my own research except as cited in references.

Signature :

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Date : 29 June 2012

APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Management) (Hons.). The member of the supervisory committee is as follow:

……

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ABSTRAK

Analisis keselamatan dan kesihatan bahan kima dengan menggunakan cara menganalisis tenaga telah digunakan ke atas makmal Fakulti Kejuruteraan Pembuatan di Universiti Teknikal Malaysia Melaka. Tujuan analsis ini adalah untuk mengenalpasti dan menilai bahaya berlaku di makmal FKP semasa menggunakan bahan kimia menggunakan kaedah analisis tenaga. Dalam laporan ini, analisis in lebih fakus dan terhad kepada bahan kimia yang digunakan di makmal FKP sahaja. Beberapa makmal dan bahan kimia tertentu akan dianalisa. Sebelum membuat analisis ini, penting untuk mengetahui tentang sejarah yang berlaku semasa penggunaan bahan kimiauntuk menjadi pengajaran untuk penggunaan bahan kimia tersebut pada masa depan. Di bawah Akta keselamatan dan Kesihatan Kerja 2000 dijadikan rujukan semasa kajian analisis ini dijalankan. Terdapat peraturan untuk pekerja atau orang yang akan menggunakan bahan kimia tersebut. Pegawai OSHA telah mendokumentasikan manual untuk membantu orang yang akan melakukan analisa sebagai rujukan. Dengan menganalisis semua bahaya yang telah dikenalpasti, pelbagai langkah-langkah keselamatan dicadangkan. Cadangan ini juga adalah untuk meningkatkan keselamatan di tempat kerja.

ABSTRACT

Chemical Health and Risk Assessment is needed to be done at FKP Laboratory. It is very important to make sure the safety of the people surrounding while used the chemical. In this report, the scope of the project is focused and limited to the chemicals used in manufacturing processes only which are existed in FKP Lab. Therefore, in doing the project there are a few chemicals and laboratories will be select. It is important to know the history of the usage in the industry so it can make as the guideline in using it. Under the Occupational Safety and Health (Use and Standard of Exposure of Chemicals Hazardous to Health) Regulations 2000, is referred to as USECHH Regulations 2000, the duty to perform an assessment of health risks arising from the use of chemicals hazardous to health at the place of work is mandatory whereby employers are not permitted to use any chemicals hazardous to health unless an assessment has been conducted. To provide guidelines for employers and safety and health practitioners, the OSHA officers has been compiled the manual to assist them on the procedures and protocol for conducting an assessment, is referred to as chemical health risk assessment or in short CHRA. It is will conduct by using the methodology as been described in chapter 3. With this assessment hazard had been identified and make suggestions for control measure. This suggestion for improve the safety in the lab or workplace.

DEDICATION

I take opportunity to thanks to my father, my mother and my family members who gave me support to do the best during my Final Year Project. The motivation and encouragement from my family members is give me inspired to do well during to complete my project. I also would like to thanks to my Supervisor, person who guide me in OSHA and my friends those help me a lot in completing this project.

ACKNOWLEDGEMENT

First of all, I would like to this opportunity to thanks my Supervisor, Mr. Muhammad Syafiq Syed Mohamad for being as my guidance and supporting me to carry out my final year project. As I was under him, he helped me a lot and I learned and gained knowledge on safety and health in a manufacturing environment. I also would like to express my sincere to MR. Azlan and Pn. Zalifah who help me a lot about OSHA and guide me how to manage my final year project.

People should know about the effects for the short and long term on using the chemical. it is very important and they need to exposed with this knowledge to make easier for them to handle the chemical and use precaution steps.

Finally, I would like to thanks to UTeM for offering this final year project which provide an opportunity to explore and experience a working problems and how to overcome it.

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FYP - Final Year Project

FKP - Fakulti Kejuruteraan Pembuatan

EC - European Community

CSDS - Chemical Safety Data Sheet

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CHAPTER 1
INTRODUCTION

1.1 Background

Hazardous chemicals is defined as any chemical that has any of the properties are explosive, oxidising, extremely flammable, highly flammable, very toxic, toxic, corrosive, harmful or for which there is information that is relevant to show that chemicals are dangerous. Chemical health hazard is the potential of a chemical to cause harm or adversely affect health of people in the workplace. Adverse health effect ranges from fatality, permanent and serious health impairment to mild skin irritation at the other end. Although the chemical is in a small quantity, but if the level of toxic is high, it can cause death for example is hazard of cyanides. Chemicals that can adversely affect the health of an exposed person are termed as chemicals hazardous to health.

1.2 Problems Statement

The handling and labelling of chemicals in FKP Lab is not conducted properly. There is not too much sign for the hazardous chemicals. Therefore, the difference of hazardous or non-hazardous chemicals is not too clear to the user. Before the chemical can be used in any industry or processes, each of chemical is needs to go through the risk assessment. The propose of these risk assessment is parallel with Occupational Safety and Health Act 1994 which is protecting employees from the adverse effects of chemicals is one of the primary duties of an employer. While performed this duty, an assessment of all chemicals used in the workplace had been

carried out in order to identify, evaluate and control any health risk associated withwork activities involving the use of the chemicals. Under the Occupational Safety and Health (Use and Standard of Exposure of Chemicals Hazardous to Health) Regulations 2000, hereinafter referred to as USECHH Regulations 2000, the duty to perform an assessment of health risks arising from the use of chemicals hazardous to health at the place of work is mandatory whereby employers are not permitted to use any chemicals hazardous to health unless an assessment has been conducted. To provide guidelines for employers and safety and health practitioners, the OSHA officers has been compiled the manual to assist them on the procedures and protocol for conducting an assessment, hereinafter referred to as chemical health risk assessment or in short CHRA.

1.3 Objectives

The objectives of the end of this project will be able:

1. To identify and list all the chemicals and the potential hazards of chemicals use in a manufacturing environment.
2. To analyse the risk assessment of chemical hazards that are used in the FKP Lab.

1.4 Scope:

The project of Chemical Safety and Risk Assessment in a Manufacturing Environment is focused and limited to the chemicals used in manufacturing processes only which are existed in FKP Lab. Therefore, in doing the project there are a few chemicals and laboratories will be select. In this project, example report as reference to this project which is given from the OSHA‟s Officer a report of risk assessment those chemicals that have been done by expert person in this field and get the results at the end of my project. The thing that I will not focus on is make a real risk assessment because that is not focus in my project.

CHAPTER 2
LITERATURE REVIEW

2.1 Background of Industry

The chemical industry park is the product that the modern chemical industry adapts to the resources or raw materials conversion, complies with the international, intensive, large-scale operation, the event trend for the optimization and the most potency. It is the leading direction for achievingthe long-term development of the chemical industry. With the rapid economic development and boom of building the chemical industry park in China, the quantity of chemical industry park is increasing. The construction and development of the chemical industry park promotes the development of local economy and chemical industry, it has additionally brought new safety issue. Because there are many Chemical and Petrochemical Enterprises within the chemical industry park, that produce, deposit, use, manage, transport and dispose the large quantities of flammable, explosive, toxic and dangerous chemicals, and there are also many major hazard installations in the chemical industry park. In case of the accidents of fire, explosion or dangerous chemicals leakage, it has caused easily the serious consequences and the enterprises are relatively intensive in the chemical park, if one enterprise makes a major accident it will affect neighbouring enterprise. It is seemingly to trigger disastrous chain of domino impact accident. One of the main reasons for such phenomena is that we are lack general recognition to risk management. The current systems of risk management in the chemical industry park are not perfect and they are waiting for the further explored and improved. It can implement the scientific, effective and systemic risk management for the chemical industry park and avoid, control, reduce the casualties, property losses and environment damage as soon as possible, promote the safe development for the

chemical industry park. To promote the safe development for the chemical industry park, the scientific, effective and system risk management for the chemical industry park and avoid, control, reduce the casualties, property losses and environment damage as soon as possible can be implemented.

2.2 History of Chemical and Risk Assessment

2.2.1 Risk Assessment of Chemicals

In the future, the usage of chemicals will increase by day to day for production and to create a new product. Despite of that, the chemicals will effect on human health and on the environment in daily life. Therefore, the organizations need undertaking toxicological evaluation and risk assessments of these on behalf of industry, environmental organizations and national and international regulatory authorities, often produces conflicting interpretation and confusing results. For the chemical safety and risk assessment are need more global approach in term of an increasingly interdependent world. This requires a higher degree of uniformity and harmonization between numerous national and international assessment teams.

The primary importance to succeed at the international level is cooperation between the regulatory authorities of developed and developing country. Given the regulatory diversities that exist within the EC countries and between the EC, Japan, and the USA, total global harmonization of risk assessment policies is an unrealistic goal. Nevertheless in spite of the considerable disparities in national regulations, cooperation and uniformity in evaluation of risk assessment is likely to increase in the future. Resource rich developing countries are likely to play an important part in the global harmonization of risk assessment.

The Environmental (Protection) Act 1986 of India increased the government‟s authority to ascertain and enforce environmental standards. The law is probably going to follow western model of chemical safety and risk assessment. The Indian Law Institute recommends that, „The import and/or use of any chemical substance

that is banned in the country of its origin or the country where the substance was first manufactured for its hazardous impact on the environment.‟ stated by Prabhu Kulkarni and Brendan J. Nangle, (1994).

2.2.2 Why Assess the Risk?

Occupational Safety and Health as a special phenomenon is the main area of the world of work. It is included neither the society, the state, management, the employees, nor their representatives have perceived it to be a priority area. It is only in comparatively recent times that is has become the norm to expect to be able earn a living for a life time at work and retain one‟s health and be free from comparatively serious injury.

Researchers who worked in chemical laboratories 25 years ago keep in mind well that benzene was one of the common solvents used extensively, with none any special precautions, for column chromatography and for general cleaning. Diethyl ether extraction of organic substances was dispensed in laboratories equipped with gas hot water geysers with ever lit pilot flame, and metals like lead, mercury, cadmium and arsenic were detected by completing flame test using Bunsen burners on the work bench.

Referred to the (Mervyn Richardson, 1994) till late 1960s, the chemical industry has been fortunate in its development and was held in high esteem by the public. Its fortunes have changed dramatically due to factors:

i. The public awareness of the damage to the environment and it‟s unfortunate association with chemical pollutants; and,
ii. A series of major accident in the last 20 years, which included incident like the Sandoz spills in Switzerland, the Seveso disaster in Italy, Petrol Storage Fire in Mexico, and the Bhopal gas leak in India.

There is a dramatic change in the public perception of the chemical industry which in their mind, it became the principal culprit for all environment ills because of these factors. During the 1980s almost each country in the world passed their own

environmental protection laws, remodelling the whole concept of work and occupational safety. The pendulum has swung totally in the other way of direction to its position in the late 1960s. Today, we tend to cannot manufacture, market, transport or dispose of chemicals without proper authorization and/or documentation in industrial countries.

Against this background, it is essential that the chemical industry determines in a very realistic manner the actual risk posed by its product. Assessment of chemical risk provides the data on which to base the safety of chemical industry workers, the public at large and environment.

2.3 Hazard Identification and Communication

The owner or the supplier of the hazardous chemicals is responsible to classify chemicals, provide a chemical safety data sheet, provide a label for chemicals for each product in order that hazard of the products stored in the warehouse or storage are clearly understood by all personnel.

2.3.1 Chemical Safety Data Sheet (CSDS)

The hazardous chemicals supplier must provide a Chemical Safety Data Sheet (CSDS) or a product data sheet for each hazardous product in order that physical, chemical and biological properties of the chemicals stored in the warehouse or storage are clearly understood by all personnel. The purpose of a CSDS is to provide information needed to allow for the safe handling of hazardous chemicals. An acceptable CSDS for a chemical should describe the chemical's identity, relevant health hazard information, and precautions for use, safe handling information and other relevant information related to chemicals.

The CSDS should contain appropriate information in accordance with one of the regulations i.e. the *Occupational Safety and Health (Classification, Packaging and*

Labeling of Hazardous Chemicals) Regulations 1997 or *The Pesticides Act 1974* or *The Environmental Quality (Scheduled Wastes) Regulations 2005.*

2.3.2 Classification, Labeling and Relabeling of Chemicals

The employer shall ensure that chemicals to be stored should be classified, labeled and/or relabeled as per The *Occupational Safety and Health (Classification, Packaging and Labeling of hazardous Chemicals)*

Regulation 1997, or The Pesticides Act 1974 or *The Environmental Quality (Scheduled Wastes) Regulations 2005.*

2.3.3 Chemical Register

The employer of workplaces which have chemicals hazardous to health should maintain a chemical register. The chemical register consists of the chemical inventory and the chemical safety data sheets for all the listed chemicals. For further information, need to refer to the *Guidelines for the Registration of assessors, Hygiene Technician and Occupational Health Doctor* that is published by the Department of Occupational Safety and Health.