



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**RISK ASSESSMENT ON PALM OIL INDUSTRY JOBS USING  
HIRARC METHOD**

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

by

**NUR SYAFIQAH BINTI ABDUL RAHIM**

**B050910023**

**901223016762**

**FACULTY OF MANUFACTURING ENGINEERING**

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**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

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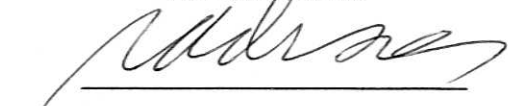
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 TIDAK TERHAD

Disahkan oleh:



Alamat Tetap:

No 490, Jalan Manis 24

Taman Manis, 81030

Kulai, Johor

Tarikh: 13/6/2013

Cop Rasmi:

**PROFESOR DR. ADI SAPTARI**  
Ketua Jabatan (Pengurusan Pembuatan)  
Fakulti Kejuruteraan Pembuatan  
Universiti Teknikal Malaysia Melaka  
Hang Tuah Jaya  
76100 Durian Tunggal, Melaka

Tarikh: 13/6/2013

## DECLARATION

I hereby, declared this report entitled “Risk Assessment on Palm Oil Industry Jobs using HIRARC Method” is the results of my own research except as cited in references.

Signature :  .....

Author's Name : Nur Syafiqah Binti Abdul Rahim

Date : 2013

## 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 is as follow:



(Project Supervisor)

**PROFESOR DR. ADI SAPTARI**  
*Ketua Jabatan (Pengurusan Pembuatan)*  
Fakulti Kejuruteraan Pembuatan  
Universiti Teknikal Malaysia Melaka  
Hang Tuah Jaya  
76100 Durian Tunggal, Melaka

## **ABSTRAK**

Tesis ini mengkaji tentang penilaian risiko kerja di Kilang Kelapa Sawit dengan menggunakan method HIRARC. Tujuan kajian ini adalah untuk mengenalpasti risiko di Kilang Kelapa Sawit dan menyediakan langkah-langkah pencegahan yang baik untuk industri ini bagi keselamatan pekerja-pekerja mereka. HIRARC digunakan untuk mengenal pasti bahaya yang ada di tempat kerja. Terdapat lima stesen yang dinilai dalam pengajian ini. Pengajian ini dimulakan dengan mengenalpastian bahaya melalui borang soal selidik dan sesi temuramah di kalangan 30 orang pekerja. Soal selidik ini dijalankan dengan mengenal pasti umur, pengalaman bekerja, tahap kesesuaian kerja yang dijalankan dan masalah kesihatan yang dihadapi oleh pekerja. Terdapat empat jenis bahaya yang dikenalpasti iaitu ergonomik, fizikal, mekanikal dan psikososial. Apabila mengenalpastian bahaya telah selesai, proses ini akan diteruskan dengan penilaian risiko. Keparahan dan kekerapan bahaya dianalisis untuk mengklasifikasikan bahaya pada tahap yang tinggi atau rendah berdasarkan skala risiko yang telah ditetapkan. Langkah seterusnya, langkah-langkah pencegahan akan dilakukan untuk mengawal risiko. Bagi mengurangkan risiko di kelima-lima stesen, kawalan risiko telah dicadangkan. Antaranya ialah kawalan kejuruteraan, kawalan administratif dan alat perlindungan diri (APD). Penilaian ini sangat berguna untuk dilaksanakan bagi industri ini untuk mengurangkan kadar kecederaan atau penyakit di kalangan pekerja.

## **ABSTRACT**

This thesis presents the risk assessment of Palm Oil Industry jobs using HIRARC method. The purpose for this study is to assess the risk involved in manufacturing of Palm Oil and provide good preventive measures to this industry in term of their employees safety. HIRARC is used to identify the hazard at the workstations. There are five workstation assessed in this study. This study started with identification of hazard by using survey and interview to 30 employees. The survey was identified the age, work experiences, comfort level of the task and health problem of the workers. There are four types of hazard identified from five stations which are ergonomic, physical, mechanical and psychosocial hazard. After the identification of hazards were completed, the process proceeded with the risk assessment. The analyzing of severity and likelihood of the hazard was identified to classify the hazard in the high level or low level based on the rating scale. Further step after assessment, the preventive measures was determined to control the risk. To reduce the risk involved in five stations, the risk control was suggested. These are engineering control, administrative control and personal protection equipment (PPE). This assessment are useful to be implemented in this industry to reduce the injury or illness among the employees.

## DEDICATION

*To my beloved parents and siblings,  
Thank you, for all love and support,  
This is for you.*

*To the best supervisor,  
Thank you, for the knowledge you have taught,  
May Allah bless you.*

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## **LIST OF ABBREVIATIONS**

APD	-	Alat Pelindungan Diri
CM	-	Coupling Multiplier
DOSH	-	Department of Occupational Safety and Health
FM	-	Frequency Multiplier
OSH	-	Occupational Safety and Health
OSHA	-	Occupational Safety and Health Administrator
HIRARC	-	Hazard Identification, Risk Assessment, Risk Control
HSE	-	Health and Safety Executive
PPE	-	Personal Protection Equipment

# **CHAPTER 1**

## **INTRODUCTION**

This chapter provides information regarding to background of the study, problem statements and objective of the study. This chapter also explains the scope of the study and the outline how the study is conducted.

### **1.1 Project Background**

Risk assessment systemizes the knowledge and uncertainties about the phenomena, processes, activities and systems being analyzed. Risk assessment elaborates the possible hazards and threats, their causes and consequences. Risk assessments have been specifically valuable in detecting deficiencies in complex technical systems and in improving the safety performance of the technical system under consideration. Risk assessment support the decision-making, they do not prescribe how risk should be treated. The assessment use probabilities and expected values (estimated or assigned) to express frequencies, but do not themselves specify what the right decision is (Aven, 2011). Risk assessment is important because it reduce the risks of accidents and ill health to the employees that could be very costly both in physically and financially (Watson, 2012).

This study was focused on how to conduct risk assessment in Palm Oil Mill Industry. This industry is one of the industries in Malaysia that growing in a global level. This industry produced oil from a palm tree fruit. The processes are starting from the delivery of fruit from the estates until the production of oil. Nowadays, global competition among the manufacturing industries is intensifying. Many companies in



order to survive in this competition need to implement a continuous improvement in terms of performance in many sector or areas. Hence, if there is a risk in the company, the company can not achieve a good performance. By doing this risk assessments the company can make the improvement continuously.

For this study, there is one method that has been used as tool for risk assessments which is HIRARC method. The HIRARC method has been used as a part of conducting this assessment. HIRARC is acronym for hazard identification, risk assessment and risk control. Hazard identification is the identification of unwanted incident leads to the existence of the hazard and mechanisms that allow unwanted incidents to happen. Risk assessment is the evaluation of risks to safety and health arising from hazards in the workplace. Risk control is the process of implementing measures to reduce the risk of related hazards. HIRARC is used to determine the level of hazard and risk assessment in accordance with Occupational Safety and Health Act (OSHA, 1994) for employers to provide a safe workplace to employees under the responsibility of the employer (DOSH, 2008).

This study determines the information from the users regarding on how they perform their task. Besides that, the data regarding how long they exposed with their task and what type of the task that they need to do also have been collected. This study performs with direct survey to the industry and video recording with workers using questionnaire to investigate the risk that they need to face it.

## 1.2 Problem Statement

There are many industrial by the nature of their operations present hazards to the safety of the workers and general public in the surrounding area. Hence, the risk assessment has been increasingly used for risk management decision (Alp and Zelensky, 1995). However, there are other problems related to the hazards and risks in the industry which are:

- a) Job risks associated with hazards can cause occupational injuries such as accidents, ill health and so on. Hazards are the major causes of the job risks.
- b) Due to the occupational injuries, the motivation, productivity and efficiency of the workers may be affected. Exposure of long period in hazard area such as noisy area will cause hearing disorder and resulted in decrease of performance. However, these effects can be avoided if the motivation of the workers is great (Harrington, 1978).
- c) Occupational injuries and illness not only impact on safety and health but also economics, due to high costs related with work injuries (Pinto *et al.*, 2011). Because of that, the company needs to spend money for medical, treatment and rehabilitation to the workers.

### **1.3 Objectives**

The goal of this study is to develop the risk assessment on Palm Oil Industry using HIRARC method. The specific objectives for this study are described as the following sentences:

- a) To investigate the hazards exposed to the workers in workstation and the health problems experienced due to the task given.
- b) To evaluate the hazard and the level of severity of jobs in the workstations.
- c) To recommend preventive measures to ensure that the risks are adequately controlled at all times.

### **1.4 Scope**

This study focused on the hazards that have been exposed by the industrial workers in their workplace. In this Palm Oil industry, it has 17 stations for its flow of the process. There will be five stations selected for this risk assessment according to their critical hazard performance. The selected stations are Kernel Recovery, Clarification, Boiler, Reception and Sterilization station. In order to control these hazards, the information regarding the hazards, existing controls and the consequences from these hazards are obtained. This study performed direct survey, interview and video recordings while the industrial workers are performing these tasks. The requirements obtained from the workers are analyzed using HIRARC sheet to identify which activities should be implementing preventive measures (risk control). There was a limitation of the study whereby the assessments did not have fixed final results. It should be continuously supervise to perform a better result and to ensure that the risks are under the control.

## 1.5 Study Outlines

This study is structured in five chapters as follows:

- a) Chapter 1 introduced the background of the risk assessment and why it is important in the industry. The problem statements are declared to show the explanation of the real problem in this study area. Objectives and scopes are also stated to achieve the target and boundary of this study. This chapter is ended by outline chapters that explain the general review of chapter by chapter.
- b) Chapter 2 elaborates on brief literature review about the risk assessment. This chapter is provided to support data, methodology and discussion of this study. It was performed through online databases such as journal, conference, books and other writing resources related to ergonomics and OSHA approach.
- c) Chapter 3 describes the method of this research in detail to give the steps by steps in performing this research. It starts with the identification of hazard at the workstations. The risk assessment is performed based on the hazard identification for analyse the risk level. The preventive measures of this risk are performed based on the risk level at the workstations.
- d) Chapter 4 gathers and identifies the result of this risk assessment. This result is obtained based on the questionnaire survey, video recordings and HIRARC sheet. This chapter also discusses the findings with supporting of journals.
- e) Chapter 5 presents the conclusion of this research and suggests recommendation related to this area. Contribution is also presented to clarify what can be produced in this area.

## **CHAPTER 2**

### **LITERATURE REVIEW**

This chapter presents the information regarding the literature review which is related to the study. The literature review was performed through online databases such as journal, reference book, case study and other writing sources related to ergonomic approach and OSHA. The information that related to the study that have been discussed in this chapter will be used in the methodology and discussion of the study in order to assist the author to achieve the feasible results that needed based on the objectives of this study.

#### **2.1 Risk Assessment Definition**

Risk assessment means the process of evaluating the risks for safety and health arising from hazards at work. Risk assessment is the part of the risk management. Risk management means the total procedure associated with identifying hazard, assessing the risk, putting in place control measures and reviewing the outcomes. The elements of risk management are illustrated in Figure 2.1 below. It is one of the general duties as prescribed under the Occupational and Safety Health Act 1994 (Act 514) and Factory & Machinery Act 1967 for the employer to provide a safe workplaces to their employees and other related person (DOSH, 2008).



**Figure 2.1** Risk Management Process (source: NASA, 2008)

There are the summarizations of proceedings papers and journals regarding risk assessment definitions as shown in the Table 2.1 below.

**Table 2.1** Summarization of Risk Assessment Definition

<b>Author</b>	<b>Description</b>
Bruce Case	Risk assessment is a scientific or mathematical discipline which is a substantive, changing and controversial field.
Canadian Centre of Occupational Safety and Health 2006	Risk assessment is a thorough look at the workplace to identify those things, situations and processes that may cause harm particularly to the people.

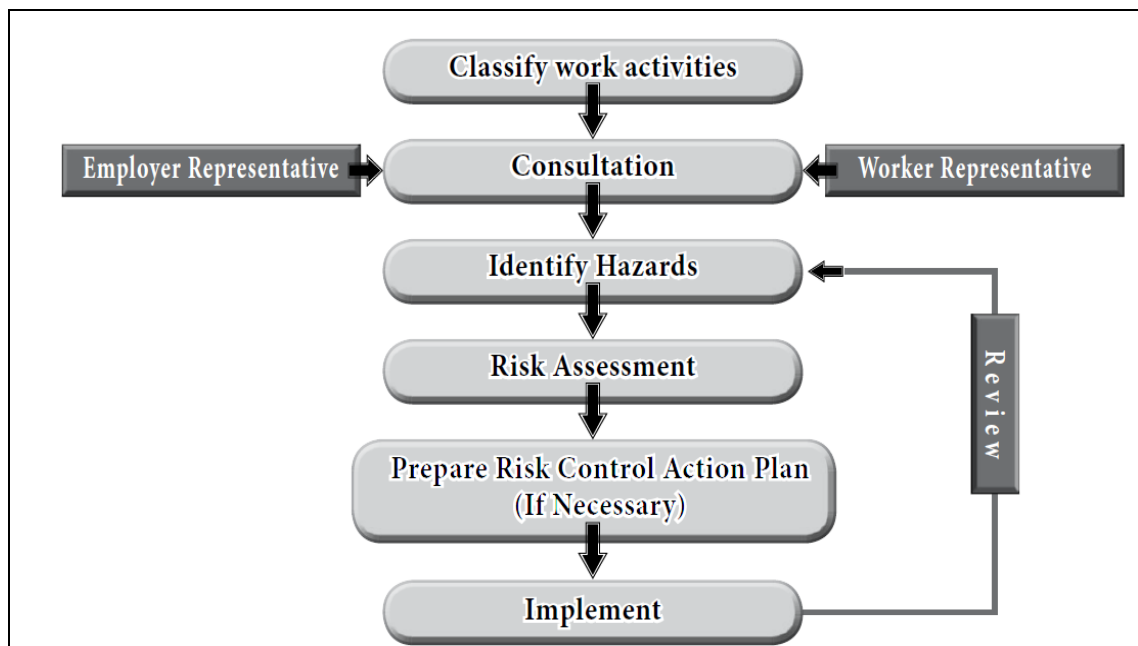
<p>Terje Aven 2011</p>	<p>Risk assessment is specifically valuable in detecting deficiencies in complex technical systems and in improving the safety performance of the technical system under consideration.</p>
<p>Hanafi Rusell 1945</p>	<p>Risk assessment is typically the process that consisting of four basic steps which are hazard identification, exposure assessment, dose-response assessment and risk characterizations.</p>
<p>Comcare Occupational Safety &amp; Health 2005</p>	<p>Risk assessment is the process of estimating the probability of occurrence of an undesirable event and the magnitude of its consequences over a specified time period.</p>
<p>Health and Safety Executive 2011</p>	<p>It is simply a careful examination of what things in the work could cause harm to the people.</p>

### 2.1.1 Importance of Risk Assessment

Risk assessments are very important because they form an integral part of a good occupational health and safety management plan (Canada OSH, 2006). Risk assessment is important because it helps to create awareness of hazards and risks among the employees and employers. Besides that, it also can identify who may be at risk such as employee, cleaner, contractors and so on. In addition, it also determines if existing control measures still adequate or not (DOSH, 2008).

### 2.1.2 Elements in Risk Assessment

The general elements of risk assessment are displayed in the Figure 2.2 below.



**Figure 2.2** Flow Chart of Risk Assessment (source: DOSH, 2008)