



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**EVALUATION OF ENVIRONMENTAL FACTORS ON
PRODUCTION SITE IN PRECISION INDUSTRY USING
ERGONOMIC ASSESSMENT**

Thesis submitted in accordance with the requirements of Universiti Teknikal
Malaysia Melaka for the Bachelor Degree of Manufacturing Engineering in
Manufacturing Management

By

AHMAD FARID BIN MOHAMMAD

Faculty of Manufacturing Engineering

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APPROVAL

This PSM submitted to the senate of UTeM and has been as partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Management). The members of the supervisory committee are as follow:

.....
(Main Supervisor)
(Official Stamp & Date)

DECLARATION

I hereby, declared this thesis entitled “Evaluation of Environmental Factors on Production Site in Precision Industry using Ergonomic Assessment” is the results of my own research except as cited in references.

Signature :

Author's Name : AHMAD FARID BIN MOHAMMAD

Date : 25TH MARCH 2008

DEDICATION

To my beloved family especially my mother, Puan Zainiah Binti Zainal, thank for her continuous support to me in performing this difficult task, and the journey does not end here.

To my supervisor, En Mohd Amri B. Sulaiman for being receptive and critical, and challenging me to be a better student

To Nor Diana Ibrahim, for always support me, and also to my entire friend, for their sacrifice, encouragement, and support towards project accomplishment.

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In the name of Allah S.W.T, the creator of all creations, all praises to Him, the Most Merciful the Most Blessing. Alhamdulillah I had completed this study successfully.

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ABSTRACT

This report is provided to explain the result of study on Evaluation of Environmental Factors on Production Site in Precision Industry using Ergonomic Assessment. This study covers the environment factor such as thermal comfort, noise, lighting level and indoor air quality of the production area on Winco Precision Engineering Sdn. Bhd. In this research also will study about Occupational Safety and Health Act 1994, Factory and Machinery Act 1967 and also the other related act. The data was obtained from several methodologies included observation, technical measurement and questionnaire among the group focusing which involved in focused area. The data were collected by the related equipment such as Thermal Comfort Monitor, Indoor Air Quality Monitor, Extech Heavy Duty Light Meter and Digital Sound Level Monitor. The standard level of exposure on the focused area are studied and compared with the current value that obtained in this research. The result showed that there are some potential risks in the worker exposure in environmental issue and need to be improved by some recommendations to eliminate or minimize the potential risks.

ABSTRAK

Laporan ini disediakan bagi menerangkan hasil keputusan daripada kajian tentang Penilaian Factor Persekitaran Terhadap Seksyen Pengeluaran dalam Industri Kejituan Menggunakan Penilaian Ergonomik. Kajian ini akan meliputi factor-faktor persekitaran seperti pendedahan terhadap suhu tinggi, bunyi, tahap pencahayaan, dan tahap kebersihan udara yang terdapat di kawasan persekitaran kerja di kilang Winco Precision Engineering Sdn Bhd. Kajian ini juga akan mengambil kira aspek-aspek yg berkaitan dengan Akta Keselamatan dan Kesihatan Pekerja 1994, Akta Kilang dan Mesin 1967 dan juga akta-akta yang berkaitan. Data diperolehi daripada beberapa kaedah penyelidikan termasuklah pemerhatian, kaedah pengukuran teknikal dan juga borak kaji selidik diedarkan kepada pekerja yang terlibat dalam kawasan tempat kerja yang dipilih. Data diperolehi dengan menggunakan alat-alat seperti Thermal Comfort Monitor, Indoor Air Quality Monitor, Extech Heavy Duty Light Meter dan Digital Sound Level Monitor. Tahap pendedahan terhadap faktor persekitaran di tempat kerja tersebut akan dikaji dan seterusnya akan dibandingkan dengan nilai yang telah ditetapkan oleh Akta. Keputusan kajian menunjukkan terdapat beberapa risiko yang mungkin dihadapi oleh pekerja berkaitan dengan factor persekitaran dan perlu diatasi dengan beberapa cadangan untuk mengurangkan atau menghapuskan risiko tersebut.

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LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURES

CNC	-	Computer Numerical Control
DOSH	-	Department of Occupational Safety and Health
OSHA	-	Occupational Safety and Health Act
FMA	-	Factory and Machinery Act
TTS	-	Temporary Threshold Shift
PTS	-	Permanent Threshold Shift
dB	-	Decibel
IAQ	-	Indoor Air Quality
IARC	-	International Agency for Research on Cancer
CO	-	Carbon Monoxide
CO ₂	-	Carbon Dioxide
VOC _s	-	Volatile organic compounds
RH	-	Relative Humidity
PMV	-	Predicted Mean Vote
PPD	-	Predicted Percentage of Dissatisfied
PEL _s	-	Permissible Exposure Limits
ISO	-	International Organization for Standardization

CHAPTER 1

INTRODUCTION

1.1 Introduction

Now a days, industry field is grows rapidly and the culture is also same in Malaysia. As we know in the industry, the workers are not escape from the industry hazard and risks. This study is conducted identify the potential risk in Precision Industry and relate the value's obtain with the Occupational Safety and Health Act.

1.2 Overview of the study

As we know, environment is some of the part of our human life. Human and environment is much related to each other and many of us did not realize that level of well environment also will affect our life especially in aspect safety and health. The environment is important aspect that must to be alert for the healthy lives. The environment also can be divided into many types of environment. For the examples is such as the environment of home and also environment in working area.

There is some of the factor that effect to our environment that makes our surrounding different from other place. For example, the environment is industry area is different from public area. At industry area are usually more expose to the environment pollution. Some of us did not realize that this situation will become a danger to human life if we can't engage the environment properly.

Environment consists of the air that we breathe, the temperature around us, the sound that we hear and the visual that we see. The simplest example, we used the oxygen and carbon dioxide in the air while we are breathing. Because of air is the part of our environment, the quality of the environment will decrease if the cycle of the gases was disturbed. So, it can give a high risk to the human if the quality of air is poor.

Another part of our environment is temperature. Humans need a suitable temperature to comfort their life. The temperature can't be too cool or too hot. Hot temperature can cause the human body to dehydrate and fatigue faster than the normal temperature. Meanwhile the cold temperature can cause the human body to shiver and the eye feel sleepy. Human usually don't realize that unsuitable temperature will affect their body and it's also can be a risk the human health.

The sound is also play an important part in our environmental. The unwanted sound will become a noise to human hearing and effect the human peacefulness. The high noise can cause human to loose their hearing ability that is very important in human life. In the short term, the noise did not bring any side effect to us but in the long term it can possibly hurt our hearing.

All of the factors in environmental that stated above are important to determine the safety and comfort of the working area, where we spend a lot of our daily time there. Many of people that work in industry including the workers and the employers don't realize the hazard in the environment of their working area. Both of the employer and workers should have learned and have a knowledge about this four factor in their working area that will be a potential risk to their health and safety.

Because of that, this research was conducted to identify the potential risk in term of environment issue in CNC machining industry and relate the issue with the Occupational Safety and Health Act. This research is done in environment issue in the working area at Winco Precesion engineering Sdn Bhd, which is one of the parts of CNC machining industry. The environmental factors will be researched in are thermal comfort, noise level, lighting level and indoor air quality. All four factors are the most

important environmental issues but sometimes never been given serious attention by the employer.

1.3 Problem Statement

Nowadays, there is not much research done in the Precision Industry. These types of industries are also facing the problem that related with environment issue that will be a potential risk to the workers. All potential risk may be a factor that can affect worker productivity, occupational and safety, worker performance, dangerous for worker and also for the stuff. If were consider the environment factor in this types of industry that which the exposure to the dust, dirty oil, coolant that have chemical properties and the airborne contaminant, there are have several aspect that can be a risk for worker health.

The environment condition like hot condition, lighting level, noise level and the vaporizations is a factor that must to consider in a safety system in Precision industry especially in machining area to avoid or decrease any accident, injury and any health problem. Besides, in this types of industry, the activities such as running the CNC machining, exposure to the high noise level, coolant smell and dirty from oil that bring bad air quality and thermal discomfort will give more risk in health and safety for worker in that side. The exposure to high noise level, improper lighting level, bad air quality and thermal discomfort can all be directly effect to personal health and safety and also can affect the worker performances. All the symptom and health problem that potential occur by thermal discomfort such as heat stress, heat strain, fatigue, nausea and/or vomiting, headache, and many more. Besides, the machine that operates used the coolant that has chemical compound that will bring bad air quality and the dirty and dust from the site will affect airborne contaminant at this area. This entire problem will be a hazardous to human's health. Some of the company do not realize this risk and do not imply the standard of the working area that has been stated in OSH Act.

1.4 Objectives

The main objective of this study is to assess a potential risk in Precision Industries in term of safety health and environment. In order to achieve it, the following objectives have been identified:-

1.4.1 Used assessment method to identify the potential risk from environmental issue which is Noise, lighting, indoor air quality and thermal comfort that could occur in Precision industry especially in machining area.

1.4.2 To relate this risk and make a comparison with Occupational Safety and Health Act, Factory and Machinery Act and other related Acts.

1.4.3 Used an engineering and administrative control to make some recommendations to eliminate or minimize the potential risks.

1.4.4 To expose for review Occupational Safety and health Act, Factory and Machinery Act and Environment Act those have been used in industry law from literature reviews.

1.5 Scope and key Assumption

This research will carry out with study the Occupational safety and Health Act (OSHA) related to Precision industry, and make a Winco Precision Engineering as a research selected areas. This research will carry out with some observation on M3 department which is one of the production site in Winco Precision Engineering Sdn. Bhd. and some questionnaire survey to the worker about their health and comfortable during working on that area. The scope of research will focus on M3 department condition and environment. The scope of this research is on environment factor such as exposure to high noise level, lighting level, thermal comfort and indoor air quality that

cause from environment, commonly focus in certain period which is 3 session (Morning, afternoon and evening). The relevant equipment such as Thermal Comfort Monitor, Indoor Air Quality Monitor, Extech Heavy Duty Light Meter and Digital Sound Level Monitor will be use to collect data. This study also implements some solutions regarding health and environment based on above problem. This study will be proposed some recommendations to reduce the entire problem.

1.6 Company Background

Winco Precision Engineering is a company that known as specialist in CNC machine (computerized numerical control), first established in Singapore in 1988 and function as buyer and seller metal processing equipment. In 1992, Winco start to expand their territory by opening new branch in Taman Teknologi Cheng. Starting from 5 lathe CNC machine and one CNC milling machine, Winco develop from day to day till today and Winco Melaka now have more than 50 CNC lathe machine and CNC milling machine.

This Company performs a mass production which the product that produced is like Cylinder, Roller piston, Cylinder plate, Crankshaft, Bearing, Cylinder head and many more. That product was sort and given responsible under department and supervisor involve, which section function to control the production of related product, they also find a solution to improve product, jig/fixture and layout machine so productivity can increase. Winco is today regarded as a diversified company offering a total machining and tooling solution operating in the hub the highly competitive Asian cities in Malaysia and Singapore. Their delicated, highly skilled workforce has grown in excess of 200 providing a variety of Precision Engineering Contract Services.



Figure 1.1: Winco Precision Engineering Main Building

Winco general information:

Company Name	Winco Precision Engineering Sdn Bhd
	Company No. 269790-D
Location	35&37, Jalan TTC 25, Taman Technology Cheng, 75250 Melaka, Malaysia
Telephone/ Fax	+ 606335 1190/ + 606335 2196
Product	Cylinder, Roller piston, Cylinder plate, Crankshaft, Bearing, Cylinder head, all the product that produce is the part of the refrigerator devices

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides the introduction, definition, and the history of safety, health and risk, also the some introduction about Precision Industry. This chapter also discusses the Occupational safety and health history and their development in Malaysia.

The potential risk of the high temperature, noise and lighting level and the hazard from poor indoor air quality also discusses. Besides, this chapter also will use to relate the risk with Occupational Safety and Health Act (OSHA), Factory and Machinery Act (FMA) and other related Acts.

2.2 Introduction of safety

Since the dawn of human history, the desire to be safe and secure has always been an intimate part of human nature. Safety is a well-developed discipline and it may simply categorize in two broad categories: general and system. The general includes occupational safety, highway safety, etc. and the system includes the various aspects concerning engineering equipment safety ^[5]. Safety has become a very important issue because each year a vast number of people die and get seriously injured due to workplace and other accidents. There are many goals of engineering safety and some of these are as follow:

- Reduce accidents.
- Control or eliminate hazards.
- Develop new methods and techniques to improve safety.
- Maximize returns on safety efforts.
- Maximize public confidence with respect to product safety.

As we proceed into the Middle Ages, more awareness of the link between the work that people did and the types of injuries and illnesses which they suffered was recognized. With the advent of the industrial revolution, injuries, illnesses and death soared, caused by machinery and the work environment.

2.2.1 Definition of Risk

In engineering, the quantitative engineering definition of risk is: