
**KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA**

# Evaluating And Planning For Facilities Compliance OSHA's Ergonomic Regulation In Manufacturing Industry.

Thesis submitted in accordance with the requirements of the Kolej Universiti Teknikal Kebangsaan Malaysia for the Bachelor of Manufacturing Engineering In Manufacturing Process

By

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**KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA**

## BORANG PENGESAHAN STATUS TESIS*

JUDUL: EVALUATING AND PLANNING FOR FACILITIES COMPLIANCE OSHA'S ERGONOMIC REGULATION IN MANUFACTURING INDUSTRY.

SESI PENGAJIAN : 2005/2006

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# DEDICATION

*For My Beloved Father, Mother, All My Siblings and Friends*

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# ABSTRACT

This research is basically about to plan for facilities compliance OSHA's Ergonomic regulation in the manufacturing industry. This report contains of five chapters; introduction, literature review, methodology, data collection and data analysis. This research is based on the OSHA need's and from the law which been approve in 1994. In methodology, this research is done by evaluating three aspects which are indoor air quality, sound level and illumination. The equipments that will be used are sound level and light meter and indoor air quality monitor. In data collection, comparison will be made between data and standard data for all fields. Besides that, some suggestions also have been given to solve all disadvantages in each line.

# ABSTRAK

Secara asasnya, kajian ini adalah mengenai perancangan perlaksanaan peraturan-peraturan ergonomik dalam Akta Kesihatan dan Keselamatan Pekerjaan (OSHA) dalam industri pembuatan. Laporan ini mengandungi lima bab penting iaitu pengenalan, kajian ilmiah, kaedah, pengumpulan data dan penganalisisan data. Kajian ini berdasarkan keperluan yang dikehendaki OSHA yang dikuatkuasakan pada 1994 dan undang-undang lain. Bahagian kaedah menerangkan aspek-aspek yang dinilai seperti kualiti udara dalam bangunan, kadar kebisingan dan pencahayaan. Alat-alat yang digunakan untuk mendapatkan semua bacaan ialah pengukur kebisingan, pengukur pencahayaan dan pengukur kualiti udara dalam bangunan. Dalam bahagian penganalisisan data, perbandingan akan dibuat antara data yang diperoleh dengan nilai piawai untuk setiap bidang. Selain itu, cadangan untuk memperbaik kelemahan-kelemahan turut dinyatakan dalam bahagian ini.

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| | | |
|---|---|---|
| AGM | - | Annual General Meeting |
| dB | - | Decibel |
| DOSH | - | Department of Safety and Health |
| IPSB | - | Ingress Precision Sdn. Bhd. |
| ILO | - | International Labor Organization |
| ISO | - | International Standard Organization |
| KUTKM | - | Kolej Universiti Teknikal Kebangsaan Malaysia |
| MOHR | - | Ministry of Human Resource |
| NIOSH | - | National Institute of Occupational Safety and Health |
| NRR | - | Noise Reduction Rating |
| OSHA | - | Occupational Safety and Health Act |
| PERODUA | - | Perusahaan Otomobil Kedua |
| PPE | - | Personnel Protective Equipment |
| PPM | - | Part Per Million |
| PROTON | - | Perusahaan Otomobil Nasional |
| SOCSO | - | Social Safety Organization. |

# CHAPTER 1
# INTRODUCTION

## 1.0 Introduction

Nowadays, people can see safety and health aspect play a major role in all industries. Company cannot afford to lose much more skilful worker in they have. When they lose some experienced worker, they will suffer some decreasing of productivity because they will use new worker and in the same time they need to train them. In the other hand, they must pay some compensation to the worker due to the accident.

By referring to this condition, in 1994, Parliament of Malaysia has agreed to establish an act which know as Occupational Safety and Health Act 1994. This act is established to create a safety and comfortable working area in industry.

In this act, there is something that can help all workers prevent themselves from hazard which is ergonomic factor. Ergonomic is defined by Karapetrovic (1999); information about human behaviour, limitation, abilities and other human characteristic to the design of system for efficient , safe, comfortable and effective human use.

This project or research is to evaluate and improving for facilities compliance with OSHA's ergonomic regulations in manufacturing industry. This chapter will discuss about the objectives of the research, scope of the project, problem statement, important of the study and outline of the study.

## 1.1 Problem Statement

OSHA's Ergonomic Regulation is needed to be understood by all industries due to many reasons. It is related for many safety and health issues in working area. Nowadays, many industries have applied these regulations but not all the workers know about the existence of it. Basically workers cannot understand the act stated and level of implementation among workers is low. Most of workers ignore safety procedures which been ruled by company due to lack of knowledge. This research tries to understand and identify the level of implementation in one of manufacturing industry and how to simplify it so that it can be understood by all workers. Besides that, this research also tries to discover relation with safety and health issues in the industry and how it relate in increasing the productivity in the industry.

## 1.2 Objectives

The objectives of this research are:

i. To understand OSHA's Ergonomic Regulations in manufacturing industry.
ii. To construct OSHA's Ergonomic Regulations Assessment Guide.
iii. To evaluate and implement OSHA's Ergonomic Regulations in manufacturing industry.
iv. To analyse the efficiency and benefit of implementations.

## 1.3 Scope of the Research

This project is to define the OSHA's Ergonomic Regulations and a case study selected for implementation and analyse in the manufacturing industry. This study has been done in Ingress Precision Sdn. Bhd. (IPSB) which is situated in Nilai, Negeri Sembilan. This factory is one of the vendors for PROTON and PERODUA

which they supply door sash and moulding parts. This research has covered only in sash manufacturing. This research will base on sound or noise level, indoor air quality and illumination.

### 1.4 Important of the Research

This research is very important to survey the need of OSHA's Ergonomic Regulations in industry. This research also can help the industry which applies OHSAS 18000's certificate which is related to safety and health in the working area. But the most important of this research, people could see how they can avoid accident in industry and all the elements that can make accident occur. Besides that, people can see some benefit of implementation in the industry whether in productivity or the efficiency of the worker.

### 1.5 Outlined of the Research

This report consists of five chapters which are introduction, literature review, methodology, data collection and data analysis. In the introduction, it is discuss on overview of the research, problem statement, scope of the research and important of the report.

In the literature review, it explains on previous research which related to the research to be done and the hypothesis of the all study.

In the methodology, all the method to accomplish the research will state. All the experimental and analytical method will describe in this part.

In data collection, it will discuss how to setup the experiment, the data that need to collect and the result prediction of the research.

For data analysis, all data which been collected from each line have been discussed. Here, data collected has been compared with standard data. By compare between these data, any line which not performs as standard can be detected. Suggestions to overcome the problems also provided. Graphs for any standard have been constructed to see performance at each line compare with standard data.

# CHAPTER 2
# LITERATURE REVIEW

## 2.1 Overview of the Research

In creating a safety and healthy working area, there are many aspects that company must consider. In ergonomic study, there some factors that contributes to accidents which are personnel characteristic, job characteristic, equipment and tools, physical environment and social environment. (Wickens *et al*, 2004)

In personnel characteristic, there are some factors that must be considered which are age and gender, job experience and stress, fatigue, drugs and alcohol. From the research, people from 15 to 24 years old, have highest rates in accident. The primary reasons is people who get older become more conservative and their estimation to accident become more conservative. For job experience, high percentage of accidents occur to the worker who has been work fro first three month with peak about two or three month. In this case, experience worker can identify the hazard easily compare to the new worker. Workers who works in stress and fatigue will have decrement in performance an expose them to injury. For the person who taking alcohol or drug before works, he will lose much of their attention and awareness for their work. This also exposes them to the accident. (Wickens *et al*, 2004)

Many characteristics of the job or task that can cause difficulties for the operator. Some oh these include high physical workload, high mental workload and other stress including factor such as vigilance task that lower physical arousal level. (Wickens *et al*, 2004)

Many of the hazards associated with the workplace are localized in the tools or equipment use by the employees, and as a consequence, much of the safety analysis performed in an industrial environment focuses on hazard inherent in the equipment itself. Accidents cause by equipment normally due to control and display, electrical, mechanical, pressure and toxic hazard. Good control and display are desirable to detect any hazard at the equipment. Electric hazard occur due to electric shock in a sudden and accidental stimulation of the body's nervous system by an electric current. Mechanical hazard occur can come from many source such as rotating equipment, open-generate power presses and power hammer. There are some accidents due to mechanical hazard such as cutting or tearing of skin, muscle or bones, shearing, crushing, breaking and straining. The entire mechanical hazard could be reduced by applying guard at the potential area. Toxic and pressure hazard can cause from altitude change, heat, pressurize gas and many more. It can cause vessel to rupture. (Wickens *et al*, 2004)

In physical environment, elements that can cause accident are illumination, noise and vibration, temperature and humidity, fire hazard, radiation hazard, fall and exits and emergency evacuation. Lighting most directly affects safety by making its relatively easy or difficult to perform task. Illumination is important for safety include direct and indirect glare and light or dark adaptation. Noise and vibration can cause us to deaf and cannot hear any sound signal to avoid hazard. Working condition with too high or low temperature can expose body to serious safety hazards either directly by impacting body health or indirectly impairing operator performance. Fire hazard come from combination of three elements: fuel, oxidizer and source of ignition. Fire hazard can burn anything close to it. Certain combinations of the neutrons and protons can results unstable atoms, which try to become stable by giving off excess energy in the form of particles wave (radiation). The examples of elements that can produce radiation are X-ray, gamma ray and

thermal neutron. Biological effects of radiation can occur in a one-time acute exposure or from chronic long-term exposure. Falls can be cause by falling due to slippery, fall from one floor to another, falling from a structural support or walkway, fall from building and fall from ladder. Exits and emergency evacuation poles or area which is also can cause hazard. When there are any accidents occur in the building, and no emergency door, it can cause much more danger. (Wickens *et al* , 2004)

Social environment can cause accident. This is due to other work that we cannot see during doing other work and lack of human awareness. (Wickens *et al*, 2004)

From the entire causes which been stated above, this research will focus on the physical environment aspects at three elements which are illumination, noise and indoor air quality. All this elements must be related and based on OSHA's ergonomic regulations.

Occupational Safety is a branch of Occupational Safety and Health that is concerned with the physical environment of the workplace and the wellbeing of the worker. Its aim is to create a conducive environment through safe work practices, procedures and Occupational Safety and Health (OSH) management systems to ensure the protection of workers while doing their job tasks. The Occupational Safety Division of National Institute of Occupational Safety and Health (NIOSH) division is currently involved in several consultation projects and in-house training for various sectors like manufacturing, transport, construction and agriculture. (WHO/ILO, 1950)

Occupational health is the promotion and maintenance of the highest degree of physical, mental and social well being of workers in all occupations, the prevention among workers of departures from health caused by their working conditions, the protection of workers in their employment from risks resulting from factors adverse to health, the placing and maintenance of the workers in an occupational environment adapted to his physiological and psychological equipment. (ILO/WHO, 1950)

December 1, 1992 marked a new era in the promotion of Occupational Safety and Health in Malaysia. On this day the National Institute of Occupational Safety and Health (NIOSH) was launched, after careful preparation and commitment from all parties to improve the safety and health of workers at the workplace in Malaysia. In the words of the Minister of Human Resources, Malaysia, NIOSH would be a "critical catalyst" in the promotion of occupational safety and health that would also serve as the "backbone" to create a "self-regulating occupational safety and health culture" in Malaysia.

NIOSH was established as a Company Limited by Guarantee, under the Malaysian Companies Act, 1965. As a company, NIOSH is expected to operate efficiently and with minimal administrative bureaucracy. The NIOSH Board of Directors comprises of 15 Board members, ten of which are appointed by the Government while the remaining are elected by NIOSH members during the Annual General Meeting (AGM). This makes NIOSH different from similar institutions in other countries. NIOSH was set up with a RM1 million Launching Grant from the Government and a further RM50 million Endowment Fund (RM40 million from the Social Security Organization (SOCSO) of Malaysia and a further RM 10 million from the Malaysian Government), which will be invested, and the return of investment will be used to partly finance the operation of NIOSH. (NIOSH, 2002)

The definition of ergonomic base on NIOSH, 2002:

*The science on how to fit the task and working environment to the worker using scientific data*

Wilson 1995 defined ergonomic as "*the practice of learning about human characteristic and then using that understanding to improve people's interaction with the things they use and the environments in which they do so.*"

A derivative of the Greek terms; ergon and nomos

| | | | | |
|---|---|---|---|---|
| ERGON | + | NOMOS | = | ERGONOMICS |
| ( work and effort ) | | ( law or surroundings) | | |

Adoption of job and workplace to the worker by designing tasks within the worker's capabilities and limitations

Objectives of the ergonomic based on NIOSH, 2002:

Approach used is to obtain an effective match between the worker and work system to optimize:

1. Work efficiency
2. Health and safety
3. Comfort and ease of use
4. Job satisfaction

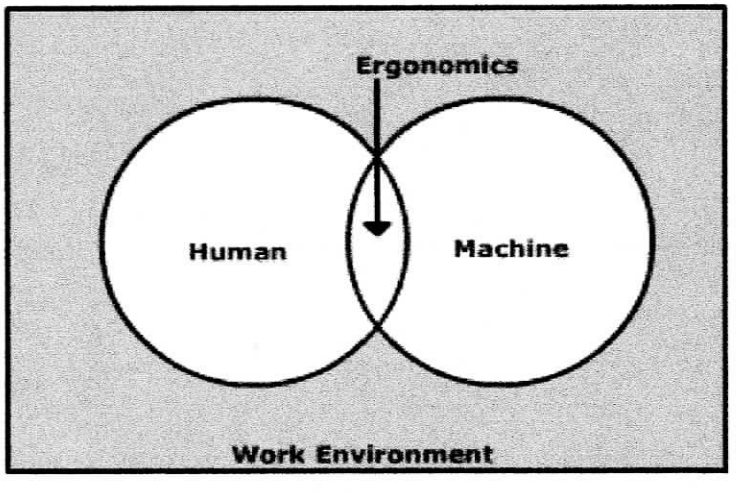


Figure 2.1: Human-machine interaction (NIOSH, 2002)

Table 2.1: Application of Ergonomics in Industry for Safety and Health. (NIOSH, 2002)

| Design/Evaluation of Workstation | Design/Selection of Hand Tools, Equipment, Devices |
|---|---|
| 1. Working height<br>2. Working envelope (reach, clearance)<br>3. Arrangement of equipment, tools, bins, components | 1. Vibration<br>2. Handle size<br>3. Grip types<br>4. Handedness<br>5. PPE<br>6. Usability |
| **Design/Evaluation of Job/Task Procedures** | **Design/Evaluation of Working Environment** |
| 1. Manual handling<br>2. Mechanical aids<br>3. Fatigue and stress (shift work)<br>4. Task demands<br>5. Errors<br>6. Working efficiency<br>7. Sitting/standing<br>8. Visual work | 1. Lighting<br>2. Noise<br>3. Temperature<br>4. Comfort |