Kolej Universiti Teknikal Kebangsaan Malaysia

Ergonomic Assessment in Manufacturing Industry

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

By

Koh Choon Chieh

Faculty of Manufacturing Engineering

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216-G, Lorong Bukit Senjuang,
75000 Melaka.

Tarikh: 30 May 2006

Disahkan oleh:

(TANDATANGAN PENYELIA)

Cop Rasmi:
NOR AKRAMIN BIN MOHAMAD
Pensyarah
Fakulti Kejuruteraan Pembuatan
Kolej Universiti Teknikal Kebangsaan Malaysia
Karung Berkunci 1200
Ayer Keroh, 75450 Melaka

Tarikh: 30 May 2006

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NOR AKRAMIN BIN MOHAMAD
Pensyarah,
Fakulti Kejuruteraan Pembuatan
(Penyelia Utama)
☎06-2332045

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I hereby, declare this thesis entitled "Ergonomic Assessment in Manufacturing Industry" is the results of my own research except as cited in the reference.

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DEDICATION

Dedicated to my beloved family and friends

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ABSTRACT

This thesis title is aim to complete an ergonomic assessment in manufacturing industry. Ergonomic assessment in this thesis is defined as the design and improve the workplace, equipment, machine, tool, product, environment, and system, taking into consideration the human's physical capabilities, biomechanical and optimizing the effectiveness and productivity of work systems while assuring the safety, health, and well-being of the workers. The study begins with literature review on the scholarly articles, books and other sources that related to major ergonomic issues like environmental and musculoskeletal disorders issues that affected workers performances. This thesis purpose is to do research about the workers musculoskeletal disorders (MSD) injuries at different body areas and environmental factors that affected worker performance. This thesis purpose also included identification and analyses of ergonomic issues in workplace and make recommendations and implementations to prevent environmental and musculoskeletal disorders issues. In this study, data analysis divided to 8 parts; questionnaire that related to ergonomic issues, temperature and humidity, light level, sound level, heart rate, pinches strength, grip strength and lifts strength for analysis purposes. Based on results from data analysis, 9 improvement suggestions given, 5 suggestions approved by Fetta management for further project implementations such as implementation of grinding station, implementation of simple jigs on welding table, implementation of proper material loading area, implementation of scissor lift and implementation of small stairway. Lastly, the feedbacks' data collected base on the implementations done. These data are to evaluate the effectiveness of the 5 implementations. The feedbacks' analysis divided into 4 parts; questionnaires feedbacks that related to ergonomic issues, pinches strength feedbacks, grips strength feedbacks and lifts strength feedbacks for analysis purposes.

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LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE

CTD	-	Cumulative Trauma Disorders
CTS	-	Carpal Tunnel Syndrome
EASP	-	Externally Applied Surface Pressure
HAVS	-	Hand-Arm Vibration-syndrome
MSD	-	Musculoskeletal Disorders
NIOSH	-	National Institute for Occupational Safety and Health
RSI	-	Repetitive Strain Injury
OSHA	-	Occupation Safety and Health Administration
WHO	-	World Health Organization
WMSD	-	Work-related Musculoskeletal Disorders
bpm	-	Beats per Minute
dB	-	Decibel
In	-	Inch
lx	-	Lux
mm	-	Millimeter
N	-	Newton
°	-	Degree
ºC	-	Degree Celsius
%	-	Percentage

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E.8 Table Shows Average Feedbacks' Floor Lift Strength in Pounds from 45 Employees at 3 Production Sections (Polishing, Final Weld K-Bar and Packing)

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CHAPTER 1
INTRODUCTION

1.1 Background Introduction

According Jeffrey (1995), ergonomics is defined as the design of the workplace, equipment, machine, tool, product, environment, and system, taking into consideration the human's physical capabilities, biomechanical and optimizing the effectiveness and productivity of work systems while assuring the safety, health, and well-being of the workers. In general, the aim in ergonomics is to fit the task to the individual, not the individual to the task.

According to Dennis et al. (2004), environmental factors or features that arise from the illumination, temperature, workplace noise and others that could be encountered at work and affect behavior. Environmental features can affect people health, performance and comfort. The affects of these three aspects are usually combined. For example, poor health can lead to both poor performance and reduced comfort and, thus, reduced work satisfaction. The ideal range for performance and comfort is narrow. Therefore, trying to adapt to conditions outside the ideal range can make people use more effort, which can lead to reduced performance and comfort. For example, a person tries to see fine details when illumination levels are too low or too high.

The physical demands of many jobs make the musculoskeletal system highly vulnerable to a variety of occupational injuries and illnesses. According to Dennis et al. (2004), musculoskeletal injuries associated with work-related musculoskeletal

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disorders (WMSD) and the conditions with repeated exposure to physical activity called cumulative trauma disorders (CTD).

According to Dennis et al. (2004), work-related musculoskeletal disorders (WMSD) are a type of injury that results from chronic (or long term) overuse or misuse of muscles, tendons, ligaments, joints, cartilage, or spinal discs during work. Carpal tunnel syndrome, tendonitis, thoracic outlet syndrome, and tension neck syndrome are examples. Work activities that are frequent and repetitive, or activities with awkward postures cause these disorders, which may be painful during work or at rest. Almost all work requires the use of the arms and hands. Therefore, most WMSD affect the arm, hands, wrists, elbows, neck, shoulders, back and others. Work using the legs can lead to WMSD of the legs, hips, ankles, and feet. Some back problems also result from repetitive activities.

According to Dennis et al. (2004), cumulative trauma disorders (CTD) can result from intense, repeated, sustained, or insufficient recovery from exertion, motions of the body, vibration, or cold. CTD generally develop over periods of weeks, months, and years. Repetitive strain injury (RSI) is another term for a cumulative trauma disorder specifically related to repetitive tasks. Examples of cumulative trauma disorders (CTD) include:

i) Tendon disorders: tendonitis, tenosynovitis, bursiti, ganglionic cyst.
ii) Neurovascular disorders: thoracic outlet syndrome, vibration syndrome.
iii) Nerve entrapment disorders: carpal tunnel syndrome.

The application of ergonomic principles in the workplace can result in the following (Jeffrey, 1995):

i) Increased productivity.
ii) Improved health and safety of workers.
iii) Lower workers' compensation claims.
iv) Compliance with government regulations (e.g. OSHA standards).

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v) Job satisfaction.
vi) Increased work quality.
vii) Lower worker turnover.
viii) Lower lost time at work.
ix) Improved morale of workers.
x) Decrease in absenteeism rate.

Fetta Auto Part Industries (M) Sdn. Bhd. at Malacca accepts the "Ergonomic Assessment" research that will carry on their company. Fetta Auto Part Industries (M) Sdn. Bhd. is one of the Malaysia's leading producers of automobile exhaust system, protector bars and car accessories. Besides that, the company also produce custom made car accessories according to customer requirement such as canopy, roof rack, bed linear, cargo linear, rubber lining, utility box, towing hook, rubber lining, stone guard and others. The company also engages in the manufacturing of automobile exhaust system, protector's bars as well as the custom made car accessories for both the Original Equipment Manufacturer (OEM) and export market.

1.2 Problem Statements

According to Dennis et al. (2004), stressors, arising from illumination, temperature, noise or any other aspect of the environment can adversely affect people when they reach a certain level, although the effect may not be apparent either to the person being affected or to an observer.

Most of the workers need to perform many manual-handling tasks, most of the tasks involved with handling the heavy weight materials in the production. Typically, the factors that caused workers' work-related musculoskeletal disorders (WMSD) and cumulative trauma are such as:

i) Application of force
ii) Repetitive motion

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