UNIVERSITI TEKNIKAL MALAYSIA MELAKA

INVESTIGATING THE ERGONOMICS BODY POSTURE ON REPETITIVE AND HEAVY LIFTING ACTIVITIES OF THE WORKERS IN AEROSPACE INDUSTRY'S WAREHOUSE

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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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) (Hon.). The members of the supervisory committee are as follows:

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(Dr. Seri Rahayu Binti Kamat)
Supervisor

ABSTRAK

Kajian projek ini telah dijalankan di salah sebuah gudang milik syarikat pembuatan bahan komposit. Jenis aktiviti pekerjaan yang paling berisiko yang melibatkan faktor peningkatan risiko ergonomik didalam gudang tersebut. adalah jenis aktiviti yang melibatkan pergerakan yang berulang dan mengangkat beban yang berat. Pernyataan masalah mengenai gangguan muskuloskeletal telah dinyatakan melalui pengagihan borang kaji selidik kepada pekerja-pekerja didalam gudang terbabit. Objektif kajian projek ini adalah untuk menyiasat mengenai postur badan pekerja gudang semasa melakukan aktiviti yang melibatkan pergerakan yang berulang dan mengangkat beban yang berat, untuk menganalisa ketidakselesaan yang timbul daripada postur badan pekerja semasa bekerja yang boleh menyebabkan gangguan muskuloskeletal, dan untuk mencadangkan postur tubuh yang terbaik semasa bekerja serta langkah-langkah penyelesaian bagi permasalahan berkaitan gangguan muskuloskeletal terbabit. Kaedah-kaedah yang telah dijalankan sepanjang kajian projek termasuklah temu ramah, pengagihan borang kaji selidik, pengambilan ukuran antropometri pekerja-pekerja, rakaman video, analisa postur badan secara manual, analisa postur badan menggunakan perisian CATIA V5, pengagihan borang kaji selidik jenis Nordik, pengiraan indeks aktiviti mengangkat barang NIOSH dan pengiraan penyaranan had limit berat beban yang diangkat. Skor RULA telah dapat dikurangkan pada akhir kajian projek melalui penambahbaikkan postur badan pekerja semasa bekerja dan rekaan alatan mengangkat barang yang dicadangkan. Selain itu, kesedaran pekerja mengenai kepentingan untuk mereka bekerja dalam postur badan yang betul telah ditingkatkan.

ABSTRACT

The project was being done at a manufacturing industrial warehouse. There are working activities that involve ergonomics risk factor in the warehouse. The most ergonomics risk factor activities found in the warehouse is repetitive and heavy lifting activities. The workers are having signs of musculoskeletal disorder (MSD) problems. The problem statement had been retrieved through the distributed questionnaires. The questionnaires had been distributed at the workers in the warehouse. The objectives of this project are; to investigate about the body posture of the workers while doing repetitive and heavy lifting activities in the warehouse, to analyse the discomfort body posture of the workers while undertaken the repetitive and heavy lifting activities that cause the musculoskeletal disorder problems and to suggest the proper body posture and ways to reduce the musculoskeletal disorder problems. The methods that had been used along this project include; interview session, questionnaires, anthropometry measurement, video recording, RULA assessment, Nordic questionnaires, CATIA V5 RULA analysis, NIOSH lifting index calculation, recommended weight limit calculation, house of quality and time study.
The result that had been gained at the end of the study is decreasing of the RULA analysis score which can lead to musculoskeletal disorder problems through the improvised working posture and lifting equipment design suggested. Besides that, this project had come out with the guidelines of recommended weight limit and lifting index that can be used by the workers and increase the awareness of the workers about the musculoskeletal disorder issues.

DEDICATION

To my beloved father, mother, family, friends and final year project supervisor, Dr Seri Rahayu binti Kamat, thank you for all of the support and encouragement given along the completion of this project study.

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I would like to thanks to ALLAH SWT, by grace and blessing from him, I had successfully completed my final year project, consisting final year project 1 and final year project 2 accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM), as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Management).

I would like to thanks my project supervisor, Dr. Seri Rahayu binti Kamat for her excellent supervision, invaluable guidance, advice, support, encouragement and help throughout the development of this project.

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List of Abbreviation

UTeM	-	Universiti Teknikal Malaysia Melaka
CTRM	-	Composites Technology Research Malaysia
MSD	-	Musculoskeletal Disorder
RSI	-	Repetitive Strain Injuries
NMQ	-	Nordic Musculoskeletal Questionnaires
RULA	-	Rapid Upper Limb Assessment
CTS	-	Carpal Tunnel Syndrome
OSHA	-	Occupational Safety and Health Administration
CFR	-	Code of Federal
NIOSH	-	National Institute of Occupational Safety and Health
SST	-	Site Specific Targeting
PPE	-	Personal Protective Equipment
HSE	-	Health, Safety, and the Environment
HSA	-	Health and Safety Authority
PSM	-	Final Year Project
LI	-	Lifting Index
RWL	-	Recommended Weight Limit

CHAPTER 1
INTRODUCTION

This chapter describes the things about the background study, the problem statement and the study's objectives. The study scope along with the limitation in the study completion had been discussed at the end of this first chapter. The problem statement had been retrieved to determine the study's objectives. Through the study's objectives, the scope, as well as the limitation had been identified. The study is about ergonomics study on body posture of the repetitive and heavy lifting activities.

1.1 Background of Study

The word 'ergonomics' is the word that comes from the Greek word with the meaning of 'work law'. Sometimes, it can also be described as 'the effort to fit the system to the human' which means that to fit the unique human limitation and abilities by selecting and designing the informed decision, tasks, environment, tools and equipment. The dimensions that define ergonomics discipline include philosophy, theory, technology or environment, management, design, practise and education according to Salvendy (2012). The main focus of this study is to improve the ergonomics body posture of workers in the aerospace manufacturing company. Hence, this study took place in the warehouse in ABC Sdn Bhd. The company was given a role to cultivate the high technology composite based industry related to aerospace industry. The company is one of the international suppliers of aero structure composites for military and commercial aircraft manufacturers. Apart from manufacturing aero structure composite, the company also assemble composites

structure, do research and development activities on composites, manufacture automotive composite structures, provide engineering design services and manufacture defence related equipment. The company's location is at Batu Berendam, Melaka. There are worldwide trusted company had becoming customers and strategic partners of ABC Sdn Bhd. The goal of this company is to bring the Malaysian local aerospace industry to higher level amidst the competent aerospace industry globally. However, with the involvement of manufacturing activities in the company as any other manufacturing companies, the workers involved were being exposed to ergonomic risk. The warehouse of the ABC Sdn Bhd had been chosen as the placed for this study is because the working process design in the building involves repetitive task and heavy lifting activities. The risk of ergonomics can be seen affecting the workers in the building as they had complained about them experiencing fatigue and pains at certain areas of the body especially at the lower back of the body. The complaints had been retrieved through the distributed questionnaires. All those symptoms and effects will greatly contribute to repetitive stress injuries (RSIs) and musculoskeletal disorder (MSDs). Both are known as parts of ergonomic injuries. Ergonomics injuries are the bad effects that caused by the existence of the ergonomics risk factors such as awkward postures, sustained postures, contact pressure, forceful exertion, forceful strain and exposure to vibration, heat or cold. When the risk factors combined and exerted on the worker through a continuous period, the risk factors will lead to injury, pain and disability. As example, in a manufacturing company, if an injury occurs, the dangerous single event will place a stress on body tissues. Although the tissues are capable to recover its condition, the repetitions of the hard manufacturing activity that cause the injury will slower the healing process.

1.2 Problem Statement

Based on the literature review and previous studies, the repetitive and heavy lifting activities can contribute to ergonomics injury. Besides, there are problems detected through the interview session with a manufacturing engineer and data collections of

the questionnaires distributed to the workers. The activities in the warehouse of ABC Sdn Bhd involved manual handling task that needs the workers to lift and move heavy objects repetitively. The objects can be referred to tools and aircraft panels which are the products of the company. Although there are equipment such as forklift had been provided by the company to lift big panels, there are still many panels that are cannot be lifted by the equipment. It is due to their sizes and the space provided in the warehouse. All the intentions stated required the worker to lift the panels manually. Besides, the worker had to risk their body to muscle injuries while lifting the panels in order to follow the existing design of work process. According to the questionnaires data collections, majority of the workers had already been experiencing the back pain, shoulder pain and several other pains that related to muscle fatigue when there are too many panels that needs to be lifted. Anyhow, the lack of training about the importance of right manual handling techniques, the least awareness about the serious injuries like MSDs and RSIs can be seen as the main reason why the workers were maintaining their bad manual handling technique although they had already been experiencing the symptoms of the injuries.

1.3 Objectives of Study

Based on the problems arise related to the repetitive and heavy manual lifting activities in the warehouse, the objectives of the study are;

i) To investigate about the body posture of the workers while doing repetitive and heavy lifting activities in the warehouse.
ii) To analyse the discomfort body posture of the workers while undertaken the repetitive and heavy lifting activities that cause the musculoskeletal disorder problems.
iii) To suggest the proper body posture and ways to reduce the musculoskeletal disorder problems.

1.4 Scope and Limitations of Study

This study focused on reducing the bad effects involving ergonomic risk from repetitive and heavy lifting activities in the ABC Sdn Bhd warehouse. There are many loading and unloading activities occurred at the warehouse. This study only focus on the activities that involved the most repetitive and heavy lifting activities that was seen as the critical activities among all the activities involved in the warehouse. The data about the body posture of the affected worker had been retrieved. The musculoskeletal disorder problems of the workers had been retrieved by the distribution of questionnaires to the workers and RULA analysis methods. The working body posture of the workers had been reclaimed by taking the photos and videos of the workers while they are working. The working postures of the workers while performing the repetitive and heavy lifting activities had been observed and determined to be analysed. The ergonomics risk factors that had been studied include; awkward body posture, repetition movement, heavy lifting, contact stress and poor design work process. Besides that, other important things have been considered in this study are the requirement of the working activities, ergonomics obligation, ergonomics problems and ergonomic principles. In advance, other aspects such as NIOSH lifting equation, anthropometric measurement, muscle fatigue, musculoskeletal disorder (MSDs) and repetitive stress injuries (RSIs) had been enclosed in this study. The software that had been used to analyse the working body posture is CatiaV5. The working body posture analysis had been done to prove the effectiveness of the body posture improvement. However, the result of the study is only based on the simulation. There are no fabrication activities and real implementation occurred in order to test the suggested improvement. This study did not cover the labour productivity issue.

1.5 Benefits of Study

There are many benefits that had been obtained from this study. Through this study, the root causes of the ergonomics risk had been determined. Thus, the determined

root causes can warn the workers and make them aware of each of their body postures while completing their works. Besides that, through the anthropometric data and the RULA analysis result that had been retrieved using the CATIA V5, body posture improvement had been made. The body posture improvement can explains more details about the concept of ergonomics to avoid any risk injury based on poor ergonomics application. The workers can gained more knowledge about ergonomics and the importance of right body posture while working through this study without having to attend any external ergonomics training session. Furthermore, this study can be the reference for the employee to reduce the musculoskeletal disorder effects as this study had also will provide guidelines for the workers to improve their working body posture. The NIOSH lifting equation inserted in this study can help the company to recognize the important aspects that has to be taken care of to avoid risk injuries. Last but not least, the benefit of the overall study is the improvement of working body postures in order to prevent any ergonomics risk injuries occurred to the workers such as musculoskeletal disorder and repetitive strain injury.

1.6 Structure of the Project

This first phase report contains of four chapters. The introduction of the project had been enclosed in the first chapter. The introduction includes the background of the project, problem statement, project's objectives, scope of projects, and the benefits of the project.

The second chapter focused on the literature reviews that are related to the project. This chapter mentioned about the previous studies that had been made, the method used of the studies and the result gained by the studies. All the previous studies were selected based on the ergonomics, body postures, anthropometric measurement, RULA analysis, the related lifting calculations, ergonomics risk injuries, rules and regulation.

The methodology of this project had been explained in chapter three. The setup of experiment, methods involved and data collection are discussed in the methodology.