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

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DEDICATION

Dedicated to my beloved family and friends
ACKNOWLEDGEMENTS

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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.
# TABLE OF CONTENTS

Abstract i  
Table of Contents ii  
List of Tables v  
List of Figures vi  
List of Abbreviations, Symbols, Specialized Nomenclature xi  
List of Appendices xii

1. INTRODUCTION 1  
1.1 Background Introduction 1  
1.2 Problem Statements 3  
1.3 Objectives of the Research 4  
1.4 Scopes of the Research 4

2. LITERATURE REVIEW 5  
2.1 Introduction 5  
2.2 Improvement in Manufacturing through Ergonomic Principles 5  
2.3 Manual Handling Tasks’ Risks 7  
  2.3.1 Work-related Musculoskeletal Disorders (WMSD) 9  
  2.3.2 Classification of Cumulative Trauma Disorders (CTD) 13  
    2.3.2.1 Tendon Disorders 13  
    2.3.2.2 Neurovascular Disorders 14  
    2.3.2.3 Nerve Entrapment Disorders 15  
  2.3.3 Workstation Design 17  
  2.3.4 Workstation Tool Design 19  
2.4 Environmental Factors 25  
  2.4.1 Illumination 25  
  2.4.2 Temperature 26  
  2.4.3 Noise 28
## 3. METHODOLOGY

3.1 Introduction 36

3.2 Experimental Design 40

3.3 External Load 41
   3.3.1 Organizational Aspects 41
   3.3.2 Environmental Aspects 42

3.4 Internal Load 44
   3.4.1 General Fatigue 44
   3.4.2 Functional Fatigue 44

3.5 Subjective Experienced Load 48

## 4. DATA COLLECTION

4.1 Introduction 52

4.2 Data Collected 52

4.3 Descriptions of the Data Collected 53

## 5. DATA ANALYSIS

5.1 Introduction 59

5.2 Analysis for Questionnaires Data 60

5.3 Analysis for Temperature and Humidity Data 65

5.4 Analysis for Light Level Data 69

5.5 Analysis for Sound Level Data 70

5.6 Analysis for Heart Rate Data 71

5.7 Analysis for Pinches Strength Data 73
   5.7.1 Overall Discussions for Pinches Strength Results 78

5.8 Analysis for Grip Strength Data 79
   5.8.1 Overall Discussions on Grip Strength Results 81

5.9 Analysis for Lifts Strength Data 82
   5.9.1 Overall Discussions on Lifts Strength Results 84

5.10 Overall Conclusion for Data Analysis 85
6. SUGGESTIONS AND IMPLEMENTATIONS
   6.1 Introduction 94
   6.2 Suggestions 95
   6.3 Implementation of Grinding Station at Final Weld Section 96
   6.4 Implementation of Simple Jigs on Welding Table at Final Weld Section 98
   6.5 Implementation of Proper Material Loading Area at Packing Section 100
   6.6 Implementation of Scissor Lift at Packing (Test) Section 101
   6.7 Implementation of Small Stairway at Packing (Spray) Section 102

7. FEEDBACKS’ DATA ANALYSIS
   7.1 Introduction 110
   7.2 Feedbacks’ Data Collected List 110
   7.3 Analyses for Questionnaires Feedbacks’ Data 111
   7.4 Analysis for Pinches Strength Feedbacks’ Data 112
      7.4.1 Overall Discussions for Pinches Strength Feedbacks’ Results 118
   7.5 Analysis for Grips Strength Feedbacks’ Data 119
      7.5.1 Overall Discussions for Grip Strength Feedbacks’ Results 122
   7.6 Analysis for Lifts Strength Feedbacks’ Data 122
      7.6.1 Overall Discussions for Lifts Strength Feedbacks’ Results 125
   7.7 Overall Conclusion for Feedbacks’ Data Analysis 126

8. CONCLUSION 138

REFERENCES 140

APPENDICES
A  Questionnaires Form, Table Sample Size and Road Map
B  External Load Data in Table Form
C  Internal Load Format Data in Table Form
D  Example Pictures of Data Collected
E  Feedback Internal Load Data in Table Form
## LIST OF TABLES

2.1 Summary of the Category Research of Ergonomic related to Musculoskeletal Injuries 31

3.1 Lighting maintained Illuminance (lx) at Different Location and Task 43
3.2 Test Results on Work Muscle Strength in Pounds 45
3.3 Performance of All Subjects Grip Strength in Pounds 46
3.4 Average Performance of All Subjects on Tip Pinch in Pounds 46
3.5 Average Performance of All Subjects and Key Pinch in Pounds 47
3.6 Average Performance of All Subjects on Palmar Pinch in Pound 47
3.7 Summary of the Research Methodology and Experimental Design 50

4.1 Data Collected and Measurement Tools used at Fetta Industries 53
4.2 Total Employees Divisions at Fetta’s Departments and Production Sections 54
4.3 The Data Requirements Listed in Category 56
4.4 Summary of Data Collection 57

5.1 Summary of Data Analysis 87

6.1 Summary of the Suggestions and Implementations 105

7.1 Summary of Feedbacks’ Data Analysis 128
7.2 Comparison between Before and After Implementations 135
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Performance Shaping Factors</td>
<td>6</td>
</tr>
<tr>
<td>2.2</td>
<td>Relationship between Human Performance and Quality</td>
<td>7</td>
</tr>
<tr>
<td>2.3</td>
<td>Number of CTD Reported in the USA from 1981 to 1991</td>
<td>9</td>
</tr>
<tr>
<td>2.4</td>
<td>An Example of a Hand Tool with an Inadequate Design from an Ergonomic Point of View</td>
<td>20</td>
</tr>
<tr>
<td>2.5</td>
<td>Pistol Grip Handles Angled at 110° and 90° used against a Vertical Surface at Knee Height, Elbow Height and Shoulder Height</td>
<td>23</td>
</tr>
<tr>
<td>2.6</td>
<td>Pistol Grip Handles Angled at 110°, 90°, and an In-line Tool used against a Horizontal Surface of a Work-piece lying on a Workbench</td>
<td>23</td>
</tr>
<tr>
<td>2.7</td>
<td>A Screwdriver that is not suitable for the Current Task, since it forces the user to abduct the Upper Arm</td>
<td>24</td>
</tr>
<tr>
<td>3.1</td>
<td>Research Methodology Flow Chart</td>
<td>39</td>
</tr>
<tr>
<td>3.2</td>
<td>Data Collection Procedures</td>
<td>40</td>
</tr>
<tr>
<td>5.1</td>
<td>Common Complaints of Musculoskeletal Disorder Injuries at Fetta Industries</td>
<td>60</td>
</tr>
<tr>
<td>5.2</td>
<td>Total Fetta Employees who have Musculoskeletal Disorder Injuries at All Departments</td>
<td>61</td>
</tr>
<tr>
<td>5.3</td>
<td>Pre-Assembly (Group B) Employees who have Musculoskeletal Disorder Injuries According to its Production Sections</td>
<td>62</td>
</tr>
<tr>
<td>5.4</td>
<td>Assembly (Group C) Employees who have Musculoskeletal Disorder Injuries According to its Production Sections</td>
<td>63</td>
</tr>
<tr>
<td>5.5</td>
<td>Packing/Final Stages (Group D) Employees who have Musculoskeletal Disorder Injuries According to its Production Sections</td>
<td>64</td>
</tr>
</tbody>
</table>
5.6 Average Morning Temperature between Minimum and Peak Degree Celsius at Fetta Production Sections and Departments

5.7 Average Afternoon Temperature between Minimum and Peak Degree Celsius at Fetta Production Sections and Departments

5.8 Average Morning Humidity between Minimum and Peak Degree Celsius at Fetta Production Sections and Departments

5.9 Average Afternoon Humidity between Minimum and Peak Degree Celsius at Fetta Production Sections and Departments

5.10 Average Light Level between Minimum and Maximum Lux at Fetta Production Sections and Departments

5.11 Average Sound Level between Minimum and Maximum Lux at Fetta Production Sections and Departments

5.12 Average Heart Rate in Beat per Minute from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)

5.13 Average Left Tip Pinch Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)

5.14 Average Right Tip Pinch Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)

5.15 Average Left Key Pinch Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)

5.16 Average Right Key Pinch Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)

5.17 Average Left Palmar Pinch Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)
5.18 Average Right Palmar Pinch Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing) 78

5.19 Average Left Grip Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing) 79

5.20 Average Right Grip Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing) 80

5.21 Average Arm Lift Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing) 82

5.22 Average Torso Lift Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing) 83

5.23 Average Floor Lift Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing) 84

6.1 Grinding Tasks in Kneeling Situation (Before Implementation) 97
6.2 Implementation of Grinding Station (After Implementation) 97
6.3 Employee Perform Welding Tasks in Standing and Bending Forward Position (Before Implementation) 98
6.4 Employee Perform the Welding Tasks Accurately Without Bending Forward with the Help of Simple Jigs (After Implementation) 99
6.5 Employee Collects the Materials with Back Bent Forward More than 30° (Before Implementation) 100
6.6 Fix the Loading Materials Area on the Table (After Implementation) 100
6.7 Employee at Packing (Test) Section Carries the Materials with Back Bent Forward More than 30° and Carries for 2 Meter Distance (Before Implementation) 101

6.8 With the Implementation of Scissor Lift, Employee can Collects the Materials at Shorten Distance and Without Back Bent Forward Situation (After Implementation) 102

6.9 Employee Perform Spraying Tasks at Lower Area (Before Implementation) 103

6.10 Employee Perform Spraying Tasks at Small Stairway with Four-fixed Support (After Implementation) 104

7.1 Feedback from Employees at 3 production sections (Polishing, Final Weld K-bar and Packing) who have Musculoskeletal Disorder Injuries after Implementations 111

7.2 Average Feedbacks’ Left Tip Pinch Strength in Pounds from 45 Employees at 3 Production Sections (Polishing, Final Weld K-Bar and Packing) 113

7.3 Average Feedbacks’ Right Tip Pinch Strength in Pounds from 45 Employees at 3 Production Sections (Polishing, Final Weld K-Bar and Packing) 114

7.4 Average Feedbacks’ Left Key Pinch Strength in Pounds from 45 Employees at 3 Production Sections (Polishing, Final Weld K-Bar and Packing) 115

7.5 Average Feedbacks’ Right Key Pinch Strength in Pounds from 45 Employees at 3 Production Sections (Polishing, Final Weld K-Bar and Packing) 116

7.6 Average Feedbacks’ Left Palmar Strength in Pounds from 45 Employees at 3 Production Sections (Polishing, Final Weld K-Bar and Packing) 117
<table>
<thead>
<tr>
<th>Section</th>
<th>Measurement</th>
<th>Average (Pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.7</td>
<td>Right Palmar Strength</td>
<td>118</td>
</tr>
<tr>
<td>7.8</td>
<td>Left Grip Strength</td>
<td>120</td>
</tr>
<tr>
<td>7.9</td>
<td>Right Grip Strength</td>
<td>121</td>
</tr>
<tr>
<td>7.10</td>
<td>Arm Lift Strength</td>
<td>123</td>
</tr>
<tr>
<td>7.11</td>
<td>Torso Lift Strength</td>
<td>124</td>
</tr>
<tr>
<td>7.12</td>
<td>Floor Lift Strength</td>
<td>125</td>
</tr>
</tbody>
</table>
## LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTD</td>
<td>Cumulative Trauma Disorders</td>
</tr>
<tr>
<td>CTS</td>
<td>Carpal Tunnel Syndrome</td>
</tr>
<tr>
<td>EASP</td>
<td>Externally Applied Surface Pressure</td>
</tr>
<tr>
<td>HAVS</td>
<td>Hand-Arm Vibration-syndrome</td>
</tr>
<tr>
<td>MSD</td>
<td>Musculoskeletal Disorders</td>
</tr>
<tr>
<td>NIOSH</td>
<td>National Institute for Occupational Safety and Health</td>
</tr>
<tr>
<td>RSI</td>
<td>Repetitive Strain Injury</td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupation Safety and Health Administration</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WMSD</td>
<td>Work-related Musculoskeletal Disorders</td>
</tr>
<tr>
<td>bpm</td>
<td>Beats per Minute</td>
</tr>
<tr>
<td>dB</td>
<td>Decibel</td>
</tr>
<tr>
<td>In</td>
<td>Inch</td>
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<td>Lux</td>
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<td>mm</td>
<td>Millimeter</td>
</tr>
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<td>N</td>
<td>Newton</td>
</tr>
<tr>
<td>°</td>
<td>Degree</td>
</tr>
<tr>
<td>°C</td>
<td>Degree Celsius</td>
</tr>
<tr>
<td>%</td>
<td>Percentage</td>
</tr>
</tbody>
</table>
LIST OF APPENDICES

APPENDIX A: Questionnaires Form, Table Sample Size and Road Map
A.1 Musculoskeletal Disorders Survey Form
A.2 Musculoskeletal Disorders Feedback Survey Form
A.3 Table Shows Sample Size (S) Required for Given Population Sizes (N)
A.4 Table Shows Thesis I Road Map
A.5 Table Shows Thesis II Road Map

APPENDIX B: External Load Data in Table Form
B.1 Table shows Common Complaints of Musculoskeletal Disorder Injuries at Fetta
B.2 Table shows Total Fetta’s Employees who have Musculoskeletal Disorder Injuries
B.3 Table shows Pre-Assembly (Group B) Production Sections Employees who have Musculoskeletal Disorder Injuries
B.4 Table shows Assembly (Group C) Production Sections Employees who have Musculoskeletal Disorder Injuries
B.5 Table shows Packing/Final Stages (Group D) Production Sections Employees who have Musculoskeletal Disorder Injuries
B.6 Table shows Average Morning Temperature between Minimum and Peak Degree Celsius at Fetta Production Sections and Departments
B.7 Table shows Average Afternoon Temperature between Minimum and Peak Degree Celsius at Fetta Production Sections and Departments
B.8 Table shows Average Morning Humidity between Minimum and Peak Degree Celsius at Fetta Production Sections and Departments
B.9 Table shows Average Afternoon Humidity between Minimum and Peak Degree Celsius at Fetta Production Sections and Departments
B.10 Table shows Average Light Level between Minimum and Maximum Lux at Fetta Production Sections and Departments
B.11 Table shows Average Sound Level between Minimum and Maximum Lux at Fetta Production Sections and Departments

APPENDIX C: Internal Load Format Data in Table Form
C.1 Table shows Average Heart Rate in Beat per Minute from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)
C.2 Table shows Average Left and Right Tip Pinch Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)
C.3 Table shows Average Left and Right Key Pinch Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)
C.4 Table shows Average Left and Right Palmar Pinch Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)
C.5 Table shows Average Left and Right Grip Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)
C.6 Table shows Average Arm Lift Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)
C.7 Table shows Average Torso Lift Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)
C.8 Table shows Average Floor Lift Strength in Pounds from 49 Employees at 3 Differences Production Sections (Polishing, Final Weld K-Bar and Packing)

APPENDIX D: Example Pictures of Data Collected
D.1 Figure Shows Temperature, Humidity, Light Level and Sound Level Data Collected at Fetta’s Plate Shearing Production Section
D.2 Figure shows Temperature, Humidity, Light Level and Sound Level Data Collected at Fetta’s Pipe Bending Production Section
D.3 Figure shows Light Level Data Collected at Fetta’s Polishing Production Section
D.4 Figure shows Sound Level Data Collected at Fetta’s Bracket Stamping Production Section
D.5 Figure shows Heart Rate Data Collected at Fetta’s Employee
D.6 Figure shows Tip Pinch Strength Data Collected at Fetta’s Employee
D.7 Figure shows Key Pinch Strength Data Collected at Fetta’s Employee
D.8 Figure shows Palmar Pinch Strength Data Collected at Fetta’s Employee
D.9 Figure shows Grip Strength Data Collected at Fetta’s Employee
D.10 Figure shows Arm Lift Strength Data Collected at Fetta’s Employee
D.11 Figure shows Torso Lift Strength Data Collected at Fetta’s Employee
D.12 Figure shows Floor Lift Strength Data Collected at Fetta’s Employee

APPENDIX E: Feedback Internal Load Data in Table Form
E.1 Table Shows Feedback from Employees at 3 production sections (Polishing, Final Weld K-bar and Packing) who have Musculoskeletal Disorder Injuries after Implementations
E.2 Table Shows Average Feedbacks’ Left and Right Tip Pinch Strength in Pounds from 45 Employees at 3 Production Sections (Polishing, Final Weld K-Bar and Packing)
E.3 Table Shows Average Feedbacks’ Left and Right Key Pinch Strength in Pounds from 45 Employees at 3 Production Sections (Polishing, Final Weld K-Bar and Packing)
E.4 Table Shows Average Feedbacks’ Left and Right Palmar Strength in Pounds from 45 Employees at 3 Production Sections (Polishing, Final Weld K-Bar and Packing)
E.5 Table Shows Average Feedbacks’ Left and Right Grip Strength in Pounds from 45 Employees at 3 Production Sections (Polishing, Final Weld K-Bar and Packing)
E.6 Table Shows Average Feedbacks’ Arm Lift Strength in Pounds from 45 Employees at 3 Production Sections (Polishing, Final Weld K-bar and Packing)
E.7 Table Shows Average Feedbacks’ Torso Lift Strength in Pounds from 45 Employees at 3 Production Sections (Polishing, Final Weld K-Bar and Packing)
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)
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
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, bursitis, 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).
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