UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Time Study Method Implementation In Manufacturing Industry

Report submitted in accordance with the partial requirement of the Universiti Teknikal Malaysia Melaka for the Bachelor of Manufacturing Engineering (Manufacturing Process)

By

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Faculty of Manufacturing Engineering

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Signature : 
Author’s Name : NOR DIANA BINTI HASHIM 
Date : 12 MAY 2008
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 Process). The members of the supervisory committee are as follow:

Nor Akramin Bin Mohamad
(PSM Supervisor)
ABSTRACT

Time study is often referred to as work measurement and it involves the techniques of establishing an allowed timed standard to perform a given task, with due allowance for fatigue and for personal and unavoidable delays. Time study are used for two main purposes in CTRM Aero Composites Sdn. Bhd., one for bidding new projects and the other one is to monitor the production line. Each of the time study techniques is applied under certain condition and the best technique for manual production is the stopwatch time study because human performance is not consistent from time to time. The stopwatch time study had been chosen for the case study because 90 percents of the production in CTRM Aero Composites Sdn. Bhd. are handled manually by man power. The aim of this case study is to find the suitable rating factor and allowance for each process in order to conduct the stopwatch time study for the panel produce by the CTRM Aero Composites Sdn. Bhd. and finally to develope a time study database which will be used as a single source of reference by the company.

Keywords: Time Study, Rating Factor, Allowances
ABSTRAK

DEDICATION

For my beloved family and friends,

Hashim Salleh
Jasma Hassan
Mohd Kamal Hanis Hashim
Nor Izzati Hashim
Nor Dalila Hashim
Adam Luqman Hashim
ACKNOWLEDGEMENTS

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Special thanks to my industrial training supervisor, Mr. Fikirly Helmi Bin Hayaha @ Adzhar for his endless effort in providing the information for my case study as well in helping and supporting me throughout the project.

Besides that, I also would like to express my gratitude to the engineers, technicians and operators at CTRM Aero Composites Sdn. Bhd. for the cooperation and permission given to conduct the case study. They all have been very kind and generous with their knowledge as well as their experiences in Aero Composites industry.

Finally, I am grateful that my friends and family had been so supportive and helped me with the project. Without their help and encouragement, it would have been hard for me to carry on my project and achieved the good result.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declaration</td>
<td>i</td>
</tr>
<tr>
<td>Approval</td>
<td>ii</td>
</tr>
<tr>
<td>Abstract</td>
<td>iii</td>
</tr>
<tr>
<td>Abstrak</td>
<td>iv</td>
</tr>
<tr>
<td>Dedication</td>
<td>v</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>vi</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>vii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>xi</td>
</tr>
<tr>
<td>List of Tables</td>
<td>xiii</td>
</tr>
<tr>
<td>List of Abbreviations, Symbols, Specialized Nomenclature</td>
<td>xiv</td>
</tr>
</tbody>
</table>

## 1. INTRODUCTION

1.1 Background                                                            1
1.2 Problem Statements                                                    2
1.3 Objectives of The Project                                               3
1.4 Scopes of Project                                                     3

## 2. LITERATURE REVIEW

2.1 Introduction                                                           4
2.2 Chronology of Time Study                                               5
2.3 Definition of Time Study                                               6
2.4 Objectives of Time Study                                               8
   2.4.1 The Important and Uses of Time Study                                9
2.5 Time Study Techniques                                                  9
   2.5.1 Time Study in Non-Manufacturing Area                                10
2.6 Description on Time Study Method                                        11
2.7 Time Study Equipments                                                  14
2.8 Making the Time Study                                                  15
2.9 Introduction on Stopwatch Time Study                                   15
2.10 Rating, Leveling and Normalizing                                       16
   2.10.1 Rating Methods                                                     18
5.5 Complete Data Collection ................................................................. 79
5.6 Summary of Data Collection ............................................................. 79

6. DATABASE DEVELOPMENT ................................................................. 80
   6.1 Introduction .................................................................................. 80
   6.2 Information Involve to Develop and to Use the Database ............... 81
   6.3 Flowchart in Developing the Database ........................................... 82
   6.4 Procedure to Develop the Database .............................................. 83
   6.5 Flowchart of Manual to Use the Database ..................................... 93
   6.6 Manual to Use the Database ....................................................... 94
   6.7 Complete Database ..................................................................... 98

7. DISCUSSION ......................................................................................... 99
   7.1 Purpose of Implementation Time Study ........................................ 99
      7.1.1 The Advantages of Stopwatch Time Study ............................. 99
      7.1.2 The Disadvantages of Stopwatch Time Study ....................... 100
   7.2 Time Study Practices and Employee Relations ............................. 100
   7.3 The factor in Determining the Rating Factor and Allowances ......... 101
      7.3.1 The Disadvantages of Stopwatch Time Study ....................... 101
      7.3.2 The Disadvantages of Stopwatch Time Study ....................... 102
   7.4 Data Collection Process .............................................................. 104
      7.4.1 Obstacles while taking Time Study ....................................... 104
   7.5 The Database .............................................................................. 105
      7.5.1 The Purpose of the Database ............................................... 106
      7.5.2 How the Database Contribute to the Company ..................... 106
      7.5.3 Limitation of the Database .................................................. 106
   7.6 Human Factors ........................................................................... 106
   7.7 Discussion on the Result ............................................................. 108
      7.7.1 Element of the Time Study .................................................. 108
      7.7.2 Summary by Process .......................................................... 109
      7.7.3 Summary by Result ............................................................. 113

8. CONCLUSION ....................................................................................... 114
9. REFERENCES

APPENDICES
A  Time Study Data Collection at Kitting Station (Kitting)
B  Time Study Data Collection at Clean Room (Lay-Up)
C  Time Study Data Collection at Autoclave Station (Curing)
D  Time Study Data Collection at Demould Station (Demould)
E  Time Study Data Collection at Trim Shop (Trimming)
F  Time Study Data Collection at NDT Station (NDT)
G  Time Study Data Collection at Paint Shop (Painting)
H  Time Study Database at Kitting Station (Kitting)
I  Time Study Database at Clean Room (Lay-Up)
J  Time Study Database at Autoclave Station (Curing)
K  Time Study Database at Demould Station (Demould)
L  Time Study Database at Trim Shop (Trimming)
M  Time Study Database at NDT Station (NDT)
N  Time Study Database at Paint Shop (Painting)
O  Work Instruction Goodrich V2500 Torque Ring Cone Fairing
LIST OF FIGURES

3.1 Flowchart of Research Methodology       33
3.2 How to Conduct Time Study Flowchart     39
3.3 Method to Conduct Time Study Flowchart  48
4.1 CTRM AC Batu Berendam, Melaka           55
4.2 Torque Ring Fairing Panel Goodrich V2500 56
4.3 Goodrich V2500 Panels                   57
4.4 Actuator Cover                          58
4.5 Blank Cascade                           58
4.6 Torque Ring Fairing                     58
4.7 Torque Ring Cone                        58
4.8 Outer Panel                             58
4.9 Flowchart Production Line               59
4.10 Kitting Process Flowchart              60
4.11 Lay-Up Process Flowchart               62
4.12 Lay-Up Tools                           63
4.13 Lay-Up Equipment                       63
4.14 Curing Process Flowchart               65
4.15 Autoclave CTRM-AC                      65
4.16 Vacuum Port and Thermocouple Position  66
4.17 Panel Position during Curing Process   66
4.18 Demould and Mold Prep Process Flowchart 67
4.19 Trimming Process Flowchart             69
4.20 Trimming Tools                         70
4.21 Trimming Process                       70
4.22 NDT Process Flowchart                  71
4.23 Paint Shop Process Flowchart           73
5.1 Flowchart of the Production Line        76
6.1 Flowchart in Developing the Database    82
6.2 Man Hours Table                         83
6.3 Man Hours and Machine Hours Table       84
# LIST OF TABLES

2.1 Chronology of Time Study ........................................ 5
2.2 Time Study Techniques by Source ................................ 10
2.3 Summary of the Category Research of Time Study related to Manufacturing Industry. ........................................ 23
3.1 Gantt Chart for Projek Sarjana Muda I ........................ 34
3.2 Gantt Chart for Projek Sarjana Muda II ........................ 35
3.3 Man Hours Observation Form ...................................... 52
3.4 Machine Hours Observation Form ................................. 53
4.1 Kitting Process ...................................................... 61
4.2 Lay-Up Process ...................................................... 64
4.3 Demould and Mold Prep Process ................................. 68
4.4 NDT Process ......................................................... 72
4.5 Painting Process ...................................................... 74
5.1 Time Study Data Collection at Kitting Station (Kitting Process) ........................................ 77
5.2 Explanation of the Table 5.1 .......................................... 78
5.3 Summary of the Data Collection .................................... 79
7.1 The Allowance Wastage by International Labor Organization (ILO) ........................................ 103
7.2 Element Explanation ................................................ 108
7.3 Summary of the Result .............................................. 113
LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVG</td>
<td>Average</td>
</tr>
<tr>
<td>CNC</td>
<td>Computer Numerical Control</td>
</tr>
<tr>
<td>CTRM AC</td>
<td>Composites Technology Research Malaysia Aero Composite</td>
</tr>
<tr>
<td>F</td>
<td>Frequency</td>
</tr>
<tr>
<td>HC</td>
<td>Head Count</td>
</tr>
<tr>
<td>HRS</td>
<td>Hours</td>
</tr>
<tr>
<td>JIT</td>
<td>Just In Time</td>
</tr>
<tr>
<td>MODAPTS</td>
<td>Modular Assignment at Predetermined Times</td>
</tr>
<tr>
<td>MRB</td>
<td>Material Refuge Board</td>
</tr>
<tr>
<td>MTM</td>
<td>Methods time measurement</td>
</tr>
<tr>
<td>MTM</td>
<td>Manual Work Measurement Technique</td>
</tr>
<tr>
<td>NDT</td>
<td>Non-Destructive Test</td>
</tr>
<tr>
<td>NPD</td>
<td>New Product Development</td>
</tr>
<tr>
<td>NT</td>
<td>Normal Time</td>
</tr>
<tr>
<td>PTS</td>
<td>Predetermined Time System</td>
</tr>
<tr>
<td>PTSS</td>
<td>Predetermined Time Standard System</td>
</tr>
<tr>
<td>QTY</td>
<td>Quantity</td>
</tr>
<tr>
<td>RF</td>
<td>Rating Factor</td>
</tr>
<tr>
<td>RTM</td>
<td>Robot Time and Motion</td>
</tr>
<tr>
<td>ST</td>
<td>Standard Time</td>
</tr>
<tr>
<td>TBC</td>
<td>Time Base Competition</td>
</tr>
<tr>
<td>TBST</td>
<td>Time-Based Strategies and Tactics</td>
</tr>
<tr>
<td>TCM</td>
<td>Time Compression Management</td>
</tr>
<tr>
<td>TCT</td>
<td>Total Cycle Time</td>
</tr>
<tr>
<td>TMU</td>
<td>Time-Measured Unit</td>
</tr>
<tr>
<td>WIP</td>
<td>Work in Process</td>
</tr>
</tbody>
</table>
CHAPTER 1
INTRODUCTION

1.1 Background

As we approach the new millennium, with a widely expanded market and manufacturing capability around the world, both the opportunities and the need for technical competence are growing dramatically. According to Niebel (1993), ten years ago the competition was centered in only a few industries - electronics and automotives in particular. But today this competition is both industry wide and world wide. Each department of these organizations is increasing the intensity of its cost reduction and quality improvement effort in order to survive and expanding. Some companies have even expanded their motion and time study method to nonmanufacturing activities with the rise in the importance of indirect factory labor.

One of the oldest tools used by industrial engineers in work measurements is time study and specifically stopwatch time study. Time study that originated by Taylor and developed by Gilbreths was used mainly for determining time standards and motion study. According to Rice (1977), over 89 percents of the companies that perform work measurement used time study. The technologies are rapidly growing everyday but there are still no tools that can replace time study method completely. They only invented equipment that can improved the tools and made it users friendly. According to Niebel (1993), computers produce standards from fundamental motion data up to 50 percents faster than manual methods. The computers also provides a simple and convenient way
to make time studies, monitor and measure machine and equipment performance, make work sampling studies, and perform other data-gathering activities. Even though there are many techniques and equipments to perform the time study, but basically the concept is just the same.

In manufacturing industries, especially for industries that implement 90 percents of manual production time study is very crucial. For example, manufacturing plant management need time standards, even before production starts, to determine how many people to hire, how many machines to buy, how fast to move conveyers, how to divide work among employees, and how much the product will costs; after production starts, to determine how much cost reduction will return, who works the hardest, and perhaps who should earn more money; and after production finish, the data are used as reference for bidding new projects and procurement. Time study can reduce and control costs, improve working conditions and environment and motivate people.

Manufacturing management and engineers are prepared to design work stations, develop efficient and effective work methods, establish time standards, balance assembly lines, estimates labor costs, develop effective tooling, select proper equipment, and lay out manufacturing facilities. However the most important thing is how to train production workers in these skills and techniques so they can become motion and time conscious. The manufacturing management and engineers only design and prepared the skills but the production workers who are going to implement it in the operation. So the objective of time study can only be achieved if the production workers are knowledgeable about the time study concept.

1.2 Problem Statements

CTRM AC used Time Study for two main purposes, one for bidding new projects and the other one is to monitor the manufacturing or production of current projects. The current project needs to be monitor by using time study in order to control the cycle time
and labor power of one project. Another point why time study suited with CTRM AC because 90 percents of the production in this company is manual basis so there’s no better tool to measure the work than time study because it include the rating factor and allowances. In the mean time it also can be use as a tool for productivity improvement and increase efficiency. Since time study is so important for the company, it had to be done precisely with the element of allowance, rating factor and head count to produce a standard time which can be used as reference to conclude the whole performance of production.

1.3 Objectives of the Project

(i) To identify the suitable rating factors and allowances for the stopwatch time study that suitable for manual production at CTRM AC.

(ii) To establishes cycle time from the current project on man hours and machine hours by using time study method.

(iii) To develop a time study database for the company by using Microsoft Excel 2003 that will be use as a single source reference of standard data information.

1.4 Scopes of Project

To ensure the objectives will successfully achieve, there are several element that need to be followed as well:

(i) Conduct a time study by including cycle time from observation with the allowance and rating factors to produce standard time.

(ii) The study was undertaken by using stopwatch time study technique.

(iii) The research is going to be done at CTRM Aero Composites for project Goodrich V2500 (Torque Ring Cone Fairing Panel).
CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

Time study is one of the oldest fundamental method ever used whose results in increased productivity. Since the research are focus on the time study from all aspects, so the history of the time study must be analysis and how it develop into the most useful tools in manufacturing industry. Most of the source used for the studied comes from a reliable and trustworthy source. The sources include articles, journals and books. There actually more than one technique mention in this thesis but the research only focuses on one method only. The method is stopwatch time study and it had been chosen because it suitable with the industry in the case studies.

Any of the work-measurement techniques represent a better way to establish fair production standard. All of these techniques are based on facts. All establish an allowed time standards for performing a given task, with due allowance for fatigue and for personal and unavoidable delays. Accurately establish time standards make it possible to produce more within a given plant, increasing the efficiency of the equipment and the operating personnel. Poorly established standards, although better than no standards at all, lead to high costs, labor dissension and possibly even the failure of the enterprise.
2.2 Chronology of Time Study

The Table 2.1 showed the major milestone of time study in the industry according to year and the persona that contribute to the evaluation of the time study technique. The descriptions of the persona are based on the contribution towards the time study fields.

Table 2.1: Chronology of Time Study

<table>
<thead>
<tr>
<th>No.</th>
<th>Year</th>
<th>Persona</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1760</td>
<td>Jean Rodolphe Perronet, French engineer</td>
<td>Extensive time studies on the manufacture of No. 6 common pins and arrived at a standard of 494 per hour (2.0243 hrs/1000).</td>
</tr>
<tr>
<td>2</td>
<td>1820</td>
<td>Charles W. Babbage, an English economist</td>
<td>Conducted time studies on manufacture of No. 11 common pins. It has determined that one pound (5,546 pins) should be produced in 7,6892 hours (1.3864 hrs./1000).</td>
</tr>
<tr>
<td>3</td>
<td>1856-1915</td>
<td>Frederick W. Taylor</td>
<td>The first person to use a stopwatch to study work content and as such is called the father of time study. He accomplishes the four Principles of Scientific Management. Responsible for the following innovations stopwatch time study, high-speed steel tools, tool grinders, slide riles and functional-type organization. He emphasized the analytical and organizational aspect of work.</td>
</tr>
<tr>
<td>4</td>
<td>1853-1931</td>
<td>Harrington Emerson</td>
<td>He was the expert that was needed to make Scientific Management, the Taylor system, a household name and his experience proved that the use of efficient methods would lead to tremendous savings. Accounts of his work were never extensively published and no comprehensive biography exists but his work is best remembered as an example of how the creative engineer can find the tools to improve any operation.</td>
</tr>
<tr>
<td>5</td>
<td>1861-1919</td>
<td>Henry Laurence Gantt</td>
<td>He invented the task and bonus system or earned-hour plan. He also developed a technique for scheduling work and performance control system. Rather than penalizing the less proficient worker, he</td>
</tr>
<tr>
<td></td>
<td></td>
<td>advocated a livable wage with a sizable bonus for performance over 100 percents. He also designed the antisubmarine tactics known as convoy zigzagging that permitted escort ships to protect the slow freighters.</td>
<td></td>
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<td>---</td>
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<td></td>
</tr>
<tr>
<td>6</td>
<td>1868-1924 and 1878-1972</td>
<td>Frank and Lilian Gilbreth</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Develop method study technique like cyclograph, chronocyclographs, movie cameras, motion picture camera and a special clock called a microchronometer. They also study fatigue, monotony, transfer of skills and assisted the handicapped in becoming more mobile. Their systematic study of motion reduced costs greatly and founded a new profession of method analysis. The Gilbreths also developed flow diagrams, process chart, and operation chart. Also the apprentice on the 17 elementary subdivisions of motion, later engineers coined a short word therblig.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1900-1984</td>
<td>Ralph M. Barnes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>His achievements included writing the longest published text on work measurement, a through description of the Gilbreths micro motion study, time study and the procedure for work sampling.</td>
<td></td>
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</table>

### 2.3 Definition of Time Study

According to Meyers (2002), time standards can be defined as “the time required to produce a product at a work station with the following three conditions: (1) a qualified, well-trained operator, (2) working at a normal pace, and (3) doing a specific task.” The three conditions are discussed below:

#### (i) A Qualified, Well-Trained Operator

Experience is usually what makes a qualified, well-trained operator and time on the job is our best indication of experience. The time required to become qualified varies with the job and the person. The greatest mistake ever made by new time study personnel is time-studying someone too soon. A good rule of thumb is to start with a qualified, fully trained person and to
give that person two weeks on the job prior to the time study. On new jobs or tasks, predetermined time study systems are used. These standards seem hard to achieve at first because the time are set for qualified, well-trained operators.

(ii) Normal Pace
Only one time standards can be used for each job, even though individual differences of operators cause different results. A normal pace is comfortable for most people.

(iii) A Specific Task
It is a detail description of what must be accomplished. The description should include the prescribed work method, material specification, the tools and equipment being used, the positions of incoming and outgoing material and additional requirement like safety, quality, housekeeping and maintenance tasks.

Time study is usually referred to as work measurement and it involves the technique of establishing an allowed time standard to perform a given task, based on measurement of the work content of the prescribed method and with due allowance for fatigue, personal or unavoidable delays. Establishes time values are a step in systematic procedure of developing new work centers and improving methods in existing work centers.

Generally time study is used to determine the time required by a qualified and well-trained person working at a normal pace to do a specified task. The result of time study is the time that a person suited to the job and fully trained in the specific method. The job needs to be performed if he or she works at a normal or standard tempo. This time is called the standard time for operation.
Time study is composed of four parts:

(i) Developing the preferred method
(ii) Standardizing the operation
(iii) Determining the time standard
(iv) Training the operator

2.4 Objectives of Time Study

The principle objectives of time study are to increase productivity and product reliability and lower unit cost, thus allowing more quality goods or services to be produced for more people. The ability to produce more for less will result in more jobs for more people for a greater number of hours per year. Only through the intelligent application of the principles of time study can producers of goods and services increase while at the same time, the purchasing potential of all consumers grows. Through these principles unemployment and relief rolls can be minimized, thus reducing the spiraling cost of economic support to nonproducers.

(i) Developing the preferred system and method—usually with the lowest cost
(ii) Standardizing this system and method
(iii) Determining the time required by a qualified and properly trained person working at a normal pace to do a specific task or operation
(iv) Assisting in training the worker in the preferred method

Corollaries that apply to the principle objective are to (Niebel, 1993):

(i) Minimize the time required to perform tasks.
(ii) Continually improve the quality and the reliability of products and services.
(iii) Conserve resource and minimize cost by specifying the most appropriate direct and indirect materials for the production of goods and services.