



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Time Study Method Implementation In Manufacturing Industry

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(Manufacturing Process)

By

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Signature :
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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 develop a time study database which will be used as a single source of reference by the company.

Keywords: Time Study, Rating Factor, Allowances

ABSTRAK

Kajian tentang masa atau juga selalu dirujuk sebagai pengukuran kerja adalah mengenai lebih masa yang dibenarkan dalam menjalankan sesuatu kerja berdasarkan lebih masa untuk keletihan, perkara peribadi dan perkara tertangguh. Kajian tentang masa digunakan untuk dua tujuan utama di CTRM Aero Composites Sdn. Bhd., yang pertama adalah untuk membida projek baru dan yang kedua untuk mengawasi pengeluaran produk. Setiap teknik tersebut diaplikasikan dibawah keadaan tertentu. Kajian tentang masa menggunakan jam randik telah dipilih untuk menjalankan projek ini kerana 90 peratus produksi di CTRM Aero Composites Sdn. Bhd. dilaksanakan secara manual dengan tenaga kerja manusia. Tujuan utama kajian kes ini adalah untuk mendapatkan faktor kadar dan lebih masa setiap proses bagi menjalankan kajian tentang masa menggunakan jam randik untuk panel yang dihasilkan oleh CTRM Aero Composites Sdn. Bhd. dan akhirnya membangunkan suatu pangkalan data kajian tentang masa yang akan digunakan sebagai sumber yang tunggal oleh syarikat tersebut.

DEDICATION

For my beloved family and friends,

Hashim Salleh

Jasma Hassan

Mohd Kamal Hanis Hashim

Nor Izzati Hashim

Nor Dalila Hashim

Adam Luqman Hashim

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LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE

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

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

No.	Year	Persona	Contribution
1	1760	Jean Rodolphe Perronet, French engineer	Extensive time studies on the manufacture of No. 6 common pins and arrived at a standard of 494 per hour (2.0243 hrs/1000).
2	1820	Charles W. Babbage, an English economist	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).
3	1856-1915	Frederick W. Taylor	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.
4	1853-1931	Harrington Emerson	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.
5	1861-1919	Henry Laurence Gantt	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

			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.
6	1868-1924 and 1878-1972	Frank and Lilian Gilbreth	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 <i>therblig</i> .
7	1900-1984	Ralph M. Barnes	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.

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.