

A Study on the Method of Task Management Using Motion Analysis

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Abstract

For manufacturing industries, improving productivity and saving cost through efficient task method based on figuring out specific time in each detailed process to improve efficient process, is urgent task for the current manufacturing companies. It is to study efficient manufacturing management method using motion analysis and removing unnecessary factors, in order to design efficient process and to improve productivity. When rebuilding the process after verification of optimization through motion analysis, it can save cost for modifying or supplementing additional process. It can deduce practical effect to improve company's manufacturing competitiveness. Through this study, shortening process design period, improving device operation rate, simple automation, realizing ergonomics, and improving process are made available for enhancing productivity and quality, and saving cost, as well as satisfying internal customers.

Key Words: Motion study, time study, process analysis, process design, image process.

1. Introduction

Efficient task management method is competitiveness in market for manufacturing industries. It is also an important factor to secure benefits for companies.

The paradigm of manufacturing in the world market is changing to production method with low cost and multiple items. In order to responds to this change, task management should be improved first, and it is true that academic or industrial sectors have attempted such management system in various ways. However, even if products are identical, they cannot be easily applied to the comprehensive manufacturing industries due to problems in reality such as differences in use, types or process.¹

In particular, the studies about methods for task management in order to improve productivity have been continuously conducted in manufacturing field.

This study suggests efficient task management method using motion analysis.

That is, it is aims comparing and analyzing the measured work time and improving the process and designing optimal task management based on the results from the comparison and analysis.

The studies of motion and time for human work activities, were derived from F.W Taylor's task time studies in 1920 but F.B. Gilbreth developed them further as basic scientific method and since then, they have been recognized as required method for activities to improve task method in the manufacturing industries in the world.

Motion study in the process of manufacturing is to understand task contents by process sufficiently on human and machine, to figure out the entire loading time of human and machine through time study, and to improve task contents, methods, and non-added-value tasks without harmful factors to safety, environment, and quality in task process.

Namely, it is to increase add-value task amount, and to distribute equally task amounts for human and machine through rearrangement of the process.

The reason to use motion study in the process of manufacturing is to subcategorize tasks in order to find unnecessary wastes and harmful factors which are not discovered in daily process, and to improve process flow, task requirement, and element tasks safer and more comfortable. In addition, motion study redesigns process, shortens production time for a product, and enhances quality making us find most efficient method in repeated process.²

2. Method of Motion Analysis and Task Management

Motion study, origin of motion analysis method of this study is the origin of the current industrial engineering or industrial psychology. It also made the foundation of ergonomics. Motion study as theoretical background of motion analysis method is a scientific approach to remove wastes derived from use of insufficient and wrong motion.³

The Gilbreths defined that it is “to find and immortalize a system for minimizing wastes of task”. It means that motion study is specialized to scientific management focusing on human’s physiological and psychological aspects.

That is, analyzing and studying to improve objectively work condition, arrangement of work table, surrounding environment, and traffic line of work and raising work efficiency, it is to increase task efficiency. The Gilbreth’s studies is to raise efficiency of task and to reduce fatigue at the same time finding and standardizing fast, easy, and convenient optimized methods.⁴

The Gilbreths designed Therblig method, including, micro-motion study to record task motions as video, and time study to record trace of task as photo by attaching lamp on body area of the worker to be observed as shown in table 1. The method is to record and review motion paths, to find basic motions for task, and to standardize and signify them as shown in figure 1.⁵

Table 1 : Therblig Chart

No.	Code	Name	Description	Color
1	Sh	Search	Locate and article	Black
2	F	Find	Mental reaction at end of search	Gray
3	St	Select	Selection from a member	Light Gray
4	G	Grasp	Taking Hold	Red
5	H	Hold	Prolongedgroup	Gold Ochre
6	TL	TransportLoaded	Moving an article	Green
7	TE	Transport Empty	Movement of a body member	Olive Green
8	P	Position	Placing in a definite location	Blue
9	A	Assemble	Putting parts together	Violet
10	U	Use	Causing a device to perform its function	Purple
11	DA	Disassemble	Separating parts	Light Violet
12	I	Inspect	Examine or test	Burnt Ochre
13	PP	Preposition	Placing an article	Pale Blue
14	RL	Release Load	Release an article	Carmine red
15	UD	Unavoidable Delay	A delay on which operator has no control	Yellow
16	AD	Avoidable Delay	A delay within operator’s control	Lemon Yellow
17	Pn	Plan	Mental plan for future action	Brown
18	R	Rest	Rest for overcoming fatigue	Orange

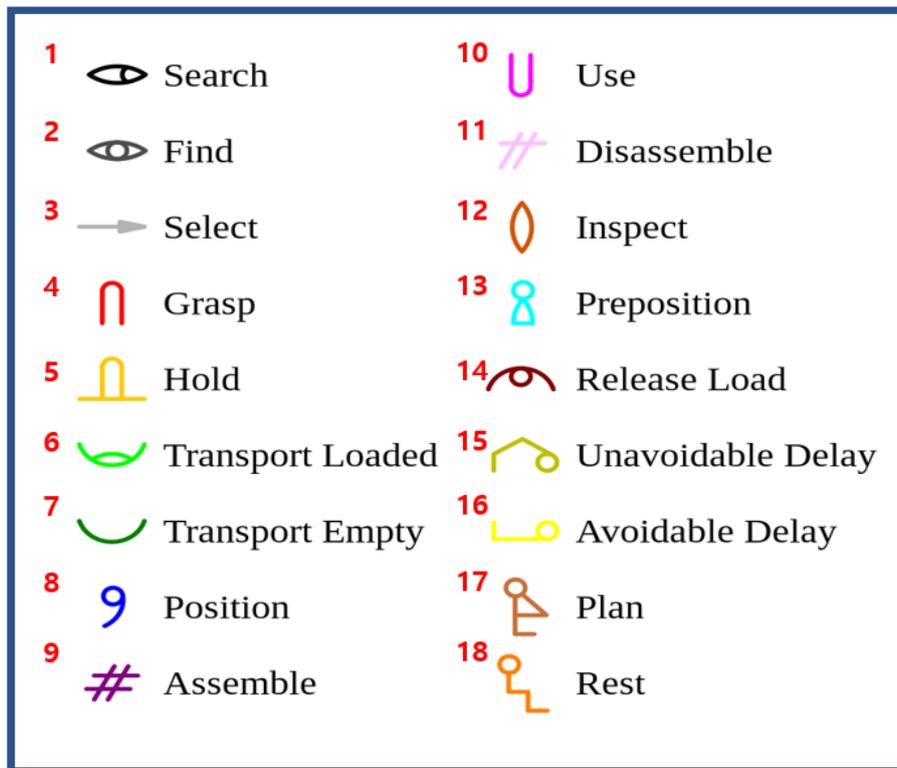


Figure 1: Therblig's Symbols

Task management is also considered as researching and studying the actual worker about tasks and process required production in order to produce economically products with some quality and quantity in the process of production, by company.

Task management aim at exploring task motion proper to physical and psychological function of workers who conduct task, improving and standardizing task method, material, equipment, and tools and deciding standard work amount and standard time, and training workers.⁶

Task study focuses on time study and motion study. Time study is a procedure to set task standard time scientifically while motion study a method to set task standard motion scientifically. Based on them, standard task is determined.

Motion study can shorten production time of products, save costs, or improve quality by finding the most effective method in repeated process and readjusting production process.

In general, the purpose to conduct motion study in the process of manufacturing, sets the principles of assignment in work place by locating tools, materials, and controllers nearby the appointed use location, and is summarized as follows.

First, it is to subcategorize task, and to find risk and loss which cannot be

discovered in daily works.

Second, it is to figure out risks and losses of task and quality quantitatively.

Third, it is to improve process flow, task conditions, and element work safer and more conveniently, as well as jig, tools, operation conditions, and part precision, etc.

3. The Principles of Motion Economy

The principles of motion economy, considered as foundation of motion analysis, was used firstly by F.B Gilbreth and supplemented by R.M. Barnes.⁷

Barnes categorized the principles of motion economy into three principles of use of human body, arrangement of the work place, and design of tools and equipment as shown in figure 2.

First, the Principle of human body, it is to arrange according to reflexive and natural rhythms, and to consider symmetric characteristic of human body. In addition, it is to maximize body capacity, and to follow physical rule for motions of arms and hands. That is, motions of hands and body should be used in the lowest motion class within the scope to treat smoothly the task.

Second, the Principle of arrangement of the work place is to locate all tools or materials on a definite and fixed place, and to arrange tools, materials, and controllers close to the place of use, according to order and direction of motion. When moving materials to the place of use, it is to locate part nearby the place of use, using part box or container applying the principle of gravity transportation, and if possible, it is to drop them for moving them.

Third, the principle of design of tools and equipment, is about prepositioning lever, handle, controllers to make workers operate them easily without changing their postures largely. Also, inducing device makes location of object of task without significant care of worker.⁸

A. Normal working area



B. Maximum working area

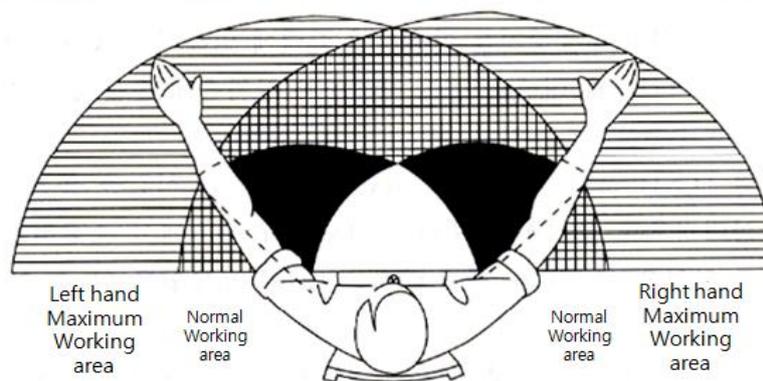


Figure 2: Normal working area(A) and Maximum working area(B)

4. Process Analysis and Measurement of Task

When segmenting task completed by one worker, there is a concept called process. Process is a unit to consist of a series of task, and means the scope of task to be assigned in order to achieve the goal of the task.

Process analysis method is to make basic data including building process management system, leveling process loads, and designing and improving task methods.⁹

With analysis unit of process, it is to classify and draw the objects as operate, transport, inspect, delay, and storage in process analysis table with their paths, according to order of treatment. It is to analyze of causes operation conditions, spent time, transportation distance, transported amount, production amount, and machine's name if necessary, and to present data in forms of scaling model, graph, signal, statistical values, etc., and to confirm production activities.

For types of process analysis, it is divided into detailed and simple process analyses. Detailed process analysis includes product process analysis and

stranding process analysis, while supplemental process analysis includes product analysis, passage process, flow analysis and transportation analysis.

For the study of method to measure tasks is rooted on scientific management method by F.W. Taylor. He improved task methods through motion study, and used stop watch as a means to measure tasks. By measuring workers' various activities with time, collecting various data and setting standard time for rationalizing tasks, it aims at setting standard of the outputs for jobs of tasks. Standard determines output amount expected from one worker, and plans and controls directly labor expenses.

Without data about time required for production activities of products or conducting services, it is impossible to run the process efficiently. If there is no standard about time required for production or production amount, it is difficult to estimate cost, and there is no evidence for comparison, resulting in no criteria to evaluate performances.

Measuring task to set standard of production activities should be done carefully in objective methods based on reasonable and scientific evidences, and if not, it will cause bad labor relations.

Measuring task can be used for various purposes, and task measuring method to be used should be defined clearly for the purpose to measure the task, and then the right method should be chosen for that purpose.¹⁰

5. Conclusion

In order to raise efficiency of manufacturing process, task method management system should precede, and such management system is now used by many manufacturing companies in various ways.

In the age of deeper international cost competition, now, to make factories operation efficient, it is required continuously to conduct the most effective time management system and to standardize improved task methods.

Recently, using and standardizing motion analysis software through video, it has been available to actualize to improve wasting in the field, team efficient, to calculate appropriate number of personnel, to measure standard time, and to use standard task video, and cost and time required for task have reduced.

Motion analysis can standardize task methods and improve productivity innovatively measuring stop location of motion, observing and analyzing specific time and motion included in machine and human works in detail, removing wastes, and setting better orders or combinations of tasks. Such improvement of task methods using motion analysis to raise productivity will be helpful to increase productivity efficiency for small and medium-sized

businesses.

Acknowledgment

This research was financial supported by Han-Sung University

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