



Application of The MODAPTS Method with Innovative Solutions in The Cement Packing Process

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Abstract

The Modular Arrangement of Predetermined Time Standard (MODAPTS) is a method for analyzing performance in performing work by monitoring the operator's movement in the workplace. MODAPTS will record the movement of each carrier in the workplace. This research will reveal a number of common features of MODAPTS and its applications in the packing process at the cement plant in particular to reduce the waste of working time that causes the production target is not achieved. This Cement Packing process becomes the chosen workplace because it requires manual work where there is continual movement of the body. The suggested improvement is in the form of determining movement activities, terminal activities, and Auxiliary Activities for each operator based on the standard time and the normal time available. Based on the results of this study obtained innovative solution that can be used as a safe, easy, and efficient working procedure resulting in increased work productivity.

Keywords: MODAPTS, Operator's Movement, Movement Activities, Terminal Activities, Standard Time, Normal Time

1. Introduction

Modular Arrangement of Predetermined Time Standard (MODAPTS) is a method proposed by Chris Heyde in 1966, provided a system that is easy to learn and easy apply [1]. It is used to analyze work performance by monitoring operator's movement in the workplace. MODAPTS records workplace or operator's movement in order to: simplify and facilitate work in workplace, detect and eliminate unnecessary movement, and performance analysis [2-6]. MODAPTS is a system for measuring work without using a stopwatch. This method is based on analyzing the movement of the body required to perform a task or job. This method is very accurate and rapidly analyzes a workable system that can be applied to the measurement of production activities, non-cycle work environments and safety management. This method is often used for automotive manufacturing industry, government organization, shipping and transportation industry, and other industries that use manual movement. MODAPTS library is a collection of databases that contribute with work elements and working hours, so in the process a product designer can use the estimated work time so that no whole assembly time changes are needed, and this method can decrease re-estimation time [7]. The MODAPTS analysis translates assembly motions into element class codes and time values through video examination [8].

This research will reveal a number of common features of MODAPTS and its applications in the packing process at the cement plant in particular to reduce the waste of working time that causes the production target is not achieved. This Cement Packing process becomes the chosen workplace because it requires manual

work where there is continual movement of the body. The suggested improvement is in the form of determining movement activities, terminal activities, and Auxiliary Activities for each operator based on the standard time and the normal time available. Based on the results of this study obtained innovative solution that can be used as a safe, easy, and efficient working procedure resulting in increased work productivity. The rest of this paper is organized as follows. In Section 2 we will provide related works with MODAPTS. In Section 3 we describe the methodology used in this research and in Section 4 we provide the statistical result in this research. Results and discussion are given in Section 5 and finally, we conclude the research in Section 6.

2. Related Works

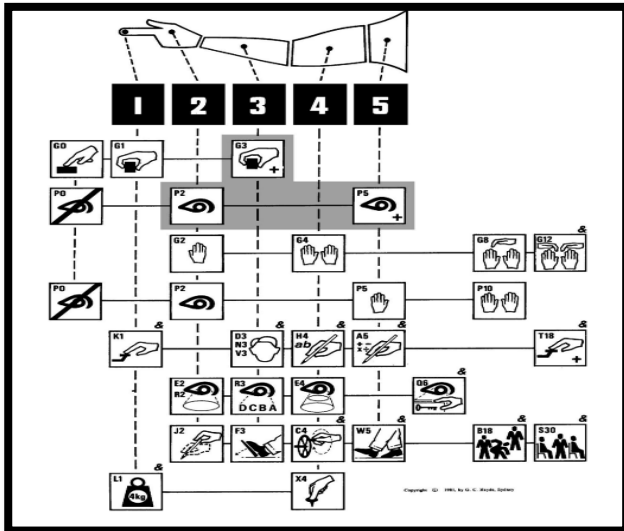
MODAPTS method is not only simple, flexible and comprehensive in comparison with the other methods, but it is fundamentally reliable according to the reliability of the MODAPTS method. It is not necessary to have an expert's point of view duration and it is the other advantages of the method according to its time saving property [9]. The MODAPTS method has been used extensively to achieve employment productivity objectives within the human resource field [10]. In [10] used MODAPTS method with Principal Component Analysis (PCA) method for movement analysis. MODAPTS is defined as a procedure for improving productivity and establishing time standards as a result of the description and classification of the movement given to carry out a series of operations and provide predetermined amount of time predefined for each movement [11]. Industrial and commercial companies have accepted MODAPTS as a valid and useful method as a predeter-

mined time system standard [8]. In the MODAPTS method, human movement is classified into 21 types, and is assigned a standard time number as a constant value for each existing movement [12].

3. Methodology

3.1. MODAPTS

Standard time calculation by MODAPTS method is done by summing the MODAPTS value and converting to standard time. One MOD value is equivalent to 0.129 seconds. The MODAPTS code can be seen in figure 1 whereas the MODAPTS code table can be seen in table 1.



work, unnecessary movements that can be inhibited as well as suggestions in order to improve work and increase work efficiency.

4. Statistical Result

4.1. Data Operator

The observed operators are 8 persons, have sufficient work experience and are willing to work fairly during the observation. The Data of Cement Carrier Operator can be seen in Table 2.

Table 2: Operator Data

Operator Name	Carrier Age
<i>Packer A</i>	
Operator 1	30 Months
Operator 2	25 Months
Operator 3	27 Months
Operator 4	29 Months
<i>Packer B</i>	
Operator 5	28 Months
Operator 6	35 Months
Operator 7	25 Months
Operator 8	27 Months

4.2. Standard Time for Each Operator

In this study we will observe the standard time of each operator based on their movement in doing the work. The following will present the standard time of operator 1 which can be seen in Table 3. The same will be done for Operators 2 to 8.

Table 3: Standard Time for Operator 1

No	Operator Movement	Modapts Code	Weight Factor	Mods Calculation	Mods	Time (Seconds)
1	Turn on the packer machin	M5A2	1	5x1	9	1,161
		E2	1	2x1		0,258
2	Spin	C4	1	4x1	4	0,516
3	Walking (2 steps)	W5	1	5x2 (step)x1	10	1,29
4	Picked up a bag of cement	M3G1	1	3x1	4	0,516
		E2	1	2x1	2	0,258
5	Spin	C4	1	4x1	4	0,516
6	Walking forward (2 steps)	W5G1	1	5x2 (step)x1	11	1,419
				1x1		
7	Place the bag of cement on the packer machine	M3P3	1	3x1	6	0,774
			1	3x1		
8	Standing (wating for a fully loaded cement)	S30	1	30x1	30	3,87
Total Mods					84	10,836

4.3. Allowance Time for Each Operator

Allowance Time for each operator can be seen in Table 4.

Table 4: Allowance Time for Each Operator

Factor	Allowance Interval (%)	Allowance (%)
A The power is very light	6,0 – 7,5	7
B Work attitude stands on two legs	1,0 – 2,5	2,5
C Work movement is rather limited	0 – 5,0	3
D Eye fatigue constantly	2,0 – 5,0	5
E High Temperature	0,0 – 5,0	5
F The atmosphere is not good enough	5,0 – 10,0	10
G Environmental Circumstances Repetitive work cycle	1,0 – 3,0	2
Sub total		32
Personal needs of men	0 – 2,5	2
The inevitable obstacles		2,5
Allowance Total		39

4.4. Standard Time for Each Operator

For example we want to calculate standard time for operator 1.

$$\begin{aligned}
 &\text{Normal Time} \\
 &= \text{Total Mods} \times 0,129 \text{ Seconds} \\
 &= (54 \times 0,129 \text{ seconds}) + \text{Waiting Time} \\
 &= 6,97 + 3 \text{ seconds} = 9,97 \text{ seconds} \\
 &\text{Standard Time} \\
 &= W_n \times (W_n + 1) \\
 &= 9,97 \times (1 + 0,39) \\
 &= 13,86 \text{ seconds}
 \end{aligned}$$

Standard time for each operator can be seen in Table 5.

Table 5: Standard Time for Each Operator

Operator	Normal Time (Second)	Standard Time (Second)
Operator 1	10,84	15,06
Operator 2	10,97	15,24
Operator 3	11,09	15,42
Operator 4	11,22	15,60
Operator 5	11,09	15,42
Operator 6	10,97	15,24
Operator 7	11,09	15,42
Operator 8	10,97	15,24

Graph of Operator Time Cycle can be seen in Figure 3.

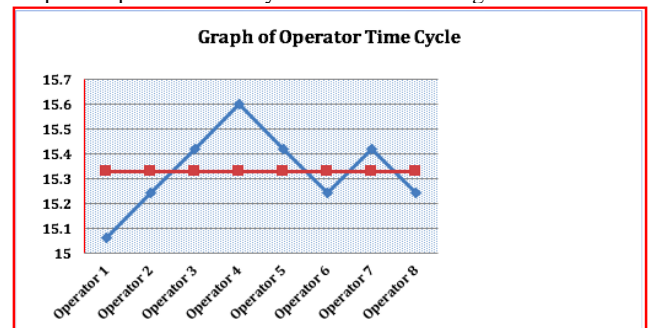


Fig. 3: Graph of Operator Time Cycle

5. Result and Discussion

Through this research can be seen which operators have achieved a good working time. The MODAPTS method is used to analyze the movement of each operator in the cement bagging process. Through this research is expected to increase work productivity through the application of standard work time is good.

6. Conclusion

Through this research can be seen that working time effect on work productivity and MODAPTS method is designed to find solutions such as reducing the application of the movement of each good operator. The resulting improvements will increase work productivity and work quality will rise and operators who leave work due to illness can be reduced.

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