Case-Study on Process Activity Improvement by Maynard Operation Sequence Technique (M.O.S.T.) – An Advanced Work Measurement Technique

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Abstract - *In today's competitive economy, a company must reduce or eliminate idle and/or downtime of activities, as well as improve current working conditions, in order to stay in business. Work measurement is an important step in determining the scope of work for an operation, as well as the foundation for deploying men/resources, monitoring, and improving resource utilization. The Maynard Operation Sequence Technique (MOST) was used in the cylinder block machining section to capture hydraulic oil top-up activities with a systematic and descriptive flow of the activity for value engineering, methods engineering analysis, and cycle time calculation (time measurement). For an engineer standing close behind the operator, monitoring and recording the various operations, the stop watch method would take a long time. As a result, the engineer is confronted with several problems, including annoyance, deliberate delay, and the addition of non-value-added tasks. As a result of the process redesign and process flow analysis, material handling and workflow are improved.*

***Key Words*: Maynard Operation Sequence Technique (MOST), Bottlenecks, Existing Time, Proposed Time, case-study.**

1. INTRODUCTION :

The Maynard Operation Sequence Technique (M.O.S.T) is one of the most advanced and powerful technique used for the measurement of work in most of the industries. It was evolved by H.B. Maynard and Co. Inc. U.S. in 1970 for the purpose of clerical work. Now M.O.S.T which is used, is a modified form of the 1970 technique and this process was brought into practice at U.S. in 1975. M.O.S.T was designed for faster and better than other work measuring techniques.

Basically, there are three types of M.O.ST involved namely:

Maxi MOST:

The Maxi MOST is at the peak. It is applied to study the activities which are possibly executed not more than 150 times in 6 working days. An activity which ranges from less than 2 minutes to several hours is categorized in this group.

Basic MOST:

At the middle level is the Basic MOST. It is used to analyze operations that are possibly executed between 150 to1500 times in 6 working days. An activity which ranges from a few seconds to 10 minutes is categorized in this group.

Mini MOST:

The Mini MOST is at the bottom level, which is used for detailed analysis. Activities that are possibly performed not less than 1500 times in 6 working days are executed with Mini MOST. An activity which has cycle time 10 seconds or less is categorized in this group.

2. LITERATURE REVIEW :

Vivek A. Deshpande [1] has suggested the most advanced work measurement technique called the 'Maynard Operation Sequence Technique' (MOST). The vital step to understand the severity of work is work measurement for activities and it is the foundation for the effective monitoring and utilisation of resources and positioning of human resources. Here the paper is provided for awareness and featuring the most advanced technique for work measurement called 'Maynard Operation Sequence Technique' (MOST). The aim of any work measurement procedure is to decrease the work matter and increase the efficiency of the activity. The activity using the stopwatch method is time consuming for an industrial engineer who is recording the various activities performed by the operator standing behind him. Here the methodology is explained and an example is shown for better understanding of method.

Prof. A. A. Karad, Mr. Nikhil K. Waychale, Mr. Nitesh G. Tidke [2] have said that to maintain the competitive edge in business at today's world one has to reduce or eliminate the rest time or downtime for activities and reconstruct the working methods or processes. An example of a company involved in automobile manufacturing contributes to inadequate process with improper capacity planning, here the technique called as Maynard Operation Sequence Technique (MOST) is applied in automobile rear assembly section to record the workflow. Among the responsibilities required are the creation of structured and complete process data blocks for value addition, value engineering,

and methods engineering analysis. To accomplish the required results, process redesign and analysis, as well as material management and logistics, are employed. Aside from the cost reductions, the product cycle time was reduced to manage peak demand with a shorter Takt time and fewer employees.

3. METHODOLOGY :

M.O.S.T. is a work measurement system that concentrates on object movement. It has been discovered that reaching, grasping, moving, placing an object, and other object motions follow recurring patterns. Objects can be moved in one of two ways: by picking them up and carrying them freely across space, or by moving them while in contact with another surface.

The following sequence models are included in the Basic MOST work measuring approach:

General Move Sequence: This is taken into account when a thing's motion / movement is transferred over open air. The primary move sequence concept, in a nutshell, is as follows:

$$\frac{A\ B\ G}{GET} \quad \frac{A\ B\ P}{PUT} \quad \frac{A}{RETURN}$$

Where,

A = Action Distance

B = Body Motion

G = Gain Control

P = Placement

Controlled Move Sequence: When an item's motion or movement is connected to the object's top surface or to another thing during the time of motion or movement, this term is employed. In brief the controlled move sequence concept follows the sequence as:

$$\frac{A\ B\ G}{GET} \quad \frac{M\ X\ I}{ACTUATE} \quad \frac{A}{RETURN}$$

Where,

A = Action Distance

B = Body Motion

G = Gain Control

M = Move Controlled

X = Process Time

I = Alignment

The time measuring unit in M.O.S.T is compiled as **"Time Measurement Unit (TMU)"**. Then further the Standard time sequence is calculated using factors below: -

1 hour = 100, 000 TMU

1 minute = 1, 667 TMU

1 second = 27.8 TMU

1 TMU = 0.00001 hour

1 TMU = 0.0006 minute

1 TMU = 0.036 second

4. MOST PROCEDURE AND EXPERIMENTATION :

The actual M.O.S.T procedure must be followed in order to obtain the desired quick and accurate results, as well as to identify the Non-Valued Activity.

1. Keep an eye on the job or task that must be finished. As a result, you'll be able to record the video and use it as a future reference and calculation tool.
2. Make a list of all the sequences you're going to use and keep track of them.
3. Use standard charts to calculate index values.
4. To get TMU, add the index values together. Add all of the index values together to get the grand total.
5. Because it's a multiplication factor, multiply the grand total TMU by 10.
6. Convert TMU to seconds, minutes, and hours as needed.

Hydraulic oil top-up is currently done in the pegard section, which has a cylinder block machining facility. The hydraulic oil top-up was previously done with a 35-litre container, which has since been replaced by a motorised oil top-up trolley. Using the M.O.S.T technique, time was measured for hydraulic oil top-up activity. Each step of the oil top-up procedure is timed and documented separately. The time required for each oil top-up activity is calculated as follows.

The following statements were made for the M.O.S.T case study before and after the implementation of oil top-up activity in the Pegard machining section:

Before Statement: A person can fill 30 litres of oil in the oil-can from the barrel at the oil section in three minutes. After that, he pushes the trolley 320 steps towards the machine for oil top-up work. He climbs a ladder five steps to place the funnel on top of the oil tank, then descends

four steps to carry the 30-litre oil can and fill the tank. Returns once the ladder has been placed in its proper location.

After Statement: A person fills 30 litres of oil into an oil-can from a barrel at the oil section in 3 minutes. Then he pushes the trolley 320 steps to the machine for oil top-up work. He takes 5 steps forward and turns on the motor. He connects the hose pipe to the oil tank of the machine. Following the oil top-up, the electric supply is turned off, and he returns to the oil section.

Q: A person fill 30 ltr of oil from barrel to oil-can at oil section in 3 min.Then he moves 320 steps pushing the trolley towards Machine for oil top-up activity.He climbs 5 steps and places the funnel on top of oil tank with the help of ladder then return back 4 steps to carry the 30 ltr oil can and then fills tank respectively.Returns back.

		GET			PUT			CONTROL MOVE			RETURN	Total
Sr No.	Steps Performed	A	B	G	A	B	P	M	X	I	A	
1	To fill the can from the oil barrel	1	3	3	0	3	1				1	12
2	Required time to fill the oil can											833
3	Movement from oil section to Pegard section	173	0	1	173	0	1				196	544
4	Top-up lader adjestment											1667
5	Placement of funnel on the machine	1	3	1	10	16	3				1	122
6	Back towards the Trolley	0	0	0	0	64	0				10	74
7	Carring the can to the opening for oil tank	10	64	3	1	6	3				1	88
8	Required time to fill the oil tank of the machine											250
9	Lader placement to origin position											500.1
10	Return to oil section	173	0	1	173	0	1				196	544
	Total time required for oil top-up activity in pegard section											27.8min

Q: A person fill 30 ltr of oil from barrel to oil-can at oil section in 3 min.Then he moves 320 steps pushing the trolley towards Machine for oil top-up activity.He moves 5 steps towards the electric supply and swith ON the motor.He places the hose pipe in the oil tank for the machine.Returns back.

		GET			PUT			CONTROL MOVE			RETURN	Total
Sr No.	Steps Performed	A	B	G	A	B	P	M	X	I	A	
1	To fill the can from the oil barrel	1	3	3	0	3	1				1	12
2	Required time to fill the oil can											833
3	Movement from oil section to Pegard section	173	0	1	173	0	1				196	544
4	Putting the hose pipe in the oil tank for machine	1	3	1	6	0	6				6	23
5	Laying the wire and ON the motor	6	3	1				1	3	1	10	25
6	Required time to fill the oil tank for the machine											167
7	Turn off the motor and remving the wire	6	3	1				1	3	1	10	25
8	Return to oil section	173	0	1	173	0	1				196	544
	Total time required for oil top-up activity in pegard section											13 min

Table - 1: M.O.S.T Case-Study for Oil Top-Up Activity

5. CONCLUSIONS :

To survive in this competitive industrial environment, it is self-evident that a company must reduce or eliminate idle and down time, improve working methods, standardise time for activity, and improve overall capacity planning. As a result, the MOST can play a critical role in this regard. In this proposed study, a potential method for increasing the productivity of an automobile business is presented. The findings show that by changing techniques and processes, competitive advantages in terms of meeting consumer demand, balancing the process flow, and ensuring economic benefits can be gained. As a result, using the MOST to predict standard durations for various fundamental tasks included in various operational activities could significantly boost an industry's productivity compared to its current level. The time saved in oil top-up activity w.r.t to the M.O.S.T case study is 15 minutes per task. In the meantime, a broader research study using the MOST could be conducted by implementing it in various machine sump tanks for the remaining number of workstations.

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