© 2017 IJSRSET | Volume 3 | Issue 1 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section: Engineering and Technology

Productivity Improvement through Maynard Operation Sequence Technique

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ABSTRACT

The every industry has main motive to improve their productivity. The Maynard operation sequence technique is a time study technique, which improves productivity through effective use of available time, proper sequencing of operation, line balancing, automation etc. Our project is carried out at Mahindra CIE Automotive Nashik. In our industry, we had developed a welding fixture from manual to automatic clamping through the study of managed operation sequence technique(MOST). Due to this productivity get increase and also the reduction in product cost by saving in labour cost. In this paper, we did data analysis (MOST Worksheet) for actual set up and also for developed set up which gives clear information about productivity improvement and cycle time of the process.

Keywords : Maynaed Operation Sequence Technique (MOST), Takt Time, Existing Time, Proposed Time, Productivity Increament.

I. INTRODUCTION

MOST (Maynard Operation Sequence Technique) is a work measurement technique developed by H. B. Maynard and Company, Inc. in the Unites States. MOST has been already introduced into the wide varieties of industries, such as aerospace, automotive, electronics, etc., in EU, US, and Asia. Although the work measurements are the basics for the business management, companies tend to hesitate to maintain the measurement system due to its cumbersome procedure. MOST is a work measurement system which can be easily implemented and practically maintained. Maynard Operation Sequence Technique (MOST) is a predetermined motion time system that is used primarily in industrial settings to set the standard time in which a worker should perform a task. To calculate this, a task is broken down into individual motion elements, and each is assigned a numerical time value in units known as time measurement units, or TMUs, where 100,000 TMUs is equivalent to 1 hour.

In this paper we had done detail study of MOST technique for a welding fixture at Mahindra CIE Automotive Nashik. There is a welding fixture which has manual clamping, through MOST study we had suggested to industry to replace this clamps by auto clamps. We also did MOST analysis for developed setup, which gives more productivity with less fatigue on operators.

Types of MOST

a) Mini MOST
b) Maxi MOST
c) Basic MOST

The Basic MOST work measurement technique therefore comprises the following sequence models.

Sequence Models.

Basic MOST Work Measurement Technique		
ACTIVITY	SEQUENCE MODEL	SUB-ACTIVITY
General Move	A B G A B P A	A – Action Distance
		B – Body Motion
		G – Gain Control
		P – Placement
Controlled Move	A B G M X I A	M – Move

		Controlled
		X – Process Time
		I – Alignment
Tool Use	A B G A B P – A B P A	F – Fasten
		L – Loosen
		C – Cut
		S – Surface Treat
		M – Measure
		R – Record
		T - Think

II. METHODS AND MATERIAL

A. Literature Review

Ingle Mahesh Vishwanath[1] in his study 'Improvement of Productiviity by New Approach-Lean Enterprise by MOST Way',The methodical approach connects Lean Manufacturing and Methods-Time measurement (MTM) and offers new distinct advantages to reduce lead time and increase productivity based on lean principals and standardized processes. They reviles the conceptual framework of Work Measurement using Basic MOST and its application in for the first time in Pump manufacturing industry located in Maharashtra Zandin[2] contribution is considered as pioneer to MOST Work Measurement systems. Zandin in his, 'MOST Work Measurement Systems', has defined work in terms of operation, sub operation, time standard, activity, method step, sequence model, sub activity and MOST analysis. The concept of MOST and the basic MOST sequence models are clearly discussed by focusing on MOST as a productivity improvement technique.

Sunil Londhe[3] in his study ' Review On Work Measurement By Most (Maynard Operation Sequencing Technique)', The Work measuring used for management choices like designing, scheduling, estimation of prices and analysis of performance.

Kothari[4]In his study 'Implementation of MOST on 8BK80- 800 Structure Assembly',SAP was used to understand and implement MOST. To increase the productivity of the assembly line, two layouts of workstations were combined.

Ankit P. Vekariya[5] in his study ' Productivity Improvement of Manufacturing Process of Diesel Engine by M.O.S.T. Technique', Work study is most effective tool for any enterprise to determine standard time and increase the productivity. Time and motion study method is useful for simplify the operation and reduction of operation whenever possible. Automation is suitable for mass production but medium size enterprise it is not preferable.

Sirdeshmukh[6] in the study 'Productivity Improvement through Application of MOST in Switch gear Company', The Predetermined Motion Time systems (PMTS) have become attractive and a useful evaluation tool for manpower utilization and productivity improvement.

Mr. Pramandra Kumar Gupta [7] in the study of 'To improve work force productivity in a medium size manufacturing enterprise by MOST Technique', The Effective utilization of workforce is a primary objective for any manufacturing organization is no exception to this.

Gothey[8] in his study, 'The Study of MOST D.P Contactors for Standardisation', has studied five types of contactors. It was two phase study carried out to know and improve the existing operation procedures by application of MOST.

The study was carried out for operations in (i) Assembly (ii) testing (iii) Packaging at
Siemens India Limited., Mumbai.

H.B.Maynard [9] and Company In is international consulting, software, and training business dedicated to providing innovative solutions to improve workforce performance and eliminate waste. Below case studies represent solution implemented by Maynard Inc. by application of MOST.

B. Methodology

The desire to know how long it should take to perform work must surely have been present in those individuals responsible for erecting ancient monuments or shaping

tools. Why d id the ancients and why do we need to be able to predict with accuracy the length of a working cycle, How was such a prediction made, How is it made now, There are many reasons for wanting to know the amount of time a particular task should take to be completed. It may simply be for reasons of curiosity. But realistically, it is for any of three reasons

(1) To accomplish planning,
(2) Determine performance and
(3) Establish costs.

C. Experimental Set-Up

The analysis study applied for selected division of Mahindra CIE Automotive Pvt. Ltd., Nashik. The Industrial Engineering Department has given vital information like various standards, norms, layout of the company.

✓ Layout Of Assembly Line

The analysis study applied on floor assembly line. The existing assembly line consists of one workstations. The assembly is done by spot welding process with the help of movable spot welding guns. The layout of assembly is shown in fig.3.1

To fix the job worker previously uses manual handle which consumes the time and less production. There are total Eight manually clamping devices out of which Six is replaced by Automatic Pneumatic cylinders.

Figure 1. Actual Setup

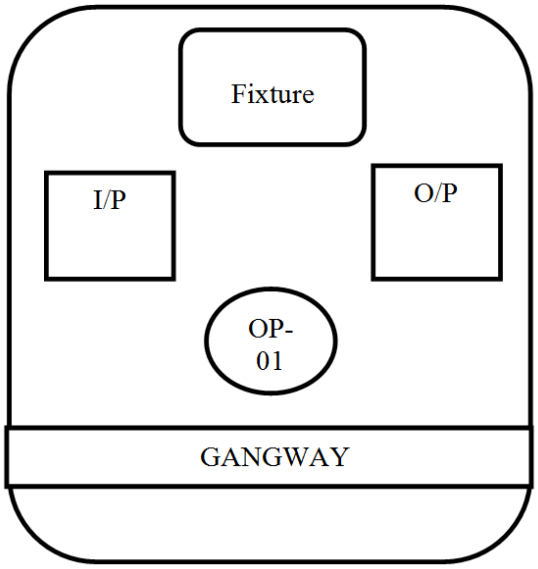

Figure 2. Layout of Work Station

As above figure shows there is a manual clamp in actual setup which consumes more time and gives less productivity. We replace this by automatic clamps as shown in developed setup.

Figure 3. Developed setup

III. RESULTS AND DISCUSSION

A. Analysis of Experimental Data

✓ The Increment of Production Rate

To assess the improvement of production rate, the Takt time of the consider assembly line is determined by dividing the total available time with customer demand.

Available Working Time = 480 min
Daily Required Quantity = 220

Takt Time = Available Working Time/Daily Required Quantity

= 480/220

=2.182 min.

As the calculated Takt time for the assembly line is as 2.182 min per piece, the customer demand of 220 piece per day can not be entertained by the current practice. However, by bringing the proposed changes in assembly lines it is possible to satisfy the demand on time as well as increase the productivity.

✓ **The Amount of Investment**

Table 1. Manpower Requirement

Type of Assembly Line	Shift Time		Total Manpower	Largest W/s. Time In Min
	Day	Night		
Current Assembly Line	1	1	2	2.52
Proposed Assembly Line	1	0	1	2.14

As shown in the above table 4.2, proposed changes in the assembly line reduced manpower up to 1 man. As the daily required quantity is achived in only day shift, manpower of 1 man work in night shift saved in proposed assembly line. The amount of investment save is given below.

Investment saved/Year = Manpower * Average salary per year

= 1 (man) * 3 (lakh)

= 3 lakh

Hence we can saved amount of investment up to 3 lakh per year by implementing the proposed changes in the current assembly line. The time saved to complete task in largest workstation in given below.

Time Saved/Unit Quantity = Largest W/s. Time In Current Assembly Line – Largest W/s .Time In Proposed Assembly Line

= 2.52 – 2.14

= 0.38 min.

B. Result

1. Takt Time = 2.182 min
2. Previous cycle time for process = 2.52 min
3. New cycle time for process = 2.14 min
4. Time saved = 0.38 min
5. Investment saved/year = 3 lakh

IV. CONCLUSION

In this way by applying the Maynard Operation Sequence Technique there is a increament in productivity which gives maximum jobs in 8 hrs. thus no need to run setup in second shift because requirement get fullfilled in first shift only, hence there is saving in energy and oprator cost also.

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