Time Study on Offline Tool Setting

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Abstract—Time study is a work measurement technique for recording the times and rates of working for the elements of a specified job, for analyzing the data so as to obtain the necessary time for carrying out the job at a defined level of performance. The aim of the project is to develop and apply time study model for an automobile manufacturing firm which is engaged in production of commercial vehicles, engines, trucks and buses. The production of parts of truck involves several major activities such as cutting, trimming and flange making. Each activity requires different tools and each part requires different sets of tools for operation and hence needs immense amount of time in setting up the tools. Number of problems arises due to the glitches in time management and hence time study methods are used to overcome them. The motivation of this project was the need to reduce the time taken for the offline tool setting in sheet metal department (CPPS- cap panel press shop) of the firm. Hence the processes were broken down into jobs and tasks, and MOST (Maynard Operation Sequencing Technique) is used to calculate the time taken for the tasks and jobs. Therefore, there is a need to reduce the time taken for setting up of the tools to speed up the processes and in turn increase productivity. Also the calculated time can be used to make efficient production plans.

Key words: CPPS, MOST, Efficient Production Plans.

I. INTRODUCTION

Offline tool setting is the time taken to set the tool without disturbing the on going production operations. This project was carried out in Cab panel press shop, Ashok Leyland, Hosur. This facility indulges in production of PANELS for cabins of pick-up trucks and MUVs. Cab panel press shop houses 3 types of presses, they are:

A. Single action:
In this system of pressing, the two faces of the die (tool) are pressed against each other and hence the sandwiching of the sheet metal takes place. This operation provides only one stroke on the sheet metal. The sheet metal is loaded and placed without any firm fixture while pressing operation.

Two elements: upper and lower faces of the die

Set up: both the faces of the tool are directly placed and aligned on the moving bed
No of strokes: 13 strokes/ min

B. Double Action:
This type of pressing involves three motion elements. One is the bottom face, which provides a strong base for the tool to sit on. Second is the blank holder, which holds the tool firmly over the bottom face. Third is the inner punch, which connected to the stroke arm imparts its shape on the sheet metal.

The advantage of this technique is that, the sheet metal is held firmly and the shape of the inner punch is cleanly imparted.

C. Single Action with Cushion Pins:
This type of tool setting is one where in the sheet metal is held by the upper face of the tool firmly and the imparting of the shape is done by lower face of the tool, which is done by cushion pins.

Cushion pins are placed in the moving bolster and arranged into the pattern depending on the tool shape. These pins lift up the tool when the blank holder firmly hold the sheet metal.

Four elements: cushion pins, bottom face, blank holder and upper face.

Set up: the pins are arranged in a pattern, and then the bottom face is placed over it precisely. Then the blank holder is placed over it above which is the upper face of the tool.
No of strokes: 12 strokes/ min

II. PROBLEM DEFINITION

The production of panels is by series of press forming methods. For this, tools have to be set up near the presses, EXTERNALLY

(1) The setting time for these process was different for different operations
(2) The actual tool setting time did not match with the time allotted during production plans

Hence there was a need to reduce time for tool setting and also standardise the activities.

III. LITERATURE SURVEY:

(1) Tarun Kumar Yadav et.al has presented a paper in TATA plant based Measurement time method for engine assembly line with help of Maynard operating sequencing technique (MOST). Knowledge Based Design Methodology (KBDM) for automated and manual assembly lines, which can be applied equally well to single, multi- and mixed-product assembly lines with either deterministic operation times or stochastic operation times. The methodology starts from a suitable assembly system selection and thereafter decides suitable cycle times, parallel workstation requirements, and parallel line implementation for the type of assembly system being selected. An economical number of workstations are decided with the aid of workstation combing options depending upon the factual information provided. The end result is the detailed design of a manufacturing assembly line. A case
study from a practical assembly line is presented to illustrate how the KBDM works.

(2) Gnanavelu et al. Has presented a paper on “Establishing Time Standards for Hydraulic Cylinder Assembly Operations using MOST. The application of MOST for process were made and it was identified that many movements of assembly activities were taking more time than required w.r.t Time Measurement Unit (TMU) value in MOST sheet. After implementation of new standards for elemental operations the improvements obtained are, there is a significant reduction in the overall time consumption of assembly process from 222 seconds to 169 seconds i.e., 23.75 and by incorporating bins, press machine and pallets the overall operational time consumption has been reduced by 17.8%.

(3) Mr. Pramandra Kumar Gupta et al. Has presented a paper on “To improve work force productivity in a medium size manufacturing enterprise by MOST Technique”. Lean manufacturing system culture is based on working in every facet of the value stream by identifying and eliminating the waste, which improves the process involved by making it more flexible and reliable. MOST is a powerful analytical tool that helps increase productivity, improve methods, estimate labour costs etc. By the implementation of basic MOST it was seen that there were a considerable increase in workforce productivity and also complete elimination of human work waste.

IV. OBJECTIVES:
- To study the time consumed by each operation
- To standardize the activities and assign specific tasks for each operator
- Study the variables involved in set-ups
- Provide a template to calculate the setting time for a defined product, which will help in production planning

V. METHODOLOGY:
MOST (Maynard operation sequencing technique)
- The time study is done on activities with the help of MOST (Maynard Operation Sequencing Technique) Technique
- MOST is Predetermined motion time system where tasks are broken down into individual motion elements and each element is assigned a numerical value in units known as TIME MEASURING UNITS(TMUs)
- The time for each sub activity is calculated in terms of TMU and then converted to Seconds
- MS Excel
- Template to calculate the set up times for any product is made using MICROSOFT EXCEL
- Here all the elements listed in MOST technique are linked to sub-activities.

For each product listed, activities are predefined. Which when entered in the template, displays the time required for setting the tool EXTERNALLY.

VI. ASSUMPTIONS
- Start point of the crane is assumed to be over the tool which is to be loaded or unloaded
- Crane movements are in straight path
- Adapter and bullring are easily accessible at their locations
- Tool is of medium size and with sliding locks
- Location of each tool is considered from its top-centre
- Locations of the tools are fixed
- Only one operator sets up the cushion pins on the MB

VII. DATA COLLECTION

![Fig. 1: Single Action Press](image1)

![Fig. 2: Single Action with Cushion Pins](image2)
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VIII. RESULT

Table 1: MOST Technique Carried Out

The template made for the calculation of tool setting time is as shown

Table 2: Calculation Of Tool Setting Time

IX. CONCLUSION:

- The time for each activity is standardised
- Work is standardised for the operators
- Time allotted during production plan for tool set ups is in conjunction with the actual time taken at the shop floor
- Also production planning is now easier than before

REFERENCES

[6] Introduction to Work Study by ILO.