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Effective Shop Floor Utilization towards Minimizing Delay and Transportation in Manufacturing

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Abstract- This study is carried out at Rotavator manufacturing plant to minimise the delay in production of tillage equipment for Medium scale organisations (MSOs) in Industrial Development Corporation areas of Maharashtra State. This study is carried to minimise delay in production and to improve manufacturing productivity by using Time and Motion technique. The research objectives towards accomplished this study is to identify problems in the manufacturing process. Solutions for the problem occurred; given in terms of minimising intra-plant transportation and minimising production time by proposing an optimize production layout and efficient manufacturing process. All the processes wereanalyzed for existing production area and timing has been recorded. After analyzing the complete processes new production area is proposed and for the manufacturing of same sub-assembly time has been recorded. The improvement of manufacturing process was executed by eliminating and combining of work process, which reduces production time, transportation time, number of process and space utilization.

Index Terms- Manufacturing Process, Medium Scale Organisation (MSO), Process Chart, Production, Time and Motion Study.

1. INTRODUCTION

MSO use manual as well as semi-automatic machines in producing their products, where most of their work process was done manually by employees. Sometimes, the production takes extra time in producing their products. Moreover, the production department does not have any fixed/standard time or standard process plan for each process. They just go on manufacturing their products. This result in longer than the time estimated. Thus, it might be difficult for organisation to increase productivity and complete the task in minimum time.

2. PROBLEM DESIGN

This study is conducted through field study at shop floor in industry by time and motion technique to study on improving the work process by minimising delay in production. Field study is carried from direct observations towards the live situations of production process. Primary data were collected by observing and recorded the research subject during the observation.

3. OBJECTIVES

1. To optimize production layout to minimize intra-plant transportation.
2. To minimise delay in Production using time and motion study.

4. TECHNIQUES OF TIME STUDY USED

The techniques of time study start with the motion technique and it shows the close relationship between motion study and time study. The techniques of time study are:
(i) Stopwatch time study
(ii) Expert opinion standards
(iii) Predetermined time standards

5. RELATIONSHIP AND UTILIZATION OF TIME AND MOTION STUDY

Time and Motion Study is a scientific method designed by two different people to increase productivity and reduce manufacturing/production

time. F. W. Taylor designed Time Study; it estimates the least time require for a worker to complete a job. Frank B. Gilbreth invented motion study to determine the optimum way to complete a job. Time and Motion study helps management to determine the optimum production time, therefore making it easier to finalize work schedules. It became a necessary tool for organizations to gain higher productivity. Now a days most of the organizations like Industries, Offices, Department Stores, etc. use Time and Motion Study.

6. DATA COLLECTION

The primary data required for the study was related to the following factors; time during the manufacturing process occurs and the distance or movement for each process. Data is collected based on following methods:

(i) Systematic Observation
(ii) Stopwatch Time Study
(iii) Motion study
(iv) Process Chart

6.1 Systematic observation

Systematic observation refers to observe the complete manufacturing process in the industry. Focus on which process or job that wants to study. Based on the observation, is needs to record each and every process from start to finish in the manufacturing process.

6.2 Process chart

Process chart is used to show operations as transportation, operations, inspection, storage and delays that occur in the manufacturing process. These processes happen when the job moves from one work station to another until job finishes. Each operation is represented by symbol.

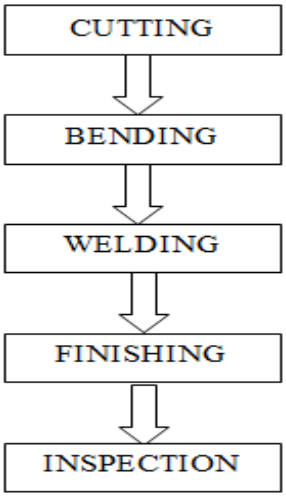

Fig 1: Process Chart

6.3 Motion study

Motion study is carried out with the help of camera by capturing photographs and videos [2]. Actual path covered while transportation is observed clearly. Alternate path for the transportation for same destination is found out without disturbing the manufacturing process. The optimum path and work order is accordingly selected. Figure 1 shows the actual shop floor area at the organization.

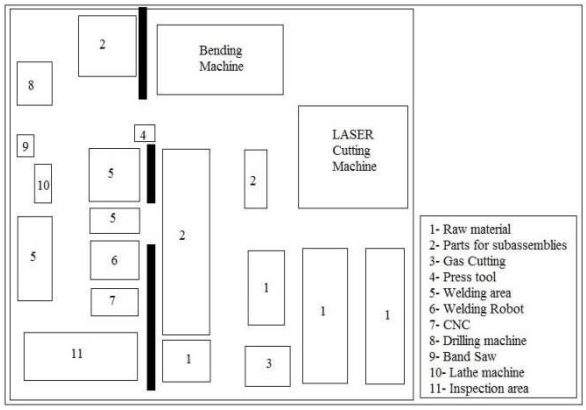

Fig 2: Actual Production Area

6.4 Stopwatch time study

Time study is carried out with the help of stopwatch. It is used to analyze manufacturing process by experts and to find the most efficient way to minimize delay in production [7]. This method measures the least time required for manufacturing process to be completed. The time was measured using stopwatch. Table 1 shows the time (average of ten readings) taken for fabrication of a subassembly.

Table 1: Timing for Fabrication of a Subassembly

Sr.	Operation	Time(min : s)
1	Collecting parts required for sub-assembly	13.19
2	Loading or Mounting on fixture	13.49
3	Tagging or Spot welding	10.48
4	Unloading	4.52
5	Full or Continuous welding	9.58
6	Transportation	4.37

$$T.T. = Tc + Tl + Tws + Twf + Tu + Tt$$

Where

$T.T.$ = Total time required for subassembly

Tc = Time needed for collecting parts for sub − assembly

Tl = Time required for loading on fixture

Tws = Time required for tagging or Spot welding

Twf = Time needed for full /Continuous welding

Tu = Time required for unloading

Tt = Total time required for transportation

$$T.T. = Tc + Tl + Tws + Twf + Tu + Tt$$

$$T.T. = 13.19 + 13.49 + 10.48 + 9.58 + 4.52 + 4.37$$

$$T.T. = 57.23$$

Total time required for manufacturing of particular sub-assembly at existing production layout is 57 minutes 23 seconds.

7. DATA ANALYSIS

After data collection is completed, the next stage is to analyze data thoroughly for all process [3]. Analyzing the data is based on process chart, systematic observation and the time and motion study, which recorded all the processes regarding production. We can find out which part is non-productive and take a long time in the manufacturing process. After analyzing the complete processes new Production area is proposed and for the manufacturing of same sub-assembly time has been recorded.

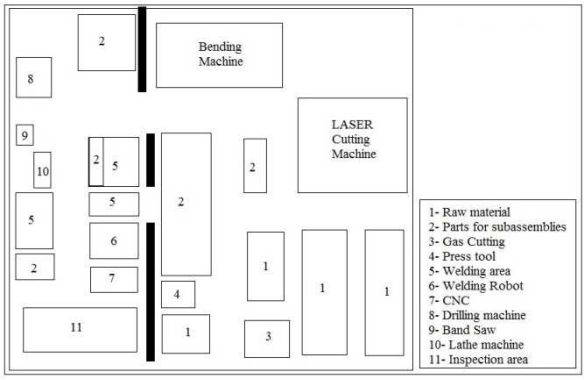

Fig 3: Proposed Production Area

Table 3: Time Required For Fabrication of a Subassembly after Proposing New Layout

Sr.	Operation	Time(min:s)
1	Collecting parts required for sub-assembly	1.38
2	Loading /mounting on fixture	13.49
3	Tagging or Spot welding	10.48
4	Unloading	4.52
5	Full or Continuous welding	9.58
6	Transportation	1.17

$$T.T. = Tc + Tl + Tws + Twf + Tu + Tt$$

$$T.T. = 1.38 + 13.49 + 10.48 + 9.58 + 4.52 + 4.37$$

$$T.T. = 42.22$$

Total time required for manufacturing of particular sub-assembly at proposed production layout is 42 minutes 22 seconds.

8. CONCLUSION

The problem occurs in manufacturing process are related to production time. Thus, the fact that related in this identified problems are:

1. Transportation within shop floor area
2. Production layout

From the observation, data collection and data analysis based on time and motion study according to new proposed shop floor area 15 minutes 01 second have been saved for manufacturing of one sub-assembly.

REFERENCES

[1] Dr. A. A. Gulhane and Dr. A. G. Matani. (2010): Innovations in SMEs. International Journal of Environment & Development, 1(3), pp. 109-113.

[2] SurjitAngra, RakeshSehgal and Z. SamsudeenNoori. (2008): Cellular manufacturing – A time based analysis to the layout problem. International Journal of Production Economic, 112, pp. 427-438.

[3] Dr. A. G. Matani. (1999): Managing new product innovations. Industrial Engineering Journal, 4(1), pp. 21-23.

[4] Jeffrey S. Smith. (2003): Survey on the use of simulation for manufacturing system design and operation. Journal of Manufacturing Systems, 22 (2), pp. 157-171.

[5] Eok Su Sim, HyoungGon Lee, Jung Chul Lee and Jin Woo Park. (2006): Efficient work measurement system of manufacturing cells using speech recognition and digital image processing technology. International Journal Manufacturing Technology, 29, pp. 772-785.

[6] Dr. Ashok G. Matani, S. K. Doifode. (2015). Effective Industrial Waste Utilization Technologies towards Cleaner Environment, International Journal of Chemical and Physical Sciences, 4(1), pp.536-540.

[7] Ann Hendrich, Marilyn Chow, Boguslaw A. Skierczynski, and Zhenqiang Lu. (2008). Hospital time and motion study: how do medical surgical nurses spend their time. The Permanente Journal Summer, 12 (3), pp. 25-34.

[8] Dr. A.G. Matani. (2006). Strategies for better waste management in industrial estates. Journal of Industrial Pollution Control, 22(1), pp. 67-72.

[9] Dr. S. K. Doifode, Ankush D. Bhishnurkar, (January-2015). Production Management Manufacturing Excellence in Indian Auto Sector: Challenges & Solutions Enhanced Agricultural Productivity with Improved Rotavator Design Towards Cleaner Environment, International Journal For Administration in Management, Commerce and Economics, ISSUE: 3, pp. 164-168.

[10] Grace Au and Ray J. Paul. (1996). Visual interactive modelling: a pictorial simulation specification system. European Journal of Operation Research, 91, pp. 14-26.

[11] L.Aharonson Daniel. (1996). Time studies in a&e departments – a useful tool for management. Journal of Management in Medicine, 10 (3), pp. 15-22.

[12] Ming Lu and Lap Chi Wong. (2007). Comparison of two simulation methodologies in modelling construction system: manufacturing – oriented PROMODEL vs. construction – oriented SDESA. Journal of Automation, 16, pp. 86-95.

[13] Dr. A.G. Matani. (2013). Curricula challenges of technical and management education institutions. International Journal of Management (IJM), 4(1), pp. 56-60.

[14] Dr. S. K. Doifode, Dr. A. G. Matani. (2014). Advanced Environment Protection Techniques By Industries: Potential For Corporate Social Responsibility Activities, Journal of The International Association of Advanced Technology and Science, 15(3), pp.1-8.