THINK INDIA JOURNAL

ISSN:0971-1260
Vol-22-Issue-37-December -2019

Cost reduction in bolster housing of mechanical press through method study: an application of lean manufacturing

Kashmir Singh Ghatorha[1], Rohit Sharma[2]

[1,2] *School of Mechanical Engineering,*
Lovely Professional University, Phagwara, Punjab, India.

Abstract

In order to withstand the demands of growing competition, continuous improvements are very important in any manufacturing company. Today the prime objective of manufacturing organizations is to review and redesign the existing work processes in order to find out the most efficient ways of doing work and efficient use of available resources through elimination of the wastes at each point of production process. The industrial engineering techniques play a major role in review and redesign of existing work process for the sake of productivity improvement. This paper is based on the cost reduction work done in press manufacturing. The manufacturing cost of housing used in the bolster assembly of the mechanical press is reduced with the help of review of existing operations through method study technique. This work has improved manufacturing process of housing and reduced the cost of manufacturing significantly.

Keywords *Lean manufacturing, Process optimization, Method study, Productivity improvement*.

1 Introduction

The industrial engineering techniques play major role in review and redesigning of the work operations for productivity improvement. These techniques focus on the following main points:

a) Elimination of the non-value added operations, idle time and bottlenecks in the production process.
b) Combining two or more operations in order to reduce number of the resources required and overall cycle time.
c) Rearrangement and simplification of the elements of work process for reducing the overall operation time.

Method study is a systematic process used to record and analyse all the facts involved in the present ways of doing a particular work with the motive of finding better ways of doing that

 Copyright ⓒ 2019Authors

ISSN:0971-1260
Vol-22-Issue-37-December -2019

work. The selection of work area is the starting point of the method study. The economic, technical and human considerations are taken into account in deciding the work area. The next step in the process is the collection of data related to the selected work area. The main focus in the data collection phase is related to the methods and techniques followed in the present operations. The process charts, string diagrams, flow charts and video recording techniques play important role during data collection phase of the study. The type of recording technique to be used in the study depends upon the nature of the operation to be recorded. In the next step all the collected facts are critically examined. This is a very important phase of the study because the deep and careful examination of the recorded facts will show all the hidden wastes in the present processes. The examination phase of the study acts as a platform for solution development phase. The new solutions developed are defined in detail with proper charts or other methods so that these should be clear to the user. After defining the newly developed solutions, the next step is to install or implement these solutions in the system. In this phase all the users of the system are taken into confidence beforehand through proper trainings. The last step in the study is to maintain the newly developed guidelines and standards in the system in order to ensure the sustainability of the developed solutions [8].

This paper discusses the application of method study in press manufacturing for cost reduction of bolster housing.

2 Literature review

Hussain & Shaikh improved the productivity of textile unit with the help of work study. The current processes were mapped with the help of method study. The time study was used for recording cycle time of various operations in the process. The method study used in the study was basically concerned with the following steps: a) Selection of the area according to the potential of improvement. b) Collection of data using various industrial engineering tools like operation process charts, layout charts etc. c) Examination of the data collected through string diagrams, man/machine charts etc. and identifying various wastes in the form of bottleneck operations, excessive man/ machine idle time and overlapping of processes. d) Developing and defining the redesigned operations for eliminating the examined wastes in the existing processes. The study improved the material handing equipments used in the company. The instruction sheets were standardized and issued to the workstations. The inspection manuals were developed for the machines. The space utilization was improved through improved

 Copyright ⓒ 2019Authors

ISSN:0971-1260
Vol-22-Issue-37-December -2019

layout. The proper place was designed for the tools used in the process. The work was also done on the efficient workers reward system [1]. Roongrat and Chansangar applied method study and line balancing techniques to improve the productivity of plastic lens production line. Due to sudden increase in the demand of plastic lens, the company needed improvement in the plastic lens production line. The methodology used in the study was based on method study which contains following steps: study of complete process through operation process chart, measurement of production capacity of machines, study of material flow through process layouts, identification of bottlenecks through value stream mapping, and elimination of bottlenecks through line balancing. The installation of additional machines at bottleneck areas helped in balancing the production line. The study achieved an increase of 7738 pieces per day in production of lens [2]. Duran et al. improved the operations at glass manufacturing unit through work study. The increased competition in the market had forced the company to improve the existing operations. The time study of existing production line was done in order to find the bottleneck operations. The study used work study techniques named as method study and time study. The study reported excessive travel of workers and it was responsible for their low efficiency. The layout was changed in order to eliminate the unnecessary travel of workers. Due to reduction in the distance travelled, the waiting periods were also reduced. The study improved the overall efficiency of the manufacturing unit by 53% [3]. Mandloi and Yadav used method study to implement lean concept in assembly line of automotive manufacturing unit. The motive of implementation of lean concept was to improve the existing processes, workplace layout, material handling, quality and work place environment. The study showed that the lean system implemented not only helped in improving the existing processes but was useful in assisting new projects as well [4]. Bagri and Raushan improved the productivity of axle manufacturing company. The work study technique was used in forging section of the company along with the implementation of automation. The study reduced the cycle time of the work centre to 14 s from 25.73 s. The number of workers required was also reduced to 4 from 5 [5]**.** Kulkarni et al. explained the role of lean concepts and work study for productivity improvement. The study concluded that the combination of lean tools and work study help in the formation of unique leaner systems which could be more effective in solving problems related to productivity. The study assured cent percent success in the efforts made through the implementation of the both techniques in a proper order [6]. Pal and Rajoria improved the machining productivity of a crank shaft manufacturing unit. The study identified the bottleneck operations and improved the existing operations through method study technique. The time study technique was used to set the

 Copyright ⓒ 2019Authors

ISSN:0971-1260
Vol-22-Issue-37-December -2019

standards for the modified solutions. The study worked on the machining parameters used in the crank shaft machining and improved the machining productivity by 4.42% [7].

3 Methodology used

The method study is used to make the existing manufacturing operations of bolster housing more economical. The data related to manufacturing process of the housing is collected through outline process charts and flow charts. The process chart starts from the activity of issuance of the forged housing from the company store and it ends at the machining activity of the housing in machine shop.

The focus of the study is on the material cost and the machining cost involved in the manufacturing of the housing. It is observed through the data collected that the forged housing is used in the manufacturing process and it is procured from the vendor. The cost of forged housing to the company is Rs 13000. So at the initial stage of the study it is decided to reduce this cost through some new methods. For this purpose the structure of the housing and its function is studied in detail in order to explore other cheaper ways of manufacturing it. After analysis of the structure and its function, it is found that the structure of the housing can be fabricated instead of forging. The fabrication drawings of the housing are made in the auto cad software. The matter is discussed with the design experts of the company regarding the change in strength of the housing manufactured through fabrication process.

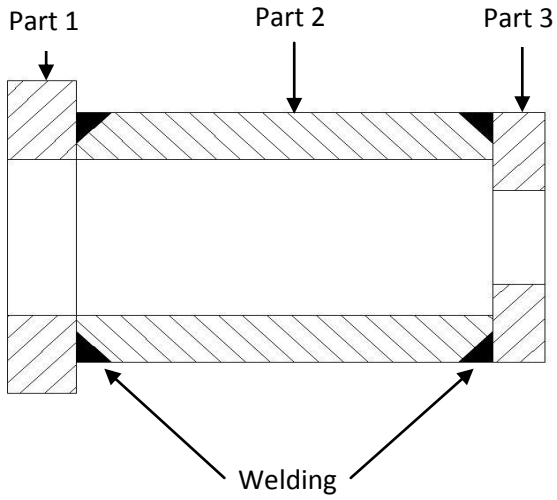


Fig. 1 Fabricated housing

The design department used solid works to simulate the fabricated housing for stress calculation and approved it after getting normal simulation results. Later on the fabrication

Copyright ⓒ 2019Authors

ISSN:0971-1260
Vol-22-Issue-37-December -2019

process of the housing is discussed in detail with the fabrication team of the company and the new process gets the approval from the fabrication team as well.

The new design of housing contains three parts welded together as shown in figure 1. A dummy housing was fabricated in order to analyse the cost involved in the newly developed method and its operation at assembly stage processes. The fabricated housing performed its functions as expected at assembly stage processes without any issues and it is approved by the assembly team. The newly developed process is incorporated in the bill of materials for incorporating the change in the future presses.

4. Results and discussion

It is observed that the outer surface of the fabricated housing is smoother than the outer surface of forged housing. The surface finish of the fabricated housing is tested and it is found lesser than the value mentioned in the drawing. This improvement in the finish of outer diameter of fabricated housing has resulted into the elimination of machining of outer diameter of the housing. Earlier the machining of outer diameter was necessary in case of forged housing due to low surface finish obtained after forging operation. The elimination of machining operation on the outer diameter helped in lowering the overall machining cost of the housing. The cost savings obtained through the implementation of new manufacturing method is discussed below:

- Cost calculation of old method (forged housing):

    a) Cost of forged housing = Rs 13000
    b) Cost of machining = Rs 8800
    c) Total cost per housing = Rs 21800

- Cost calculation of new method (fabrication housing):

    a) Cost of raw material = Rs 4200
    b) Cost of fabrication = Rs 2800
    c) Cost of machining = Rs 5500
    d) Total cost per housing = Rs 12500

- Total cost saving per housing = Rs 21800 – Rs 12500 = Rs 9300

Copyright ⓒ 2019Authors

ISSN:0971-1260
Vol-22-Issue-37-December -2019

5. Conclusion

The method study is a useful technique in developing better ways of doing a particular work and an effective tool for cost reduction as well. The study reduced the manufacturing cost of housing by Rs 9300 through improved manufacturing methods developed through the application of method study.

References

[1] H. B. Marri and G. Y. Shaikh, "The Role of Productivity Improvement Tools and Techniques in the Textile Sector during Manufacturing," pp. 2570–2573, 2012.

[2] R. Pisuchpen and W. Chansangar, "Modifying production line for productivity improvement: A case study of vision lens factory," *Songklanakarin Journal of Science and Technology*, vol. 36, no. 3, pp. 345–357, 2014.

[3] C. Duran, A. Cetindere, and Y. E. Aksu, "Productivity Improvement by Work and Time Study Technique for Earth Energy-glass Manufacturing Company," *Procedia Economics and Finance*, vol. 26, no. 15, pp. 109–113, 2015.

[4] J. Mandloi and A. Yadav, "Productivity Improvement by Lean," *Global Journal of Researchers in Engineering: G Industrial Engineering*, vol. 14, no. 4, 2014.

[5] G. P. Bagri and P. Raushan, "Productivity Improvement of Forging Section Using Work Study and Automation in Existing Axle," *International Journal of Mechanical And Production Engineering, ISSN: 2320-2092*, vol. 2, no. 6, pp. 1–4, 2014.

[6] P. P. ; Kulkarni, S. S. S. S. . Kshire, and K. V. K. V. ; Chandratre, "Productivity Improvement Through Lean Deployment & Work Study Methods," *IJRET: International Journal of Research in Engineering and Technology*, vol. 3, no. 2, pp. 429–434, 2014.

[7] S. Pal and R. P. Rajoria, "Reduction of the Machining Time of a Crankshaft Machining using Method Study," vol. 2, no. 7, pp. 66–69, 2015.

[8] Verma A.P., Industrial Engineering, 2nd Edition, S.K. Kataria and Sons, New Delhi, pp.113-186.

 Copyright ⓒ 2019Authors