Available online www.ejaet.com

European Journal of Advances in Engineering and Technology, 2015, 2(7): 66-69

Research Article ISSN: 2394 - 658X

Reduction of the Machining Time of a Crankshaft Machining using Method Study

Sunil Pal and RP Rajoria

Department of Mechanical Engineering, Poornima College of Engineering (PCE), Jaipur, India
mechstd@gmail.com

ABSTRACT

The purpose of this paper is to reduce the machining time of a crankshaft machined in a small scale industry where most of the work is done manually. The systematic stop watch time study is applied in the methodology on various processes of operation performed in the machining unit and total time is calculated thoroughly. Better utilization of man power, decreasing lead time, reduction in cost of component by implementing the observed solutions in the running process.

Key words: Productivity Improvement, Work Study, Time Measurement

---

INTRODUCTION

Work study is the generalized name used to describe a complete set of techniques through which work can be simplified, standardized and measured. It is mainly related to the human work. Work study leads to higher productivity by reducing the wastages and lead time in the present method or process of working. This research is applied in a machining plant where a forged crankshaft is the raw material and the machining is applied to achieve the desired shape and specifications. A set of process is applied in the industry in order to achieve the desired output.

As the work measurement (time study) is done in the process of the machining unit, few processes are found to be perfect with their working but few of them are observed as the bottleneck in the higher productivity of the industry. The major classification of the work is divided into two parts as rough machining and finished machining. The rough machining is used to reduce the excess material from the forged crankshaft which is done by the turning at various work stations and the surface finishing is done by the finished machining where grinding is the main operation which has a low material remove rate.

Fig. 1 Pin Grinding

Fig.2 Pin Turning

THE TIME OBSERVED IN THE TIME STUDY

Before Modification

The observations by time study are analysed in order to reduce the time of operation required where the wastage of time takes place. The two combinations of processes where turning is followed by grinding are selected to implement the improvement in order to reduce the machining time. The maximum amount of material is suggested to remove in the turning operation in which the MRR is comparatively higher than grinding.

Table -1 Time Observed in Machining Operation before Modifications

S.No.	Process/ operation	Mounting Time	Machining Time	Un mounting Time
1.	Pin Turning	00:44.62	**02:06.86**	00:19.18
2.	Pin Grinding	00:09.24	**03:29.78**	00:08.38
3.	Turning Taper side	00:16.71	**02:33.16**	00:06.20
4.	Taper dia Grinding	00:08.43	**06:42.51**	00:07.44

Total Time of Machining before modifications = 14:52.31 minutes (selected Operations only)

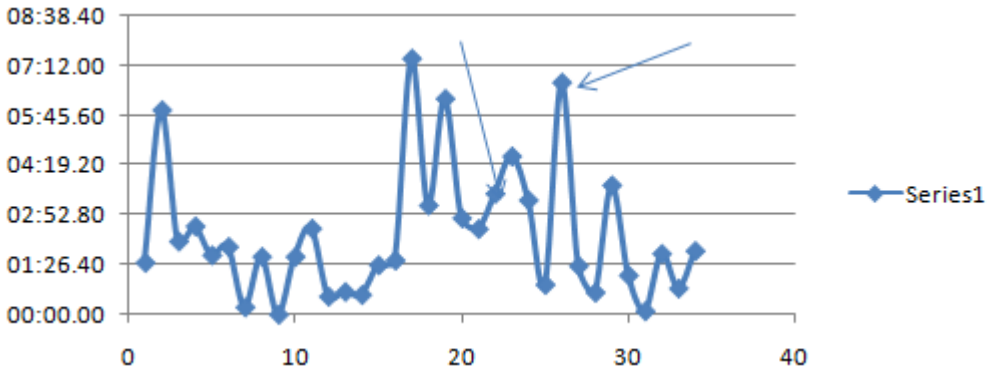

Fig. 3The detailed time study of all the operations is represented graphically

PROCESS FLOW DIAGRAM

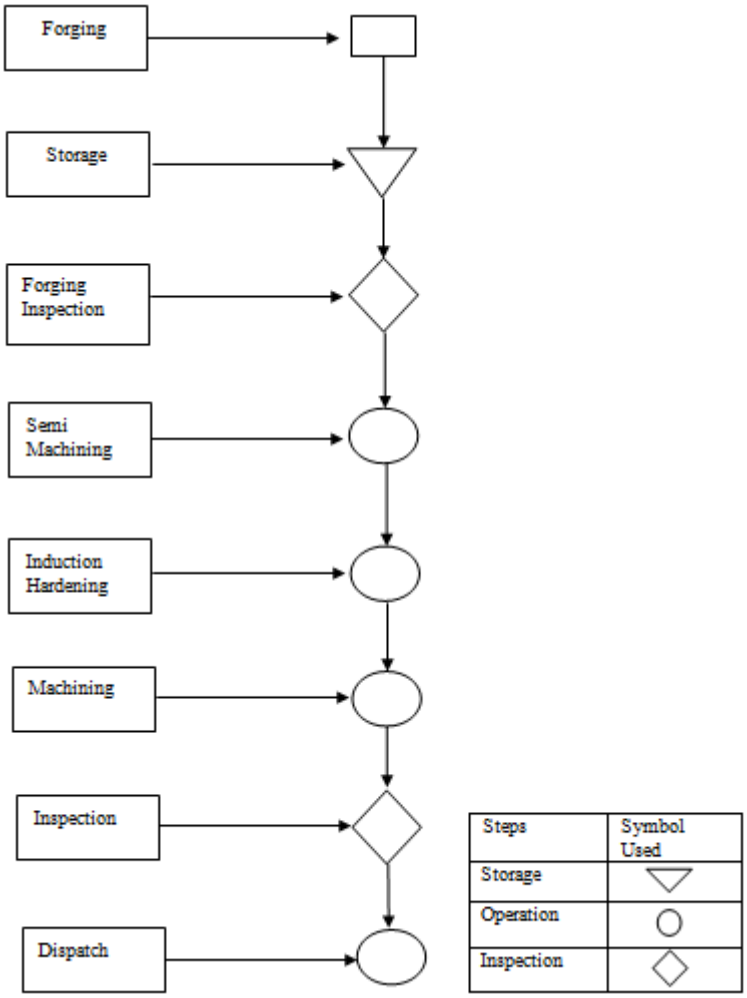

Fig. 4 Flowchart

THE TIME OBSERVED IN THE TIME STUDY

Before Modification

Table -2 Time Observed in Machining Operation before Modifications

S.No.	Process/ operation	Mounting Time	Machining Time	Un mounting Time
1.	Pin Turning	00:44.62	**02:06.86**	00:19.18
2.	Pin Grinding	00:09.24	**03:29.78**	00:08.38
3.	Turning Taper side	00:16.71	**02:33.16**	00:06.20
4.	Taper dia Grinding	00:08.43	**06:42.51**	00:07.44

Total Time of Machining before modifications = 14:52.31 minutes (selected Operations only)

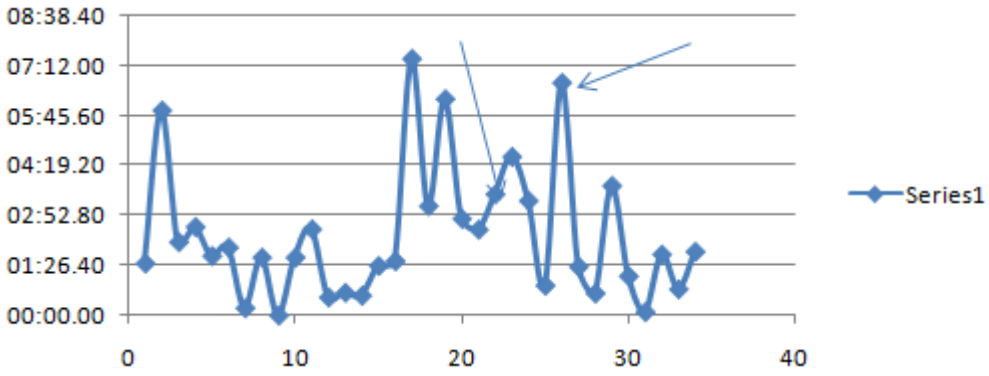

Fig. 5 The detailed time study of all the operations is represented graphically

The observations by time study are analysed in order to reduce the time of operation required where the wastage of time takes place. The two combinations of processes where turning is followed by grinding are selected to implement the improvement in order to reduce the machining time. The maximum amount of material is suggested to remove in the turning operation in which the MRR is comparatively higher than grinding.

Modifications Implemented

If depth of cut is increased in turning than lesser amount of material is required to remove in grinding so that the time required in grinding is reduced. This is preferable as the purpose of grinding is surface finishing, roundness. If the depth of cut during the pin turning operation is increased by 0.25 mm in an extra pass, the time of machining is increased but the grinding time is reduced. This results in the net reduction in time of the complete process of rough and finish machining. As the mounting and un mounting time will remain same in both the cases so, only machining time is considered with the results.

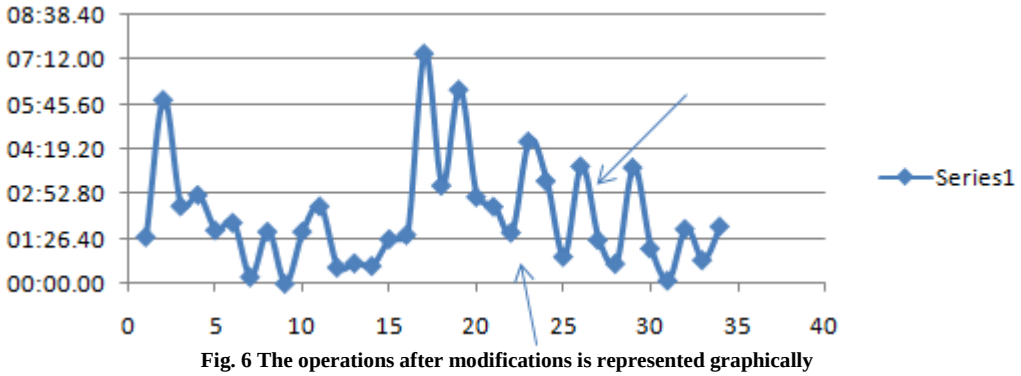

Fig. 6 The operations after modifications is represented graphically

After Modifications

Table -2 Time Observed in Machining Operation after Modifications

S.No.	Process/ operation	Mounting Time	Machining Time	Un mounting Time
1.	Pin Turning	00:44.62	**02:29.86**	00:19.18
2.	Pin Grinding	00:09.24	**01:38.64**	00:08.38
3.	Turning Taper side	00:16.71	**02:51.16**	00:06.20
4.	Taper dia Grinding	00:08.43	**03:46.69**	00:07.44

Total Time of Machining before modifications = 10:46.35 minutes (selected Operations only)
Difference (Reduced Time) = 04:05.96 minutes
Present Cycle Time = 92.73 minutes
Modified Cycle Time = 88.63 minutes
Reduced Time = 4.1 minutes (profit in terms of time)
Cycle Time Reduce = 4.42%

CONCLUSION

The Time Study is being performed on each operation and the cycle time is a component is observed as 92.73 minutes. Few of the operations are found as a bottleneck in this respect as detail study is required. In this process, the time required in rough turning and grinding was the main hurdle in the aim decided.

As the stock removal in the turning process is greater as comparative to grinding, so it is desirable to remove the maximum amount of material in the turning operation and thus by grinding, the finished surface is achieved without wasting the time and thus reduces the cost of operations.

By implementing this on the present process, cycle time is reduced from 92.73 to 88.63.Thus reducing the cycle time by 4.1 minutes. This improve the productivity by 4.42%

REFERENCES

[1] SK Sharma and Savita Sharma, *Industrial Engineering and Organisation Management*, SK Kataria and Sons, **2014**.
[2] FTS Chan and HCW Lau, Implementation of Total Productive Maintenance - A Case Study, *Elsevier International Journal of Production Economics,* **2005,** 95, 71-94.
[3] Mayank Dev Singh, To Improve Productivity by using Work Study and Design a Fixture in a Small Scale Industry, *International Journal on Theoretical and Applied Research in Mechanical Engineering*, **2012,** 1 (2), 75-81.
[4] Osama Taisir and R Almeanazal, Total Productive Maintenance Review and Overall Equipment Effectiveness Measurement, *Jordan Journal of Mechanical and Industrial Engineering*, **2010**, 4, 517-522.
[4] Abdul Talib Bon and Aliza Ariffin, An Impact Time Motion Study on Small Medium Enterprise Organization, *International Conference of Business and Economics Research*, **2010**, 1-11.
[5] Charles F Keberdle, CPIM, Reducing Machine Set up and Changeover Time, *Lean Solution Group*, Walden Drive, Westlake, **2008**.
[6] Nabeel Mandahawi and Rami H Fovad, An Application of Customised Lean Six Sigma to Enhance Productivity at a Paper Manufacturing Company, *Jordan Journal of Mechanical and Industrial Engineering*, **2012,** 6, 103-109.
[7] Sunil Dambhare, Siddhant Aphale, Kiran Kakade, Tejas Thote and Atul Borade, Productivity Improvement of a Special Purpose Machine using DMAIC Principles, *Journal of Quality and Reliability Engineering*, **2013**, Article ID 752164, 13.