An Analysis to Increase the Productivity of Fuel Injection Pump Shaft

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Abstract — **This paper addresses the analysis to increase the productivity of the Fuel Injection Pump Shaft. This study starts with understanding the standard operation procedures and analyzing the process flow to get the whole idea on the production of Fuel Injection Pump Shaft. At the same time, observations at the production line were made to identify the non-productive activities and problems that occur during production. This observation involves all the processes that had been timed using the time study techniques. The time study analysis of the processes enables the reduction of non-productive time and tasks, resulting in a set standardized work procedures for the operations. The assessment for implementation of the potential and feasible solutions were taken into considerations to increase the productivity of the Fuel Injection Pump Shaft.**

Index Terms — **Productivity, Fuel Injection Pump Shaft, Time study, Production, Cylindrical Grinding**

I. INTRODUCTION

This paper analyses the current situation of the production of Fuel injection Pump Shaft at a particular small scale industry, to find out the non-productive activities for optimization .These found activities are then to be analyzed with the time study techniques to find the underlining problems. The purpose will be to find out feasible solutions considering the technical and ergonomic factors for the non-productive tasks, to ensure that the productivity of the FIP Shaft is increased. Various researchers studied during this and they are as follows. According to Naresh Kumar, HimanshuTripathi, Sandeep Gandotra, on Optimization of cylindrical grinding process parameters on c40e steel using Taguchi technique, in the present work the cylindrical grinding of C40E steel is done for the optimization of grinding process parameters. During this experimental work input process parameters i.e. speed, feed, depth of cut is optimized using Taguchi L9 orthogonal array [1].As per M. Ganesan, S. Karthikeyan& N. Karthikeyan on Prediction and Optimization of Cylindrical Grinding Parameters for Surface Roughness Using Taguchi Method, The cylindrical grinding parameters on 304 stainless steel are conducted using Taguchi design of experiments of L9 orthogonal array was selected with 3 levels with 3 factors and output parameter of Surface Roughness is measured. After conducting experiment, it is optimized by S / N ratio and predicted that cutting speed is a dominating parameter of cylindrical grinding [2]. According to Yana Myronenko on Productivity measurement and improvement, the objective of the paper was to analyze methods of measurement of labor productivity and introduce them to real business to investigate methods of measuring performance [3]. According to Fredrick Bergstrom on analysis to increase the productivity of a surface mounting line, the data was analyzed to the major losses in the system, which were the change overs , machine stoppages and the breaks. By connecting the observations with the analysis, it was possible to determine that the lack of standardization was the largest reason to the losses [4]. According to paper by SaiNishanth Reddy, P.Srinath Rao and Rajyalakshmi on Productivity improvement using time study analysis in small scale solar appliance industry The data from the study carried out on a sample of manufacturing industry small scale solar appliances shows that motion and time study implementation and assembly line balancing contributes positively towards achieving productivity [5].

II. PROBLEM IDENTIFICATION AND FORMULATION

After studying all the process, the time consumption on cylindrical grinding is more as compare to other manual working process. The coolant flow rate on job [FIP shaft] is uneven at cylindrical grinding process. The loading and the unloading time taken at the cylindrical grinding process was considerably high.
To get a better understanding of the product design representation of Fuel Injection Pump Shaft has been depicted with the following operations that take place.

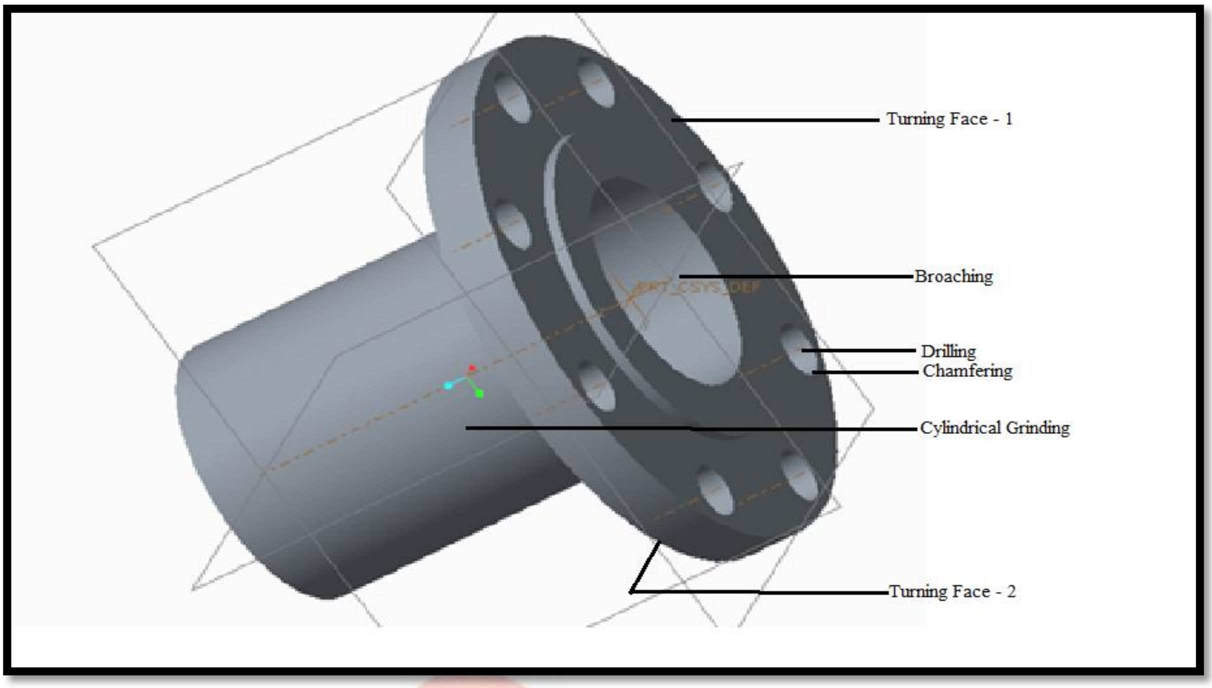

Fig.1. FIP shaft and operations carried out under it

III. DATA COLLECTION

The data gathered was totally based on the time study techniques. The quality of the data is important, since bad data may lead to the wrong conclusions in the end; therefore, a significant part of the data gathering was spend to validate the data.
It was found that Total average time of Cylindrical Grinding process was high as compared to other as this was manual process and hence it was feasible to find out problem related to it.

Table.1. Observation Table

Process	**No. of Samples**										**Avg.Time**	**Total Avg Time (Sec)**
Turning												
Loading	19	18	19	19	30	15	8	31	8	30	19.7	117
Cycle	81	83	94	103	98	88	78	73	76	71	84.5	
Unloading	12	13	8	12	13	22	15	13	9	11	12.8	
Total	112	114	121	134	141	125	101	117	93	112		
Broaching												
Loading	4	5	12	15	14	28	18	16	4	19	13.5	135
Cycle	13	21	29	26	24	24	22	25	22	39	24.5	
Cleaning	27	24	21	24	19	26	24	56	74	37	33.2	
Unloading	2	8	7	8	7	5	4	4	4	5	5.4	
Total	46	58	69	73	64	83	68	101	104	100		

Grinding												
Loading	17	11	17	8	16	7	6	19.5	6	8	7.6	315.9
Cycle	270	250	265	300	340	340	310	325	305	320	302	
Unloading	7	6	6	6	6	6	6	6	6	6	5.8	
Total	294	267	288	314	362	353	322	350.5	317	334		

Drilling, Tapping and Chamfering												
Loading	54	10	14	12	12	13	22	13	16	10	17.6	188.6
Cycle	153	153	153	153	153	153	153	153	153	153	153	
Unloading	13	11	13	12	12	10	24	24	22	39	18	
Total	220	174	180	177	177	176	199	190	191	202		

IV. PROPOSED SOLUTION

At present the operator mounts one work piece at a time for cylindrical grinding operation. To save the loading and the unloading time two FIP Shafts could be mounted on the mandrel at a time. This will cause the operator to grind the surface of both the shaft in one cycle.

To provide a standardized coolant flow rate on the cylindrical grinding since the uneven coolant flow rate may cause decrease in surface quality due to the friction caused between the job and the work piece. Hence by providing a set standardized coolant flow rate will reduce the number of defects produced during production causing the productivity to increase [10].

V. CONCLUSION

This paper has tried to raise and solve the problems that exist in the production of FIP shaft. The data collection with the time study techniques produced certain areas that were to be focused and suitable analysis was carried. The production process of FIP shaft was studied and non-value adding activities were identified and certain solutions were found to optimize the production process. Hence the Productivity can be increased.

REFERENCES

[1] Naresh Kumar, HimanshuTripathi, Sandeep Gandotra, 2015. Optimization of Cylindrical Grinding Process Parameters on C40E Steel Using Taguchi Technique.Int. Journal of Engineering Research and Applications, Vol. 5, Issue 1(Part 3), pp.100-104

[2] M. Ganesan, 2 S. Karthikeyan& 3 N. Karthikeyan, Prediction and Optimization of Cylindrical Grinding Parameters for Surface Roughness Using Taguchi Method 1 ,IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, p-ISSN: 2320-334X PP 39-46

[3] Yana Myronenko Carl-Axel Engdahl, 2012. Productivity – measurement and improvement. Department of Real Estate and Construction Management Thesis, Masters Program in Real Estate Development and Financial Services

[4] Fredrick Bergstr, Om niklas palmkvist, 2014. An analysis to increase the productivityof a surface mounting line.Master Thesis report in Production Engineering, Department of Materials and Manufacturing Technology,Chalmers University of Technology, Gothenburg, Sweden.

[5] A. SaiNishanth Reddy, P. Srinath Rao and Rajyalakshmi G.,2016.Productivity improvement using time study analysis in a small scale solar appliances industry- a case study, ARPN Journal of Engineering and Applied Sciences School of Mechanical and Building Sciences, VIT University, Vellore, India

[6] "Stretch Your Productivity" by Ankit Fadia.

[7] "Production Technology" by O. P. Khanna

[8] "Production And Operation Management" By J. P. Saxsena.

[9] https://en.wikipedia.org/wiki/Grinding_(abrasive_cutting)

[10] http://advancedmanufacturing.org/grinding-coolant-application-matters