

Bottleneck Analysis of an Automobile Industry Component

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ABSTRACT: Work study is that body of knowledge concerned with the analysis of the work methods and the equipment used in performing a job, the design of an optimum work method and the standardization of proposed work methods. Time study is a technique of work measurement used for determining the time necessary to carry out a given activity at a defined standard of performance. A stop watch is used for the purpose of recording the actual time taken by the worker under observation to perform various elements of the work or task. The main objectives of the work and time study are to analyze the present method of doing a job, systematically in order to develop a new and better method, to increase the productivity by ensuring the best possible use of human, machine and material resources and to achieve best quality product/ service at minimum possible cost.

KEYWORDS: Work study, Time study, Minimum cost

I.INTRODUCTION

Time and motion study is a direct and continuous observation of a task, using a timekeeping device (stopwatch for example) to record the time taken for accomplish a task. After recording the time, the worker's performance time (level) is recorded, and then the data are used to make the standard time for the task. Personal time, Fatigue, and delays are then added to the standard time that had been made, in other words Time and motion study, or motion and time study, is a basic set of tools used by industrial engineers to increase operational efficiency through work simplification and the setting of standards. Originally developed to drive productivity improvement in manufacturing plants, motion and time study.[1]

II.STUDY OF THE COMPONENT



Fig1. Ford Gear

The study is done on ford gear component. The component undergoes many processes, such as forging, turning (profile cutting), drilling, boring, counter boring, heat treatment (core hardening), turning (profile cutting).Supreme Automech's operations are turning, drilling, boring.[2]

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2.1 PROCESS FLOW

The process flow in the company is given by Profile cutting, Drilling, Boring

2.1.1 PROFILE CUTTING:

Machine 'ON'. First Air gun is used to remove the burr form the raw material. Then the machine is cleaned using air gun. The component is loaded. Two processes are done simultaneously are given below

- Profile turning rough
- Profile turning finish

The component is unloaded. Inspection is done using ring gauge (go/no go) and three needle height gauge. The tools used are

- TNMG insert for Rough diameter
- PDJNR for finish

The Recording method used are,

- Stop watch.
- Production monitoring chart

2.1.2 DRILLING:

The various operations are, Deburring (removing the burr). Remove the burr present in the machine using air gun. Load the component. Bring the tool to position. Switch on the machine. Machining process. Unload the component. Clean it using the air gun. Place it in the tray. No inspection is carried out as boring is accompanied [3]

The Recording method used are,

- Stop watch.
- Production monitoring chart

2.1.3 BORING:

Three operations are done simultaneously.

Processing in the machine

- Internal diameter rough.
- Internal diameter finish.
- Counter boring.

The tools used for inspection are

- Plug gauge (go/no go).
- Air gauge

The Recording methods used are,

- Stop watch.
- Production monitoring chart

2.2 FACTORS AFFECTING PRODUCTION:

2.2.1 Storage tray:

The storage tray where the components are placed has two main disadvantages. It is uncomfortable for the user to pick up the component as it is very small for the operator to put his hand and pick up. So an additional effort is required to pick the

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component. It is hard to find whether all components are machined with a bird's view as they are placed vertically each component is to be inspected individually.[4]

2.2.2 Coolant supply:

There is loss of coolant while machining hence coolants are to be added at a regular interval to provide consistent coolant flow. 9-12 minutes are wasted in coolant adding.[5]

2.2.3 Material handling:

The pallet truck used has a larger fork length hence it is uncomfortable for the user to travel in the plant and leads to delay of raw materials.[6]

2.2.4 Place the component at right place:

Mostly the operators do not place the machined component in a separate tray instead they place it in the trays that contain components to be machined. So there is a chance of sending unmachined component to the customer.

2.2.5 Power supply:

When there is a power cut the machine stops abruptly causing damage to the tool and product.[7]

2.2.6 Operator concentration:

Due to the lack of operation concentration the drill bit often gets damage. It is grinded and reused. About 30 to 35 minutes are wasted in resetting of tool and to bring back to correct form.

III. TOOL IMPLEMENTATION

3.1 BEFORE IMPLEMENTATION:



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3.2 AFTER IMPLEMENTATION:



- S16N SCLCR 09-APT Boring Bar for CCMT 09T3 Insert
- CCMT 09T0308 M12 TOOL

IV. PRODUCTION IMPROVEMENT SUGGESTIONS

4.1 Storage tray:

The storage tray must be designed in such a way that the components can be placed horizontally and it should provide enough space for the worker to pick the component easily.[8]

4.2 Material handling:

The pallet truck's fork length can be minimized as a variety of lengths are available in market. And it would be better if an automated truck used. The company could accommodate a truck that could travel at a speed of 5-10m/s. Best truck available in the market (*Raymond Model 8400*)

- Capacity: 6,000 – 10,000 lbs.
- Battery: 24 volt battery
- Loaded Travel Speed: 6.5 and 6.2 mph
- Unloaded Travel: Speed 9 mph
- Fork Length: Adjustable to various lengths and widths

4.3 Coolant supply:

Instead of adding coolants frequently a consistent coolant supply could be installed so that it may save the time wasted in it.[9]

4.4 Power supply:

The company may install a generator with minimum cost so it may carry the machine at least till the process ends.

V. TOOL UTILIZATION SUGGESTIONS

The tool used in boring has eight edges but only four are used. This is because the boring bar currently used allows the insert to fit in it in only two ways. If a suitable tool holder is made such that it will accommodate the tool in all four sides then more components can be machined in a single tool. It may reduce the tool expenditure to the company.[10]

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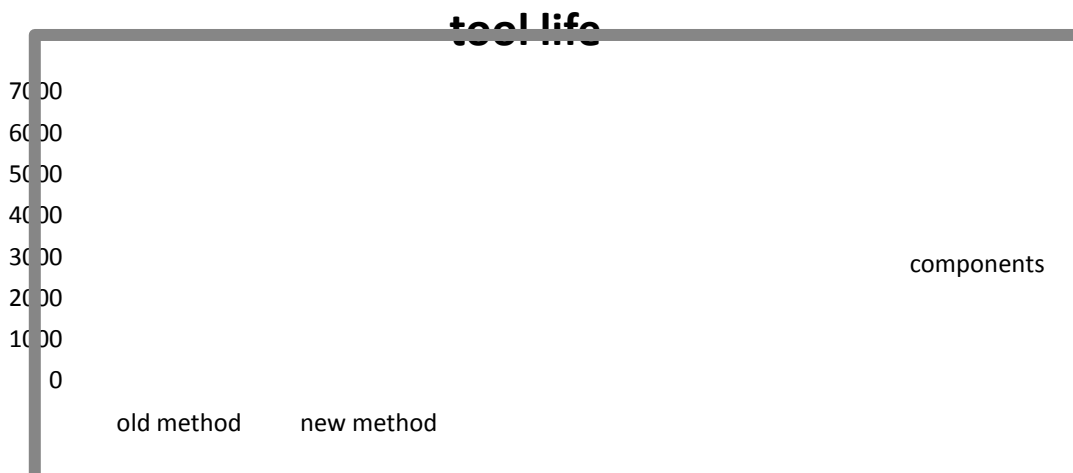
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Old method

Tool	No of components
Side 1	300-500(max 700-750)
Side 2	300-500(max 700-750)
Side 3	300-500(max 700-750)
Side 4	300-500(max 700-750)

if new method is implemented, the improvement in the tool life is given below.



100% maximum utilization of tool.

If the suggestions are implemented at maximum 5 percentage production efficiency can be increased.

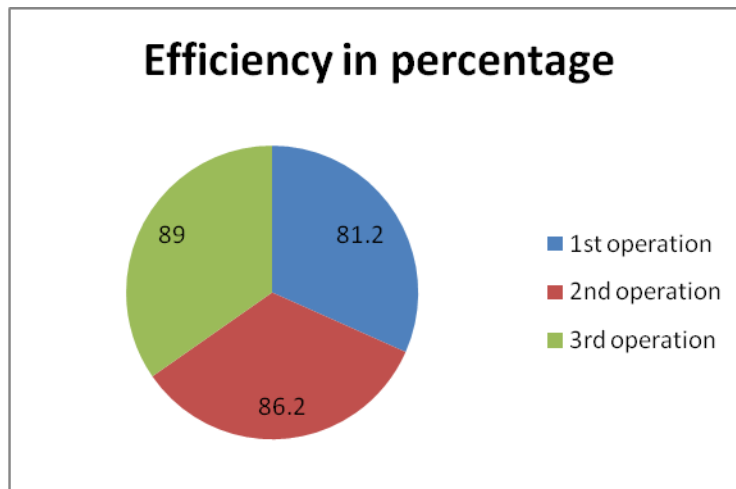
VL.DATA ANALYSIS

After the tool implementation, the efficiency is given by

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VII.CONCLUSION

To conclude with I have found out that using a holding tool (Boring bar) with an angle of 113° , we can utilize all four sides of boring tool, thus saving time and money. Other than that, production and quality improvement ideas are suggested for the maximum utilization of resources such as man, machine, material in order to improve production.

REFERENCES

- [1] A book by Elwoods Buffa and Rakesh.K Eight edition (2000), "Modern production and operations", Gives a detailed description about Taylorism and Therbligs.
- [2] Babu T.A., Sharmila V., "Cefotaxime-induced near-fatal anaphylaxis in a neonate: A case report and review of literature", Indian Journal of Pharmacology, ISSN : 0253-7613, 43(5) (2011) pp.611-612.
- [3] A book by V.Jayakumar by Lakshmi publications (2008), "Process planning and cost estimation", chapter 1 gives detailed information about work Measurement.
- [4] Valiathan G.M., Thenumgal S.J., Jayaraman B., Palaniyandi A., Ramkumar H., Jayakumar K., Bhaskaran S., Ramanathan A., "Common docking domain mutation e322k of the erk2 gene is infrequent in oral squamous cell carcinomas", Asian Pacific Journal of Cancer Prevention, ISSN : 1513-7368, 13(12) (2012) pp.6155-6157.
- [5] A book by O.P.Khanna (2003), "Industrial engineering and management", DhanpatiRai Publications gives detailed information about method study.
- [6] Mani Sundar N., Krishnan V., Krishnaraj S., Hemalatha V.T., Alam M.N., "Comparison of the salivary and the serum nitric oxide levels in chronic and aggressive periodontitis: A biochemical study", Journal of Clinical and Diagnostic Research, ISSN : 0973 - 709X, 7(6) (2013) pp.1223-1227.
- [7] A book by P.Ramamurthy (2001), "Production and operation management" provides formula for calculating production efficiency.
- [8] Thirunavukkarasu A.B., Chandrasekaran V., "Efficacy of anti-scorpion venom serum over prazosin in severe scorpion envenomation: Is the current evidence enough", Journal of Postgraduate Medicine, ISSN : 0022-3859, 57(1) (2011) pp.83-84.
- [9] A research paper done in Cpek Automobile Parts by Nik Simon in the year (1990), source from www.directscience.com.
- [10] Subbaraj G.K., Kulanthaivel L., Rajendran R., Veerabathiran R., "Ethanol extract of Carum carvi (EECC) prevents N-nitrosodiethylamine induced phenobarbital promoted hepatocarcinogenesis by modulating antioxidant enzymes", International Journal of Pharmacy and Pharmaceutical Sciences, ISSN : 0975 - 1491, 5(S1) (2013) pp.195-199.
- [11]. B Karthik, TVUK Kumar, Noise Removal Using Mixtures of Projected Gaussian Scale Mixtures, World Applied Sciences Journal, 29(8), pp 1039-1045, 2014.
- [12]. Vijayan T ,Cooperative Communication over Rayleigh Fading Channel,International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering , ISSN: 2278 – 8875 , pp 2702-2708,Vol. 2, Issue 6, June 2013.
- [13]. E.Kanniga, Dr.M.Sundararajan , Design and Architecture of Bio Signal Amplifier for Signal Extractor Neuro feedback Interface Machine ,International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering ,ISSN: 2278 – 8875 , pp 792-780 ,Vol. 2, Issue 3, March 2013



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(An ISO 3297: 2007 Certified Organization)

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- [14]. S. RAJESWARII, S.JASMINE2, Industrial Manifold Control Systems Using High Speed Networks, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, ISSN: 2249-2615, pp 17-23, Volume2 issue-4 No1 July 2012
- [15]. G.TAMIZHARASI & S.KATHIRESAN, Four Stroke Diesel Engine's Surface Ignition using Ethanol, International Journal of Computer Trends and Technology(IJCTT) , ISSN (Print) : 2320 – 3765 , pp 3639-3646 ,Vol. 2, Issue 8, August 2013.
- [16]. Sridhar raja .D , Application of BCI in Mind controlled robotic movements in intelligent rehabilitation ,International Journal of Computer Trends and Technology (IJCTT), ISSN: 2278 – 8875 , pp 1231-1238,Vol. 2, Issue 4, April 2013.