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Time Study of Production Process of Solid Shaft for Megha Engineering Works

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Abstract*: The process to improve the time taken to carry out various processes in Megha Engineering Company is carried out at the New V V Nagar. Time study process is one of the techniques of work measurement, which is concerned with investigating, reducing and subsequently eliminating ineffective time. With help of time study process by measuring basic time of product manufacturing process and proper analysing collected information, we were able to achieve the substantial improvement in the time taken for production and dispatch of the shop floor products in day to day activity. We have suggested possible improvements based on time study carried out at Megha Engineering Works. Finally, the suggestion to improve the time taken to carry out the production has been reduced by applying time study analysis.
Keywords*: Time study, Process Layout, Product Layout, Facility,

I. INTRODUCTION

The term work consider grasps a few technics, but in specific strategy think about and work measurement. Strategy think about is the efficient recording and basic examination of way of doing thing in arrange to make improvement. Work estimation is the application of strategies plan to set up the time for qualified labourer to carry out an errand at a characterized rate of working.

Method study is concerned with the decrease of the work substance of a work or operation, while work estimation is for the most part concerned with the examination and of any incapable time related with it. Method think about is the foremost method for lessening the work included, fundamentally by disposing of superfluous development on the portion of fabric or agents and by substituting great strategy for destitute once. Work estimation is concerned with examining, lessening and hence dispensing with ineffectual time, that is time amid which no compelling work is being performed, whatever the cause. We intend to reduce the time of production of the jobs and improve the layout.

II. METHODOLOGY

The strategy of work measurement 1 work sampling 2 structure estimating 3 time study 4 foreordained time standard 5 standard data. Work Study is the efficient examination of the strategy of carry on enacts so us to move forward the successful utilize of assets and to set up standard of execution for the exercises being carried out. Stop watch: There are two fundamental sort of observe is common utilize for time consider- mechanical and electronic. Electronic 1. Stand-alone halt watch. 2. Electronic consider board. Mechanical sort observe may be gotten with any one of three graduated scales. Recording one miniature per insurgency by interim of one-fifth of a moment with a, little hand recording 30 minute. Recording one miniature per transformation calibrated in 1/100th of a diminutive, with a little hand recording 30 diminutive (the decimal-minute watch). Recording 1/100th of an hour per transformation calibrated in 1/10000th of an hour, little hand records up to one hour in 100 division.

Study board is the examination load up is essentially a level load up, more often than not of plywood or appropriate plastic sheet, required for setting the time consider shapes. It ought to be unbending and bigger than the biggest frame liable to be utilized. It might have a fitting to hold the watch, so the hand of the work ponder individual are left moderately free and the watch is in a situation to be perused effectively. For right gave individuals the watch is typically put at the highest point of the board on the correct hand side, so the board might be refreshed on the left lower arm with the base edge against the body and for figure or centre figure to one side hand use to press the winding handle while resetting the watch.

Time study form is taking a period ponder required the chronicle of considerable measure of the information this information is in a standard frame comprising of a component Codes or portrayal, rating a component span. Despite the fact that the information could be recorded on plain paper it is more advantageous to utilize pre-printed shape which guarantee that each examination is of a similar comprise arrange, that every single pertinent datum recorded and the filling and recovery of the finished investigation is more solid.

Breaking the job into element is an element to distinct part of a specified job selected for convenience of observation, measurement and analysis. Work cycle is the sequence of the elements which are required to perform a job or yield a unit of production. The

sequence may be some time include occasional elements. Types of elements viz. a. Repetitive elements are repetition which occur in every work cycle of an operation. b. Occasional elements are elements which does not occur in ever work cycle of an operation but which may occur at regular or irregular interval. c. Variable elements are elements for which the basic varies in relation to some characteristics of the product, equipment of the process. d. Manual elements are elements performed by a worker. e. Machine elements are elements performed automatically by any process, physical chemical or otherwise that, once stared, cannot be influence bye a worker except to terminate it prematurely. f. Governing elements are elements that occupy a longer time with in a work cycle then that of any other element which is being performed concurrently. g. Foreign elements are elements to observe which does not form a part of the operation being studied. h. Constant elements are elements for which the basic time remain constant whenever it is performed.

Process layout or layout by function: This is typical of the job-shop type of production where the equipment performing similar operation is grouped together to form a work area, milling machines could be grouped together, drilling machines could be grouped together, etc. Such layout is particularly useful here the volume of manufacturing is low and the variety of job is great.

Here, the layout should provide tremendous flexibility in the sequence of operation because, the sequence of operation for one job is different from that of another job. For this reason, in all job-shop types of production, work areas are grouped together as shown in fig:1 in Megha Engineering Works Pvt. Ltd.

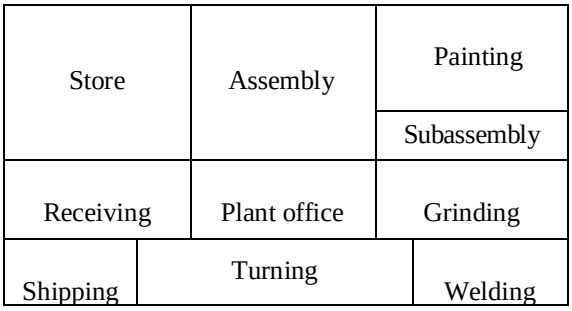


Fig.1 Layout of Machine Shop

The company has following types of products: Shafts (solid & hollow), Sleeves Bearing housing, Metal coupling (forged, shaft, gear), Metal flange, Flue adapter, Brake drum, Split covers, Fabrication work (sheet metal work). The company has following types of machines to accomplish the work: Lathe, Slotter, Radial drilling, Boring, Milling, Grinder, and Vertical Turret Lathe. Steps involved in production of a product are taking raw material from yard to the machine 1, machining – turning one, traveling from machine one to two, machining – turning two, traveling from machine two to marking dept, marking for key way, movement – marking dept to machine three, machining – the key way, movement – machine three to machine four, machining – key way two, movement – machine four to machine five, machining – grinding process, movement – machine five to inspection department, movement – inspection department to storage of finish product.

Time study has been carried out to find the bottle neck and eliminate it to increase the efficiency of the production line. Following readings were obtained during time study for consecutive three days.

III.RESULT TABLE

Sr No	Process	Reading 1 (HH.MM.SS)	Reading 2 (HH.MM.SS)
1	Raw Material Yard to M-1	00.01.33	00.01.55
2	Machining 1	00.17.25	00.18.56
3	Movement – M 1 to M 2	00.03.12	00.02.42
4	Machining 2	00.22.14	00.21.33
5	Movement M2 to Marking	00.01.33	00.01.02
6	Marking	00.08.28	00.07.58
7	Movement Marking to M 3	00.00.58	00.01.23
8	Slotting first key way	00.38.20	00.36.15
9	Movement from M3 to M4	00.01.33	00.01.04

Sr No	Process	Reading 1 (HH.MM.SS)	Reading 2 (HH.MM.SS)
10	Slotting Second Key way	00.26.14	00.24.16
11	Movement from M4 to M5	00.00.57	00.01.16
12	Finishing	00.29.46	00.31.39
13	Movement from M5 to Inspection	00.00.27	00.00.42
14	Inspection	00.06.04	00.07.19
15	Movement from Inspection to Storage	00.01.32	00.01.54

Fig.2 Time study of production process on Day-1

Sr No	Process	Reading 1 (HH.MM.SS)	Reading 2 (HH.MM.SS)
1	Raw Material Yard to M-1	00.01.43	00.01.47
2	Machining 1	00.17.27	00.18.26
3	Movement – M 1 to M 2	00.03.14	00.02.59
4	Machining 2	00.22.37	00.21.01
5	Movement M2 to Marking	00.01.04	00.01.49
6	Marking	00.08.10	00.07.01
7	Movement Marking to M 3	00.00.28	00.01.47
8	Slotting first key way	00.36.14	00.39.22
9	Movement from M3 to M4	00.01.04	00.01.47
10	Slotting Second Key way	00.26.44	00.22.07
11	Movement From M4 to M5	00.00.47	00.01.50
12	Finishing	00.27.14	00.28.48
13	Movement from M5 to Inspection	00.00.25	00.00.37
14	Inspection	00.07.19	00.08.15
15	Movement from Inspection to Storage	00.01.53	00.02.14

Fig.3 Time study of production process on Day-2

Sr No	Process	Reading 1 (HH.MM.SS)	Reading 2 (HH.MM.SS)
1	Raw Material Yard to M-1	00.03.01	00.02.15
2	Machining 1	00.17.59	00.19.17
3	Movement – M 1 to M 2	00.03.47	00.02.14
4	Machining 2	00.23.44	00.22.16
5	Movement M2 to Marking	00.02.11	00.01.59
6	Marking	00.07.49	00.08.34
7	Movement Marking to M 3	00.00.49	00.01.23
8	Slotting first key way	00.39.21	00.36.36
9	Movement from M3 to M4	00.01.35	00.01.03
10	Slotting Second Key way	00.25.14	00.29.24
11	Movement from M4 to M5	00.00.58	00.01.21
12	Finishing	00.28.14	00.30.50
13	Movement from M5 to Inspection	00.00.45	00.00.32
14	Inspection	00.07.18	00.07.49
15	Movement from Inspection to Storage	00.01.13	00.02.19

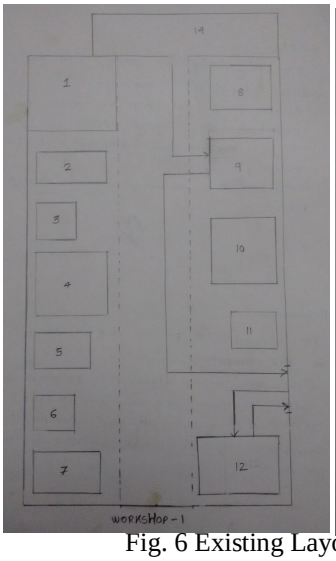
Fig.4 Time study of production process on Day-3

Time study has provided the following results:

Product Cycle Time			
Cycle time /box	Day - 1	Day - 2	Day - 3
Reading 1	02 hr 40 min 16 sec	02 hr 36 min 23 sec	02 hr 43 min 58 sec
Reading 2	02 hr 39 min 54 sec	02 hr 39 min 50 sec	02 hr 47 min 52 sec

Fig:5 Time study of production process

Based on the available data we get average cycle time to produce one product: 2hr 40mins 42sec
We have worked on the layout of the plant to optimize the time taken for the production as follows:



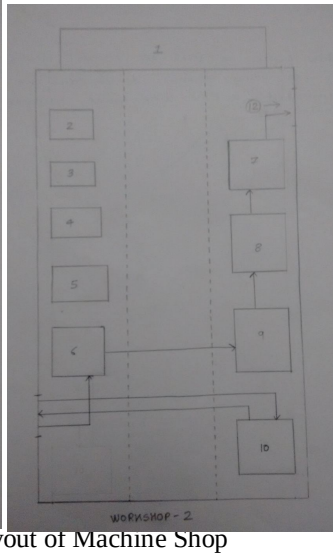
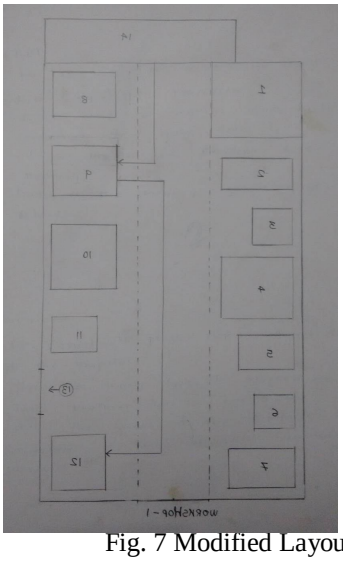


Fig. 6 Existing Layout of Machine Shop



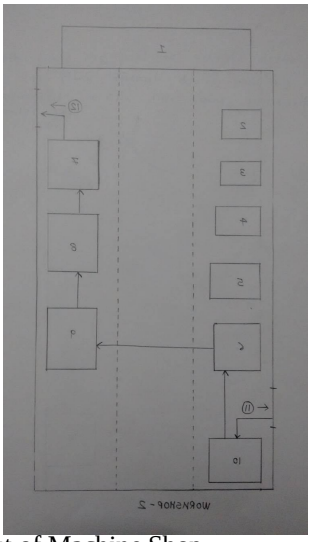


Fig. 7 Modified Layout of Machine Shop

Workshop-I

A. Admin Office
B. Lathe Machine
C. Slotter Machine
D. Vertical Turret Lathe Machine
E. Radial Drilling Machine
F. Vertical Milling Centre Machine (VMC)
G. CNC Turning
H. Lathe Machine
I. Boring Machine
J. Marking Machine
K. Door to W2
L. Raw Material Yard

Workshop-II

1. Office
2. Milling Machine
3. Milling Machine
4. Milling Machine
5. Radial Drilling
6. Lathe Machine
7. Slotter Machine
8. Inspection
9. Grinding Machine
10. VMC
11. CNC Turning
12. Door to Storage

After drawing existing and modified layouts we can suggest following changes that will improve the productivity of the shop flor. Here, we have seen each movement of worker from start of the day to end of the day.
We can reduce the material movement time by relocating machines. but there is also some other time which can be minimized by proper communication between workers. Now, here we apply 5S. Then we can see each and every necessary and unnecessary movement of workers. Men or worker is idle when machine is in working condition in some operations. So, we can reduce the setup and movement time by utilizing the idle time of man.
Here, machining time on machine a is less then machine c. So, the time when worker on machine b is idle, he can collect the job from machine a worker.so movement time can be minimized to zero, also worker need tools to setup job on machine, to make mark

on it. So, when worker is in idle position he can collect all the necessary items. So, the time wastes in finding right tool can be minimized.

Movement of material from operation 2 to 3 can be minimized by relocation of machinery, it can save time up to 1 minute.

Here, we can see that man on marking on job take 5 to 9 minutes.so there is an idle time for him is 20 min for each job. So, he can take the job to the place of next operation in order to save material movement time. The labour can save approximately 1 to 2 minutes.

Here we can see that second key way operation take less time than the first keyway.so there is some idle time he gets before each operation. During the time he can collect the job from earlier portion of the process.

Next operation is finishing operation. It is mainly depending upon the quality of material and the operations done on the job before.so if we do smooth turning in operation a and b. so we can reduce this finishing time up to 10 minutes.

For inspection, all the thing need for inspection a man can collect in his idle time. So, inspection time also reduces by 1 to 2 minutes.

After modification improvement by minimizing passage in layout is according to following table:

	Existing		Modified	
	Distance (m)	Time (Sec)	Distance (m)	Improved Time (Sec)
M 1 to M 2	22.5 m	3 min 45 sec	10 – 11 m	1min 45 sec
M 2 to marking	12.5 m	2min 11 sec	5 – 7 m	1min
Marking to M3	5.7 m	1 min 33 sec	2 – 4 m	40sec

Fig.8 Improvement Table

Improvement by implementation of layout change are as follows: a. Standard time for manual material handling for 22.5 meter i.e. 3 min 24 sec and modified time is 1 min 30 sec. Similarly, after changing all three distances time, reduction is nearly 10 minutes.

IV. CONCLUSION

After analysing the time study data that is recorded from the industry, we conclude that the layout change and time study is optimising time taken to produce the product by considerable improvement. These techniques are effective and efficient in any production area and manufacturing industries if executed in correct manner.

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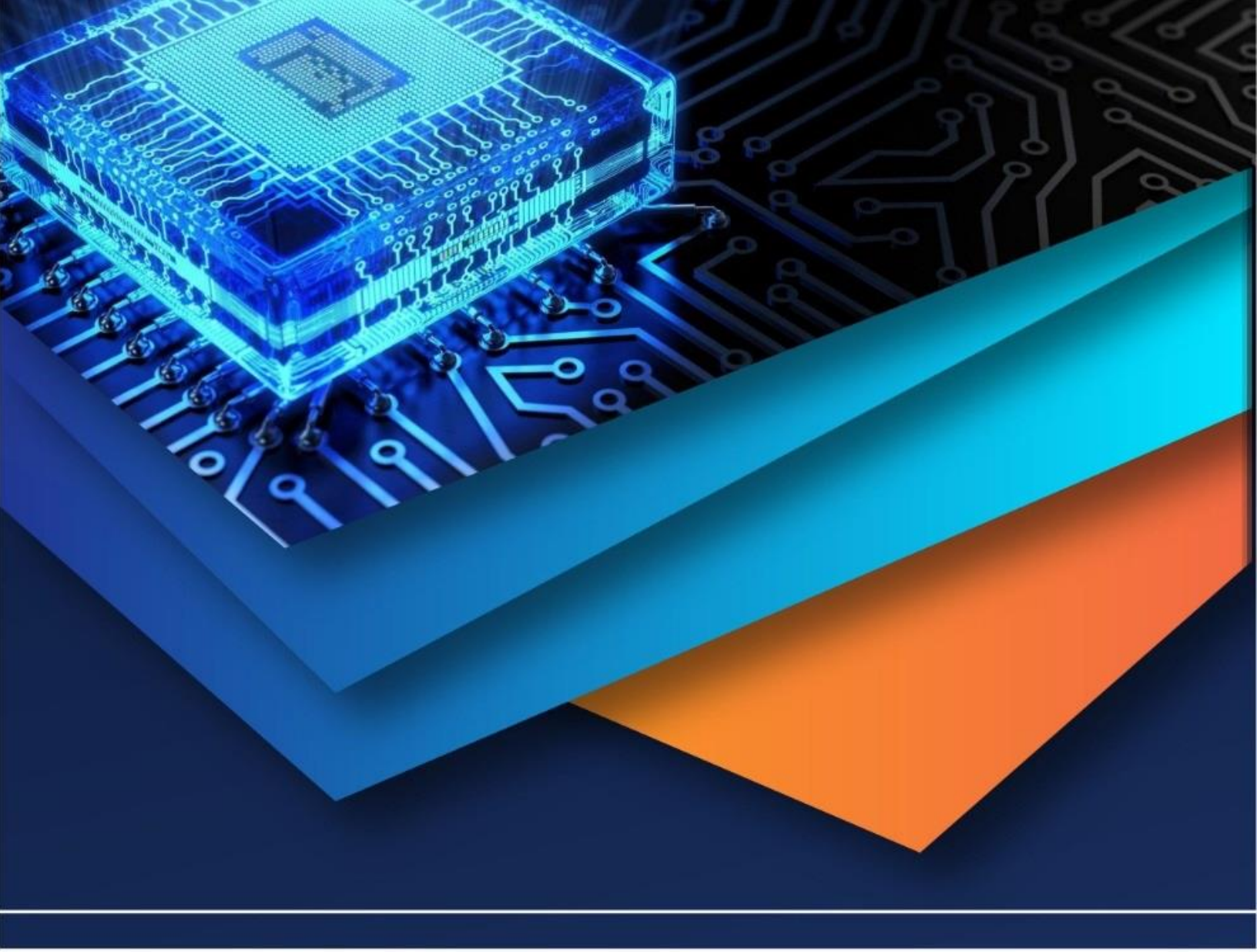

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