Productivity Improvement by Method Study

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Abstract

Productivity is directly linked with the performance of the organization. Higher productivity will increase the performance of the firm as well as profit. Productivity can be improved by many tools, one of the tool is method study. Method study is the procedure for systematic recording, analyzing and critical examination. In this manuscript flange has been selected for method study as the component having maximum back tracking and hence maximum chances for improvement. In these study different tools like, plant layout, flow diagram, flow process chart and man machine chart has been used to obtain better method and enhance productivity.

Key Words - Method study, plant layout, Man machine chart, flow process chart

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INTRODUCTION

Increasing the productivity has been the main objective of every firm since globalization. 'Nijanand Engineering', Makarpura GIDC, Vadodara, are manufacturing different engineering components. The firm has been selected to carry out method study. This firm mainly produces flanges that are used in making injection moulding machines. After making plant layout details and finding the operation sequence for different jobs, it has been found that flange had the best chances of improvement. Hence, method study applied to improve the productivity of the firm.

Why the Flange is selected?

Flange is one of the most widely produced product of the firm. The manufacturing of Flange involves more than one machine. As different operations carried out on different machines, so the chances of back tracking are more as compared to other products hence flange is selected for applying method study.

Technique used for method study:

Different techniques like, FPC (Flow Process Chart) used to calculate distance travelled by the material, MMC (Man Machine Chart) used to calculate % utilization of man and machine. Existing layout has been prepared to calculate total time and distance travelled by material. New suggested Layout has been prepared to calculate total time and distance.

CREO 3-D Model of Flange

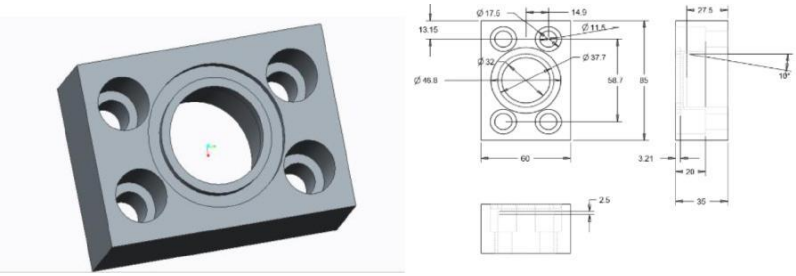

Figure 1 Flange and its Dimensions

Sequence of Operations to be performed on Flange:

1. Shaping	5. Grooving	9. Drilling
2. Centre Marking	6. Boring	10. Surface Grinding
3. Facing	7. Threading	11. Oiling
4. Boring	8. Marking	12. Packing

Types of plant layout:

Following are different types of plant layout:

1. Product layout (Line Layout), 2. Process layout (Functional Layout), 3. Combined layout
4. Fixed position layout

Existing Plant Layout:

Here, the existing lay out is functional lay out.

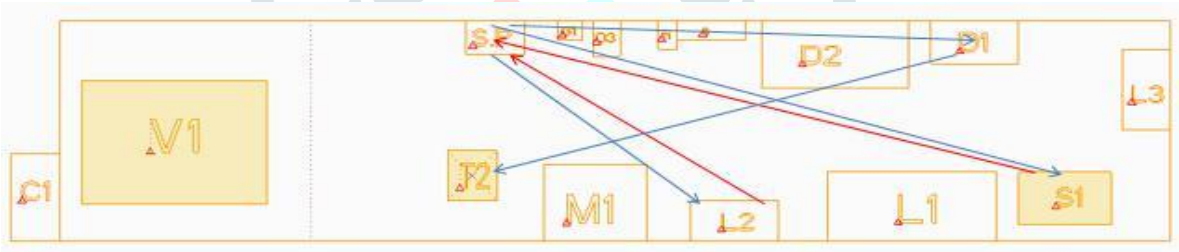

Figure 2 Existing plant layout

1. SP: Surface plate, 2. S1: Shaping Machine, 3. L2: Lathe Machine, 4. D1: Drilling machine, 5. T2: Table

Travelling of Flange in Existing Layout:

SP to S1: 11.8 m, SP to L2: 6.3 m, SP to D1: 9.7 m, D1 to T2: 9.4 m **Total distance travelled= (11.8*2) + (6.3*2) + 9.7+9.4 =55.3m

Here the blue arrows show the travelling of flange in the positive direction where as the red arrows show the back tracking of flange. (The arrow shows the entry of material)

Table 1 Existing plant layout

Activity	Operations	Distance moved(m)	Time (min)	Remarks
1.Material arrival in store				
2.Moved to surface plate		3.02		
3.Wait(marking equipment setting)				
4.Marking			2	
I5.nspection			1	
6.Send to Shaper		11.8		
7.Shaping			60	
I8.nspection			4	
9.Send to surface plate		11.8		Delay
10.Marking			2	
11.Send to lathe		6.3		
12.Lathe Operation			40	
13.Inspection			3	
14.Send to surface plate		6.3		
15.Marking			5.1	
16.Inspection			1	
17.Send to Drilling		9.7		
18.Drilling			16	
19.Inspection			1	
20.Send for Oiling and Packaging		9.4	1.8	

- Total distance travelled= 58.32 m

Modified Plant Layout:

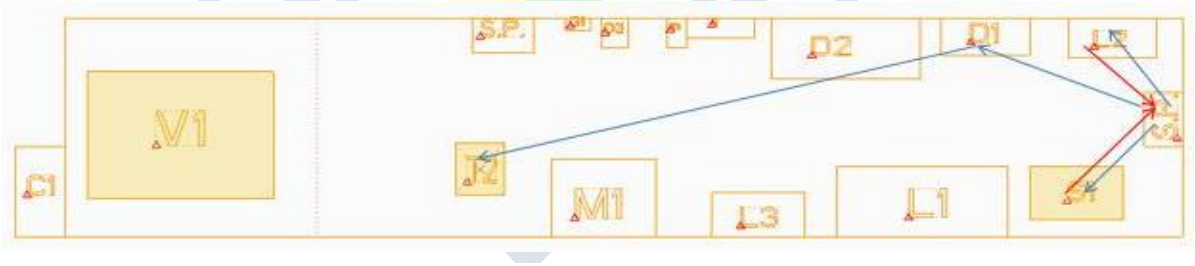

Figure 3 Modified Plant Layout

1. SP: Surface plate, 2. S1: Shaping Machine, 3. L2: Lathe Machine, 4. D1: Drilling machine, 5. T2: Table

SP to S1: 2.3 m, SP to L2: 2.1 m, SP to D1: 3.5 m, D1 to T2: 9.4 m **Final travel of flange in modified plant layout from new SP to T2 = 21.7m

Here the blue arrows show the travelling of flange in the positive direction whereas the red arrows show the back tracking of flange.

Table 2 Modified FPC

Activity	Operations	Distance moved(m)	Time (min)	Remarks
1.Material arrival in store				
2.Moved to surface plate		14.3		
3.Wait(marking equipment setting)				
4.Marking				
I5.nspection				
6.Send to Shaper		2.3		
7.Shaping				
I8.nspection				
9.Send to surface plate		2.3		Variable time
10.Marking				
11.Send to lathe		2.1		
12.Lathe Operation				
13.Inspection				
14.Send to surface plate		2.1		
15.Marking				
16.Inspection				
17.Send to Drilling		3.5		
18.Drilling				
19.Inspection				
20.Send for Oiling and Packaging		9.4		

- Total distance travelled from entry gate to T2= 36 m

Machines in Plant for which MMC is made:

After investigating the design and operation sequence of the flange, the MMC were made for the following machines:

1.Shaper Machine, 2. Lathe Machine, 3. Drilling Machine, 4. Grinding Machine

Table 1 shows the summary of all man machine chart and Table 2 shows the man machine chart for shaping machine and same way we have prepared the man machine chart for other machines.

Table 3 Man Machine Charts Summary

Sr.no.	Machine	Man Utilization(%)	Machine Utilization(%)
1	Shaping Machine	23.07	81.62
2	Lathe	90.7	63.78
3	Drilling Machine	86.21	64.13

Table 4 Man Machine Chart for Shaping Machine

Shaping operation Man Machine Chart					
Sr No.	Operator	Time Taken(min)		Machine	Time Taken(min)
1	Set Up Shaper	6		idle	
2	Pick up And Placing the block (largest area side)	2			
3	Shaping side one	6.27		Shaping	6.27
4	setting machine	0.96		idle	
5	Shaping side one	5		Shaping	5
6	setting machine	1.2		idle	
7	Shaping side one	5.2		Shaping	5.2
8	all operations for opposite side of side 1	18.417			18.417
9	setting side two	1.93		idle	
10	shaping	5.816		Shaping	5.816
11	setting	0.983		idle	
12	shaping	4		Shaping	4
13	setting	1.25		idle	
14	shaping	5.95		Shaping	5.95
15	setting	2		idle	
16	all operations for opposite side of side 2	17.283		Shaping	17.283
17	setting for side three	2.2		idle	
18	shaping	4		Shaping	4
19	setting	1.45		idle	
20	shaping	6.716		Shaping	6.716
21	setting	1.55		idle	
22	shaping	4.316		Shaping	4.316
23	all operations for side opposite of side 3	16			16
24	unloading	0.75		idle	
	Total time	121.241			98.968
	Percentage Man Utilization=23.07%				
	Percentage Machine Utilization=81.62%				

Since from man machine charts (MMC) it was founded that the shaper machine has the least man utilization also it takes too long on shaper to machine the given side and hence it was suggested that smaller side of the block to be machined can be placed in series so as to reduce the timing for changing the blocks it was being implemented as shown in figure below.

Earlier, shaping was done for a single job on the least area side, but now placing two blocks in parallel in the fixture, machining can be performed and the time required taking out and placing job in the fixture is reduced to half. Hence the time to replace new job was reduced.

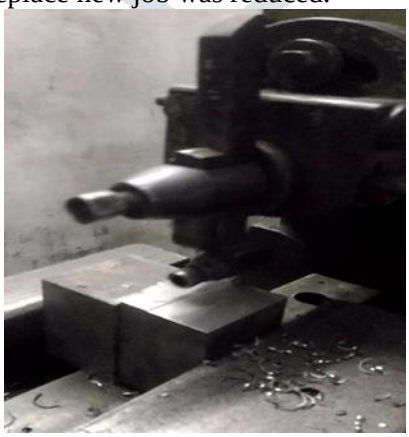

Figure 4Blocks placed in parallel

CONCLUSIONS

Initial travel of flange in the plant layout = 55.3m
Final travel of flange in modified plant layout = 21.7m
The difference in travel of one flange = 33.6m

If we assume that total 50 flanges were made during a day then the total travel is reduced by (55.3 – 21.7) * (50) = 1680m

Hence if we calculate the increase in production then the numbers of flanges which can be made more in one day are equal to 1680/ 21.7 = 77.41

Now even if we consider the other factors and we assume that only 0.3 of the calculated flanges were produced due to various reasons then also the number of flanges which can be produced extra = 0.3 * 77.41 = 23.

Hence the number of flanges produced in a day before = 50
Number of flanges produced after implementing method study = 50 + 23 = 73.
Hence increase in productivity = (73 - 50) / 50 = 0.46

Hence the productivity can be increased almost by 46% after applying the modified layout.

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