IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)
e-ISSN: 2278-1684, p-ISSN: 2320-334X
PP 01-08
www.iosrjournals.org

Productivity improvement in shoe making industry By using method study

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Abstract : *Productivity improvement is very important factor for a firm to survive and to achieve breakthroughs. The work carried out deals with enhancing productivity in shoe making industry. Being a tough competitor and to be distinct from competitors the firm has to increase productivity to meets its customer requirements. The production process does not have efficient work procedure and workers are affected by unwanted fatigue, so the industry not able to improve productivity. Thus, the purpose of this work is to propose improvement areas in the industry to improve its productivity by analyzing the problems associated with it. Identified problems were solved by using method study principles. Improvement was achieved by reducing the cycle time, combining the workstations and reducing the worker's fatigue.*
Keywords *- Flow process chart, method study, plant layout, productivity and shoe making.*

I. INTRODUCTION

1.1. Background of the study

The work presented here is done in a large scale industry which engaged in making of shoes. The company produces of variety of shoes according to the customer requirement of the customers. As the customer‘s demand is high, the firm has to increase productivity. This work takes initiative to implement method study techniques to improve the work process in order to meet the customer demand. The study examined the problems associated in the shoe production in the perspective of work study which can reduce the production time, operation time and eliminate non productive process.

1.2. Scope of the study

- The work is focused on work procedure involved in the every operation.
- The work also focused on improving productivity by reducing worker's fatigue.

The data required to be collected in this study are plant layout, process flow chart, details for each process and number of shoes produced in the specific period.

II. LITERATURE REVIEW

According to Mayank Dev Singh etal, they working on "To improve productivity by using work study & design a fixture in small scale industry". The purpose of this research is to improve production capabilities for small scale industry and this research focused on the company, which produce Stay vane of Francis turbine. This research used work study technique to improve work process in company, and the research objectives towards accomplished this study is to identify problems in the production work process and improved it in terms of production time, number of process and production rate by proposing an efficient work process to company. This research used systematic observation, flow process and stopwatch time study as research methodology. Pro-E model software used for model testing and develop new model.

They concluded that the improvement of work process was executed by eliminating and combining of work process, which reduces production time, number of process and space utilization.

According to Khalid S. Al-Saleh working on "Productivity improvement of a motor vehicle inspection station using motion and time study technique" This research was carried out at the Motor Vehicle Periodic Inspection (MVPI) station to improve and enhance the bottleneck inspection point by using different applications to reduce the inspection time. The main problem of this research was an inspection point (No. 1) which consumed more time in comparison with the other inspection points. Accordingly, this inspection point increases the flow time in the inspection lanes. This research investigated and searched for possible solutions and alternatives aimed at achieving the objective using some tools from motion and time study and ARENA software to simulate and predict the changes expected to occur in the inspection lanes. They concluded that the overall, the suggested alternatives yielded an expected improvement of 174.8% in the production capacity.

2.1. Productivity

The work presented here is done in a large scale industry which engaged in making of shoes. The company produces of variety of shoes according to the customer requirement of the customers. As the customer‘s demand is high, the firm has to increase productivity. This work takes initiative to implement method study techniques to improve the work process in order to meet the customer demand. The study examined the problems associated in the shoe production in the perspective of work study which can reduce the production time, operation time and eliminate non productive process.

2.2. Method study

Method study is essentially concerned with finding better ways of doing things. It adds value and increases the efficiency by eliminating unnecessary operations, avoidable delays and other forms of waste.

III. PROBLEM STATEMENTS

- The industry does not have an efficient work procedure for certain process.
- The design of workplace is poor in such a way that the workers are affected by unwanted fatigue.
- Improper utilization of material and machine.

IV. DATA COLLECTED AND IMPROVEMENTS SUGGESTED

4.1. Plant layout

It is the product based layout which consist of two lines namely line1 and line 2. Both the lines consists of conveyor for transferring job from one workstation to the other. Four major raw materials are required for shoe making namely upper, last, insole and sole. All materials enter at different workstation. Upper enter at workstation1, Last enter at workstation3, Insole enters at workstation6 (all in the Line1) and Sole enters at workstation4 (in the Line2).

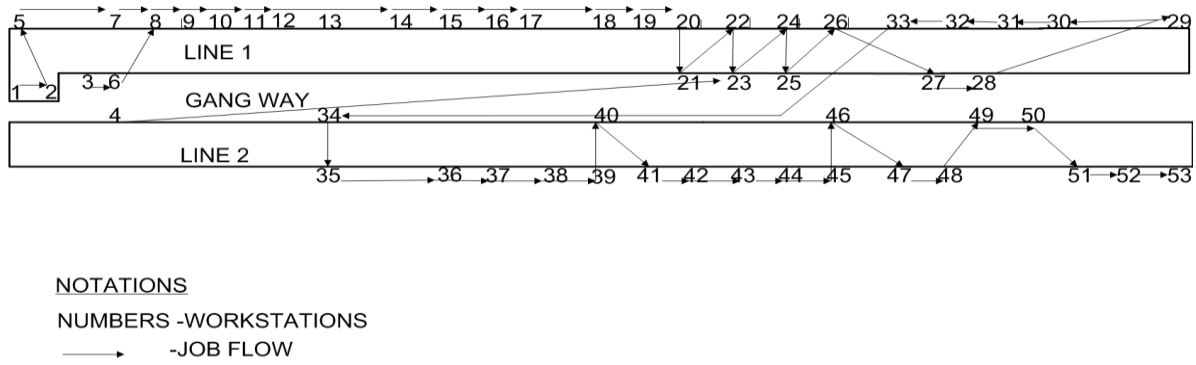

Fig 1 plant layout

Only one workstation (4^{th}) is not arranged according to the sequence. At the fourth workstation sole enters with a lot size of 150 pairs, after processing the job with the size 5 pairs is manually transported to 23^{rd} workstation. So 30 transportations are required for a lot in order to avoid the transportation without using any algorithm we suggested to place the 4^{th} station in front of 19^{th} workstation.

4.2. Reducing elemental time of toe lasting process

There are 53 process involved in shoe making, but this is very crucial operation. This is only process where method study principles can be employed to reduce the elemental time. It is process which provides base for toe shape in the upper. Man machine chart was drawn and idea has been proposed to reduce the elemental time.

While toe lasting, the operator is idle (the operator can do the first operation for the next job and job can be kept in one hand). In unloading operator presses the button after 10 seconds the job will be released from the machine, he catches the job and drop onto the conveyor. Hence 4.65Seconds saved for this operation.

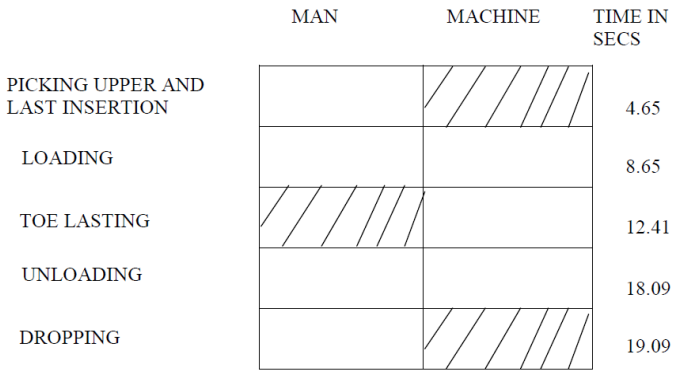

Fig 2 Man Machine chart

4.3. Reduced movements in top line forming & Sole pressing

Sole pressing is process in which Sole and Upper are attached by applying 5-10 bar by using Iron foxing machine. Once the bonding has been done, the top part of the job is subjected to pressure for straightening the job.

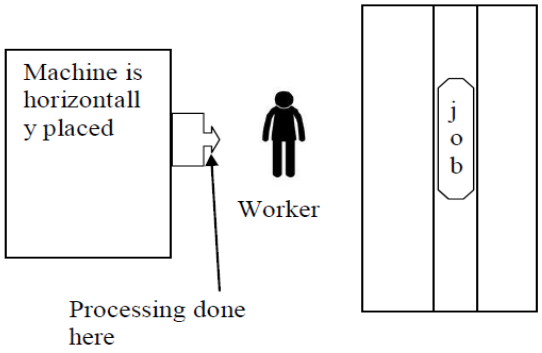

Fig 3 Movements in the existing system

The following movements are involved in the existing system:

1. Picking
2. Rotate 180 degree
3. Processing
4. Rotate 180 degree
5. Dropping

Worker is facing conveyor. Rotating is unwanted, it should be eliminated.

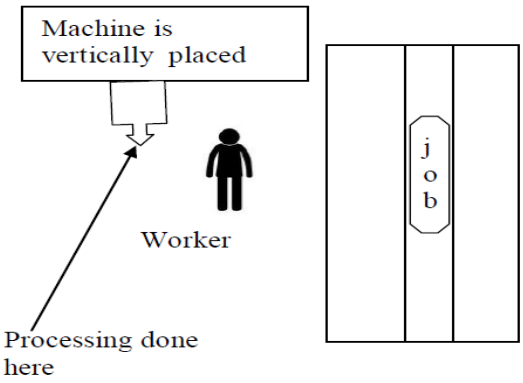

Fig 4 Movements in the proposed system

The following movements are involved in the proposed system:

1. Picking
2. Processing
3. Dropping

Worker is facing machine. The worker can perform operation by picking the job in one hand, after the job can be dropped. Worker is escaped from the unwanted fatigue.

4.4. Combining operations Cloth Brushing1 and Cloth Brushing2

Cloth brushing1 and Cloth brushing2 are done by separate machines. Two machines have the same rpm but the wire brush over the disc is made up of different clothes. Two operators were required to do both the operations, these workstations exist in both the lines.

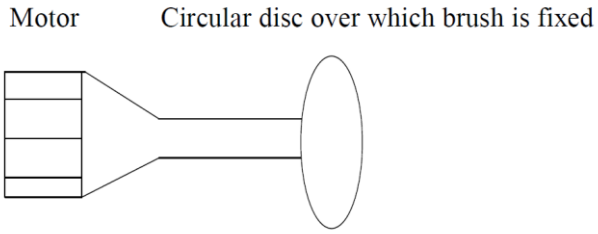

Fig 5Existing system

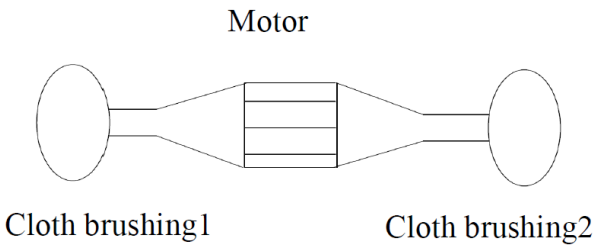

Fig 6 Proposed system

Cloth brushing1 and cloth brushing2 can be combined in this way. First time Cb1 & Cb2 is done in the first line1 and same done for the second time in the line2.Number of workstations reduced from 4 to 2.

4.5. Reduction of fatigue felt by the worker while transferring job from Line1 to Line2

Once the job passes through all the workstations in the Line1, it is shifted to the lower belt of the conveyor. After reaching its starting point in Line1, it is shifted to the Line2. Both the lines are same in size and shape.Movements involved in transferring job from Line1 to Line2

Work done by the worker in the Line1 are listed below

1. Picking from upper belt of conveyor in the Line1.
2. Bending.
3. Placing in the lower belt of conveyor in the Line1.

Work done by the worker in the Line 2 are listed below

1. Bending
2. Picking from lower belt of conveyor in the Line1.
3. Placing in the upper belt of conveyor in the Line2.

To prevent bending in both the Lines, the diameter of the conveyor can be reduced. The maximum job's height is 18cm. So the diameter can be reduced from 54cm to 25cm. So that the advantage is to reduce the fatigue felt by the worker.

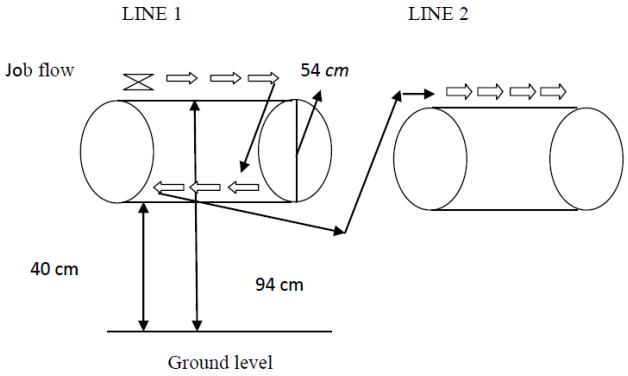

Fig 7 Transfer of job from Line1 to Line2

4.6. Flow process of raw material to finished shoe

The flow process consists of all the process but it does not have delay which will be explained in detail in the flow process chart.

Table 1 Process Flow Chart

S.NO	Process	○	□	D	⇨	▽
1	Charging	x				
2	Transportation				x	
3	Lacing	x				
4	Transportation				x	
5	Last cleaning & charging			x		
6	Transportation				x	
7	Sole cleaning	x				
8	Transportation				x	
9	Flanging	x				
10	Transportation				x	
11	Insole attachment	x				
12	Transportation				x	
13	Toe Mulling	x				

14	Transportation				x	
15	Toe Lasting	X				
16	Transportation				x	
17	Adhesive application	x				
18	Transportation				x	
19	Drying	x				
20	Transportation				x	
21	Side Lasting	x				
22	Transportation				x	
23	Steam chamber	x				
24	Transportation				x	
25	Seat and side lasting	x				
26	Transportation				x	
27	Pounding	x				
28	Transportation				x	
29	Cleaning	x				
30	Transportation				x	
31	Heat setter	x				
32	Transportation				x	
33	Hammering	x				
34	Transportation				x	
35	Ironing	x				
36	Transportation				x	
37	Cloth Brushing1	x				
38	Transportation				x	
39	Cloth Brushing2	x				
40	Transportation				x	
41	Stage inspection1		x			
42	Transportation					
43	Roughing1	x				
44	Transportation				x	
45	Sole marking	X				
46	Transportation				x	
47	Roughing2	x				
48	Transportation				x	
49	Sole cementing1	x				
50	Transportation				x	
51	Upper cementing1	x				
52	Transportation				x	
53	Sole cementing2	x				
54	Transportation				x	
55	Upper cementing2	x				
56	Transportation				x	
57	Heat activation	x				
58	Transportation				x	
59	Sole attaching	x				
60	Transportation				x	
61	Sole pressing	x				

62	Transportation				x	
63	Chiller	x				
64	Transportation				x	
65	Edge cleaning	X				
66	Transportation				x	
67	Lace cutting	x				
68	Transportation				x	
69	Delasting	x				
70	Transportation				x	
71	Sock's attaching	x				
72	Transportation				x	
73	Cream application	X				
74	Transportation				x	
75	Hot air blower	X				
76	Transportation				x	
77	Cleaning	x				
78	Transportation				x	
79	Stage inspection2		x			
80	Transportation				x	
81	Cloth brushing1	x				
82	Transportation				x	
83	Cloth brushing2	x				
84	Transportation				x	
85	Top line forming	x				
86	Transportation				x	
87	Lacing	x				
88	Transportation				x	
89	Paper stuffing	x				
90	Transportation				x	
91	Spraying	x				
92	Transportation				x	
93	Cloth brushing1	x				
94	Transportation				x	
95	Cloth brushing2	x				
96	Transportation				x	
97	Lining and cleaning	x				
98	Transportation				x	
99	Final Inspection		x			
100	Transportation				x	
101	Labelling & tag insertion	x				
102	Transportation				x	
103	Packing	x				
104	Transportation				x	
105	Storage					x

Table 2 Summary of Process Flow Chart

Process	**No. in the existing system**	**No. in the proposed system**
Operation	47	45
Inspection	4	4

Combined operation and inspection	1	1
Transportation	52	50
Storage	1	1
Total	105	101

Table 3 Profit Analysis

S.NO	Detail	Before Implementation	After Implementation
1	No. of job per month in pairs	22680	23220
2	No. of job per year in pairs	22680*12=272160	23220*12=278640
3	Profit per year in INR	272160*200=54432000	278640*200=55728000

Increase in profit per year in INR: 55728000-54432000=1296000
Here INR 200 is the profit per pair

V. conclusion

From the above discussion it can de concluded that the process can be improved based on method study, work procedure and proper utilization of machine and material. It will improve the current process by reducing the number of workstations, transportations, combining the operations and reducing the worker's fatigue. After implementing the suggested improvement ideas the firm is able to increase its productivity.

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