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"Simulation And Optimization Of The Assembly Line Of Small Scale Industry"

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Abstract*— This paper aims to improve the plant layout of factory to eliminate obstructions in material flow and thus obtain maximum productivity. The present plant layout and the operation process of each section have been investigated. The problem in term of material flow of each operation section was indentified. The suitable of new plant layout can decrease the distance of material flow, which rises production. . In my paper, a generalized model is developed for process optimization of small-scale industries for competitive production within the acceptable quality level of production. It is observed that most small-scale industries do not lend themselves to flexible production processes, therefore making it difficult for them to optimize production.

Keywords- small-scale industries, analysis, process optimization, simulation.

1. Introduction:

Small industrial units are industries with limited scale of manufacturing operations, producing a product or few products with limited levels of employment and investment and are many in number than large scale industries. In many developing countries, the roles of these industries are crucial as they provide employment to a large number of people. Breaking the size barrier (limited levels of employment and investment) is a measure of success of the small-scale industries. Small-scale industries are dependent for their equipment and process technology on a limited number of resources that start with:

(a) The entrepreneurs' own technical expertise probably gained during earlier stages of paid employment.

(b) Large firms that provide the technology as a component within a sub-contracting arrangement.

(c) Government institutions desirous to support a measure of indigenous Technology.

The demand for the products of small-scale industries is crucial to their growth. Therefore this work focuses on process re-engineering of a small-scale industry for economical and competitive production.

For this purpose modeling of complex systems such as manufacturing systems is an arduous task. Simulation has gained importance in the past few years and allows designers imagine new systems and enabling them to both quantify and observe behavior. Whether the system is a production line, an operating room or an emergency response system, simulation can be used to study and compare alternative designs or to troubleshoot existing systems. With simulation models, how an existing system might perform if altered could explored, or how a new system might behave before the prototype is even completed, thus saving on costs and lead times.

For these investigation and simulation I have chosen the metal sheet product manufacturing industry of the automobile. It produces parts like battery cover, assembly thresh guard, assembly grill cover. First the metal sheets are transported to the shear machine where these large sheets are cuts into required size for the further process as per the requirement of the product to be produced and then these parts are transferred to the press section which cutted it into the required dimensions using different press machines.

Then these parts are transferred to the welding section where different parts are welded as per the product requirement. Then next operation is grinding where these parts are corner and radius grinded using grinding machine.

The next operation is priming where these parts are primed and baked. And finally it is transmitted to the store room.

2. Objective:

- To find out an optimal production line process.
- To minimize the process time.
- To improve productivity using simulation.
- To maximize the utilization of machine and floor space area.

3. Literature Survey:

[1] A generalized model was developed for process optimization of small-scale industries for competitive production within the acceptable quality level of production. It was observed that most small-scale industries do not lend themselves to flexible production processes, therefore making it difficult for them to optimize production when there are fluctuations in prices of production inputs. [2] Simulation is a very helpful and valuable work tool in manufacturing. It can be used in industrial field allowing the system`s behavior to be learnt and tested. Simulation provides a low cost, secure and fast analysis tool. It also provides benefits, which can be reached with many different system configurations. Topics to be discussed include: Applications, Modeling, Validating, Software and benefits of simulation. This paper provides a comprehensive literature review on research efforts in simulation. [3] Based on a field investigation of 399 small‐scale industries in three Indian states, i.e. West Bengal, Haryana and Maharashtra, collected during April‐June 2000, the present paper analyses the pattern of awareness, acquisition and adoption of technological changes in small‐scale industries. It also examines possible constraints of non‐adoption of improved technologies. The pattern of use of various components of Information Technology (IT) by small entrepreneurs is also discussed. Following a broader definition of technological changes, the paper identifies major causes that are inhibiting the adoption of improved technologies and examines the role of existing policies and programmes in overcoming them; it also analyzes the present procedure for availability of finance to SSI units for upgrading and modernizing their technologies and suggest measures for facilitating such services to small‐scale entrepreneurs; further it evaluates the requirements of improvements in skills, education and training both of entrepreneurs and workers among the SSI units to absorb and implement technologies in their diverse manifestations. Rural urban contrasts are brought out markedly while discussing these issues.

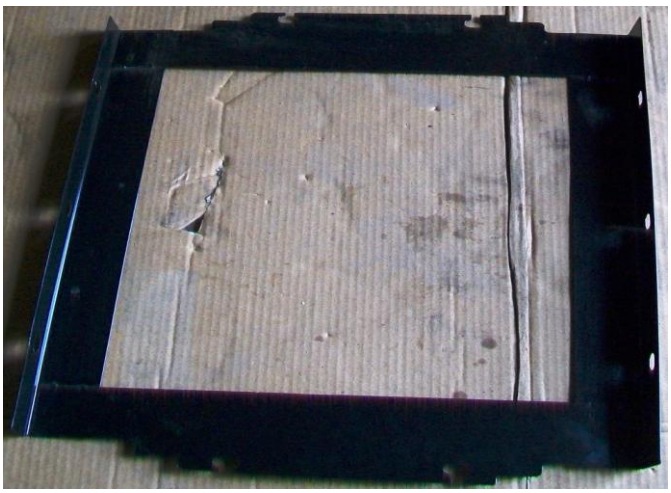
For the critical analysis of existing system method study is best tool. In which various charts such as Man/Material charts, Man and Machine charts are prepared which are available in standard format in Introduction to Work Study by International Labour Office, Geneva. The success of the whole procedure depends on the accuracy with which facts are recorded, because they will provide the basis of both the critical examination and the development of the improved method.

4. Problem Identification

It is observed that most small-scale industries do not lend themselves to flexible production processes as well as due to inefficient utilization of floor space the sequencing of machines are not in proper order and these results in greater process time.

5. Experimentation

The first step to minimize this problem is the critical analysis of the system. For the critical analysis Method Study is the best tool. In the method study various charts such as man charts and man and machine charts are prepared for all the workstatios.



FLOW PROCESS CHART — MAN/MATERIAL/EQUIPMENT — TYPE

CHART NO | SHEET NO | OF

SUBJECT CHARTED: D. C. STRIP

ACTIVITY: Blanking

METHOD: PRESENT/PROPOSED

LOCATION: Workstation 2

OPERATIVES: | CLOCK NO

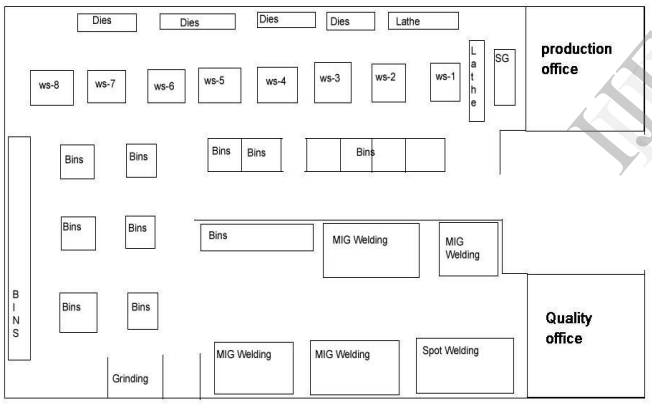
CHARTED BY: | DATE:

APPROVED BY: | DATE:

SUMMARY	PRESENT	PROPOSED	SAVING
OPERATION O	3		
TRANSPORT ⇨	5		
DELAY D	1		
INSPECTION □			
STORAGE △			
OPERATION CUM TRANSPORTATION ⇦⇨			
DISTANCE(m):			
TIME(man/hr):			
COST LABOUR MATERIAL			
TOTAL			

DESCRIPTION	QTY	DIST(m)	TIME (min)	O	⇨	D	□	Δ	⇦⇨	REMARK
Worker transport the material to the workstation by trolley	500	5	0.30							
Delay to place the material	-	-	0.10							
Material placed in bin	500	0.02	0.10							
Worker at the machine pick the raw material and carries on work table	100	0.03	0.05							
Pick the material and placed on the machine	1	0.01	0.02							
Adjust the material on the die of the machine	1	-	0.01							
Holding the material and pressing the paddle of the machine (blanking)	1	-	0.05							
Remove the finished material from the die	1	-	0.01							
Place the finished material in the bin	1	0.02	0.02							
TOTAL	500	5.08	1.06	3	5	1				

DESCRIPTION	QTY	DIST(m)	TIME (min)	O	⇨	D	□	Δ	⇦⇨	REMARK
1. pick up the first part	1	150	1							
2. place it on fixture			5							
3. pick up the other part		50	1							
4. place it on fixture			5							
5. adjust these parts on fixture			4							
6. grasp the welding gun			1							
7. starts the welding			6							
8. place weld gun into holder			2							
9. remove thrash guard from fixture			5							
10. stand this part on fixture			9							
11. weld on the inside part			2							
12. place the gun into holder			5							
13. turn the part			5							
14. grasp the gun and weld the other inside part			5							
15. pick this welded part and placed near to the workplace		150								
			52	0	5			3		



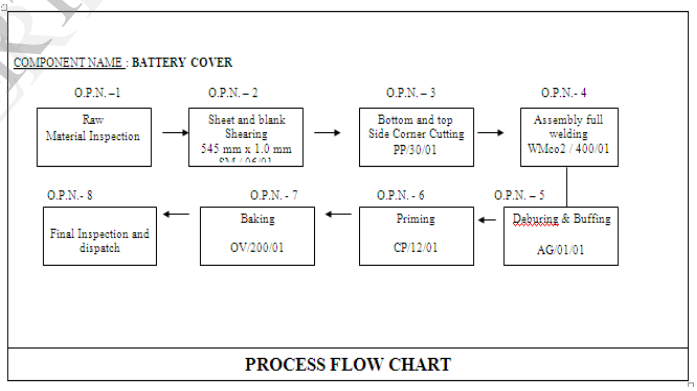


Figure 1: PRESENT PLANT LAYOUT

6. Conclusion

For the problem identification the method study conclude insufficient utilization of floor space the sequencing of machine are analyzed using critical analysis method and from the man chart, decrease process time using proper sequencing of machine.

7. References

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