



## To Improve the Productivity of Printing and Packaging Industry

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**Abstract** — Increase in the Productivity is the important factor for the organization to achieve the maximum output in required time. In today's world different types of plastic bags are used like carrying, security and for storage purpose. In production unit there are some unwanted processes which are taking extra time & effort. The production line of a company is taken as a case study and effort is made to reduce the lead time and material handling time. Main aim of this project is to increase the productivity of the printing and packaging Industry using different techniques and methods. Different types of techniques used for increasing the productivity are SLP (Systematic Layout Planning), Proper Handling of material, Lead Time Reduction and different types of methods used are Operation Process Chart, Flow Process Chart, and String diagram.

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**Keywords-** SLP (Systematic Layout Planning), Material Handling, Lead Time Reduction, Flow process chart, Operation Process Chart.

### I. INTRODUCTION

Now a day as a world slowly becoming digital online shopping increases demand for the different types of bags like courier bags, (standard tempered evidence bags) steb, carry bags, security bags, bubble bags increases. Because of the increase in demand company or industry expands our self. After expanding they facing problem in material handling, storage problems, material travelling distance and incorrect department location. In this competitive world demand increases continuously while resources for fulfilling demand are limited. Therefore, it is important for industries to manufacture good quality of products so that they can compete with others.

There are few methods and charts used for solving problems concerning productivity. Methods like systematic layout planning in which a new plant layout are prepared based on the existing plant layout and then compared. Another method is lead time reduction which is linked to the layout change. As layout changes material travelling time decreases and material flow increases. Charts used are operation process chart (OPC) for knowing sequence of different operation process. Flow process chart for knowing the material flow path, activity relationship chart which shows relationship between different activities.

### II. LITERATURE REVIEW

Abdul Talib Bon and Daiyanni Daim (2010) have carried out the “Time Motion Study in Determination of Time Standard in Manpower Process” with the considerations for Time and Motion Study for industry. By using time and motion study productivity is increased and cost can be reduced. This study includes time study with the help of stop watch, proper observations, and discussion. At the last results are analyzed and improve which in turn increases the productivity. [1]

Ajit Kumar Senapati et al (2012) has examined the “Lead Time Reduction in Inventory Control”. Time and cost are very important factor for any organization for achieving maximum profit in business. One major disadvantage was noted while studying literature on lead time reduction in inventory models is that the majority of the authors assumed that lead time is independent of lot size quality and a piecewise function is well suited to describe the relationship between lead time reduction and crushing costs. [2]

Abdul Talib Bon<sup>1</sup> and Aliza Ariffin (2013) have studied the “impact of time motion on small medium enterprise organization” with Time and Motion technique to improve work process at SME. Under this study problem are identified in the production work process and improved in terms of plant layout, production time, and numbers of process. With this study it is concluded that by the combination of production, layout, time measurement and work processes current production processes can be improved. [3]

“Improvement in Plant Layout Using Material Handling Technique” has been proposed by Amrita Kirtane and Nagendra Sohani (2014). The proposal was with the considerations for material handling cost for medium job type small

scale industry. Travel Chart method is used to minimize man work, cost and wastage of time to improve profits for the similar work from the same resources. Two layouts have been improved by considering the material movement. As a result, the material movement and handling time reduce which increases the productivity. [4]

Vinod arya, Prof, Sanjeev singh Chauhan (2014) in their article "Increased productivity and planning by improved plant layout using systematic layout planning at NCRM division" Bhushan Steels Ltd. Khopoli, Mumbai. The objective of this research is to study layout of NCRM. They conclude that by using SLP method a new plant layout was developed which significantly decreases the distance of material flow. [5]

Dinesh B. Shinde, Prashant N. Shende (2014) in their article "Improvement of plant layout by using 5S technique An industrial case study". The objective of this work is to improve the productivity. They concluded that use of 5s technique lead to the subsequent movement in the organization. The 5s improved environmental performance, reduction of physical effort, improved safety, reduce waste, reduction in accidents, improvement in quality, maintenance, shorter lead time.[6]

Md. Riyad Hossain et al (2014)in there artical "Increasing Productivity through Facility Layout Improvement using Systematic Layout Planning Pattern Theory ". The objective of this research is to study the production process layout and to develop new layout based on the systematic layout planning pattern theory to reduce production cost and increase productivity. New plant layout shows that there is a decrease in overall cost and distance travelled by the material from store to dispatch area. [7]

Parthiban and Raju (2014) have carried out the "Productivity improvement in shoe making industry by using method study". To be tough and distinct competitor the firm has to improve productivity to meets its customer needs. By using method study current process can be improve by reducing number of operations, workers fatigue, transportation time, number of workstations. [8]

Subodh B Patil and S.S. Kuber (2014) have carried out the "Productivity Improvement In Plant By Using Systematic Layout Planning (Slp) - A Case Study Of Medium Scale Industry ". Layout design is an important task when a manufacturing system is constructed, or expanded. The existing plant layout is improved using systematic layout planning theory SLP for better plant area utilization. Installation of new machines helps to improve the productivity and space utilization. By using SLP method material handling time, labor cost, transportation cost and are minimized. [9]

Mayank Dev Singh et al (2015) in their article "Overall Productivity Improvement in Casting Industry by Using Various Industrial Engineering Techniques". The objective is to improve productivity in effective manner without compromising product quality. Overall productivity of company can be increased by minimizing the problem through changing plant layout. [10]

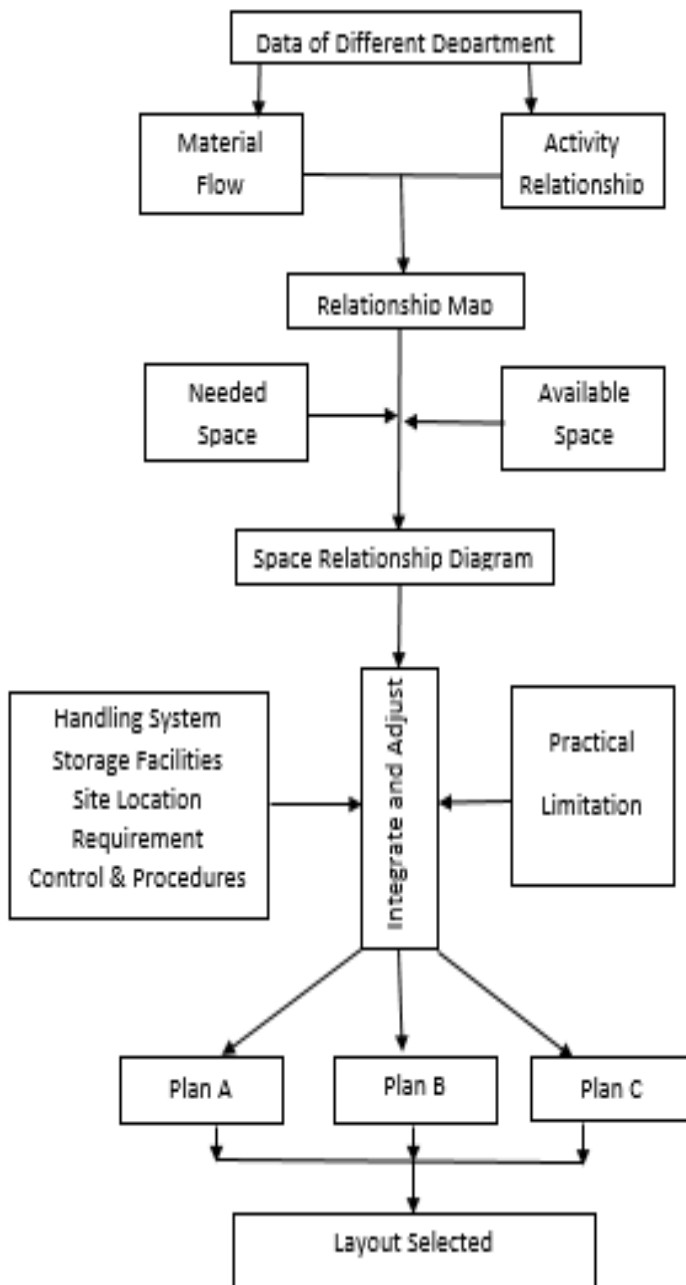
Abhilasha Dongre and Professor N.Y. Mohite (2015) have carried out the "Significance of Selection of Material Handling System Design in Industry". They had preceded with the considerations for material flow design problems for related product design in the Industry. A abridged study on developing material Handling technology. They have also concluded that material handling activity and selection of appropriate material handling equipment is an important activity in any manufacturing company. Thus material handling system plays a major role in productivity. Distribution, Manufacturing, and Warehousing and help to give the best optimization to increase the productivity, Reduced cost and idle time, Proper utilization of labour, Product quality and safety. [11]

Rishabh Mishra (2015) has carried out the "Productivity improvement in Automobile industry by using method study". In production department some unwanted work are going on which are taking extra time and extra effort as well as increasing the cost of product and worker fatigue. By the proper utilization of machine and material, method study, work procedure processes can be improved. It will improve the current process by reducing the transportations and worker's fatigue. After implementing the suggested ideas, the firm is able to increase its productivity. [12]

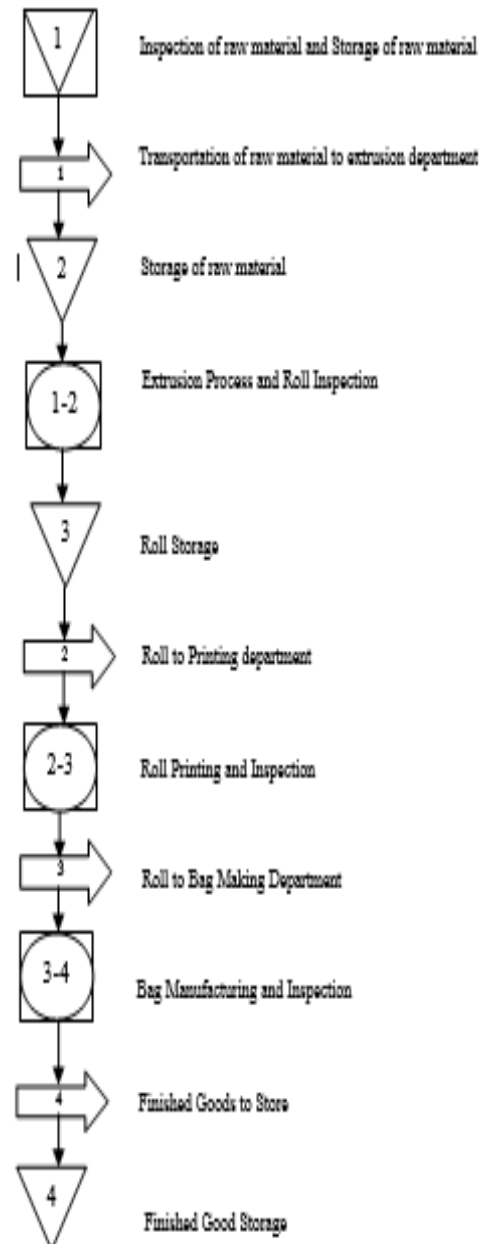
Dr Ashish Jain and Dr Punit Yadav (2016) have carried out the "Method Study to Improve Work Flow Process in a Dietary Facility" they had proceeded with method study flow process chart. They have concluded that Method study flow process chart is a means of raising the efficiency and productivity of an operating unit by the rear- generation of work which normally involves little or no capital expenditure on facilities and equipment. The present study utilises this scientific technique to improve working conditions and develop safer and hygienic methods of per- forming operations. However, it must be remembered that the success of either system will depend on facilities and equipment, equitable distribution of workload, organized of duties and a good employee orientation. [13]

### III. METHODOLOGY

The operation process chart, flow process chart, activity relationship chart has been used in analysis. Important data are collected and based on this data analysis are carried out. Problem of the organization is identified and analysed through SLP and lead time method. SLP method helps in planning the new layout based on existing layout. Lead time method helps in estimating average time taken by the worker or employee for completing their tasks.



**Figure 1. Systematic Layout Planning**



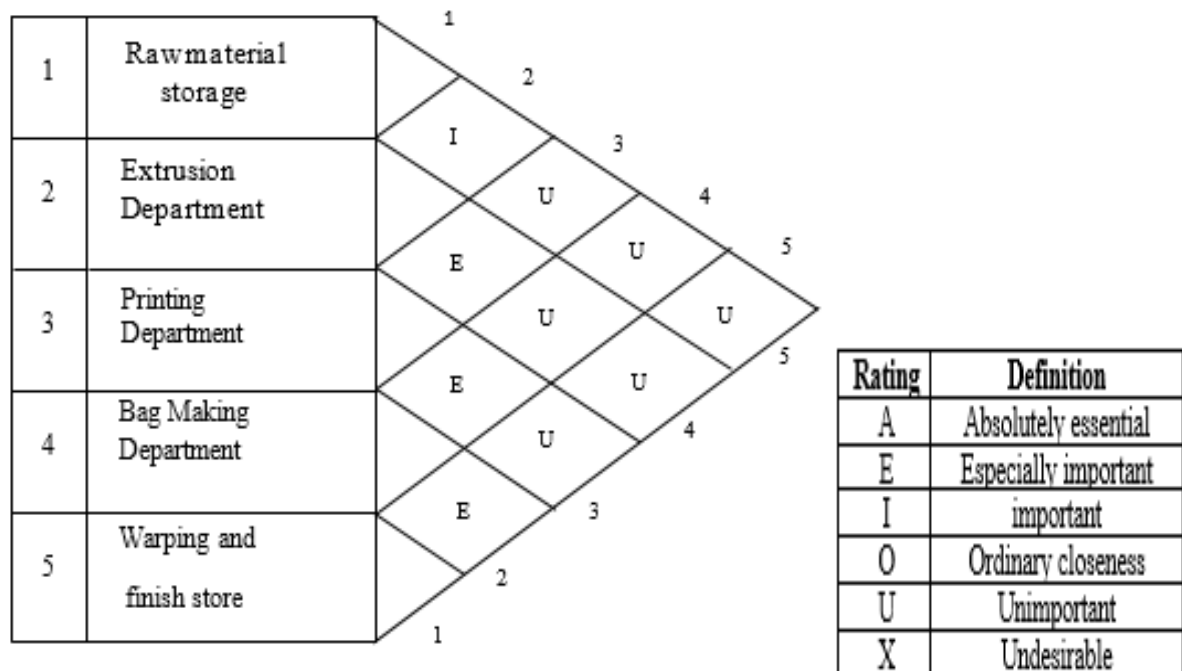
**Figure 2. Operation Process chart**

A. Systematic Layout Planning(SLP) includes following steps:

- Flow of materials
- Activity relationships
- Space requirements & availability
- Modifying considerations
- Practical limitations
- Developed layout alternatives
- Implementing suitable layout

#### IV. ANALYSIS OF ACTIVITY RELATIONSHIP CHART

According to the study of the manufacturing process it was found that the travelled distance should be reduced for moving raw materials and also the unnecessary area should be reduced. It is done by applying activity relationship chart method on the existing plant layout. The process is continuous work flow with a sequential departmental arrangement. There is a requirement for continuous material flow from department to department. Activity relationship chart is used to find the relationship between departments to department based on sequential activity.



*Figure 3. Activity relationship chart*

#### V. ANALYSIS OF LAYOUT

Existing layout and modified layout of the company is shown in below figure. This will give a complete idea of material flow, positions of different departments. After studying the existing layout completely observations made on material travelling distance and time taken by the worker to complete their task. Using flow process chart material flow path is decided and unnecessary movements of the material flow are reduced. Keeping all the above activities in mind different data related to activities are taken and final table showing reading analysis is prepared. Using this reading analysis as a reference effort is made to reduce unwanted time and layouts are modified. The best layout is selected which shows reduced material travelling distance and increase material flow and storage space.

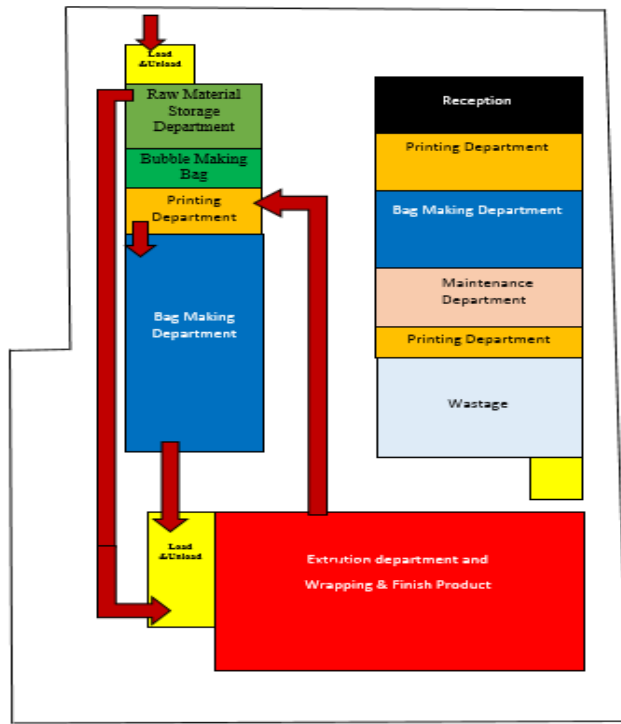


Figure 4. Existing Plant Layout

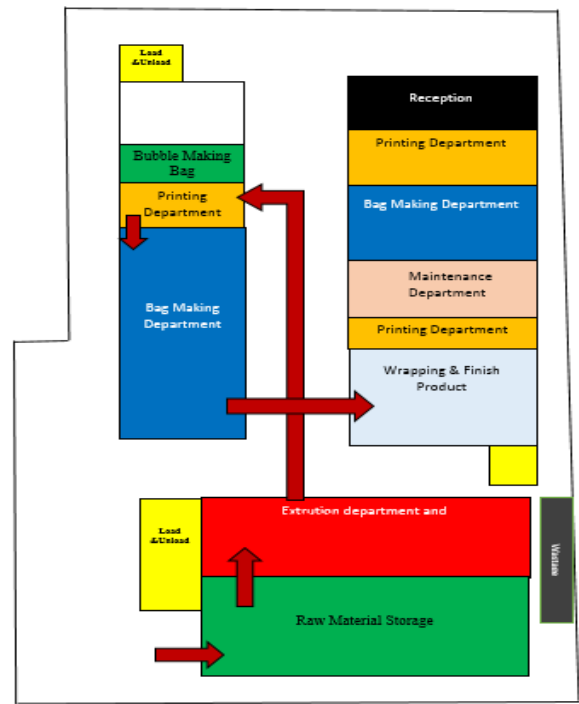


Figure 5. Modified Plant Layout

Table 1. Distance between different department and machine in layout

DISTANCE BETWEEN DEFFRENTS DEPARTMENT AND MACHINE IN LAYOUT				
No.	FROM	TO	Before DISTANCE(ft.)	After DISTANCE(ft.)
1	Raw Material	Extrusion	711.05	0
2	Extrusion	Extrusion Machine	211.520	155.33
3	Extrusion Machine	Bucket	10	10
4	Extrusion Machine	Finish Roll Rack	25.66	25.66
5	Finish Roll Rack	Printing Department	410.66	410.66
6	Printing Department	Printing Machine	3.4	3.4
7	Printing Machine	Finish Printing Roll	5.8	5.8
8	Finish Printed Roll	Bag Making Department	25.3	25.3
9	Roll Store(Bag Making)	Bag Making Machine	10.6	10.6
10	Bag Making Machine	Box packing	4.9	4.9
11	Box packing	Wrapping Machine	323.6	212.119
12	Wrapping Machine	Finish store	85.4	10
Total			1827.87	873.76

**Table2. Time taken for completing processes**

Sr. No.	Process	Before Time	After Time
1	Raw material transportation time from main storage to Extrusion Department(1.3ton)	04'11"	01'03"
2	Raw material transportation time from Extrusion Storage To Machine(100kg)	03'14"	00'00"
3	Granules Pouring Time into Big Buckets(25kg)	01'17"	01'01"
4	Time for Mixing Different Granules(one bucket)	01'17"	01'41"
5	Granules Fill Time From Bucket to Hopper(15kg)	01'30"	01'29"
6	New Roll Set up Time(one roll)	02'25"	02'17"
7	Finished Roll Removal Time(one roll)	01'59"	01'49"
8	Roll Transportation Time From Extruder To Printing Department(one roll)	03'13"	03'03"
<b>Total Time</b>		<b>19'01"</b>	<b>12'23"</b>

**Table 3. Flow process chart operation numbers**

Process	No. in the existing system	No. in the new system
Operation	17	16
Inspection	6	6
Transportation	8	6
Delay	0	0
Storage	14	11
Total	45	39

## **VI. RESULT AND DISCUSSION**

After analysing existing layout of company the material travelling distance measured is 557.135 metres and after modifying the layout material travelling distance reduced to 226.322 metres (refer table no 1). Newly developed plant layout can reduce 52.2% of material travelling distance. Due to the reduction in distance material flow smoothly.

Time taken by the worker for completing the task before modifying layout is 19'01" and after modifying layout time reduces to 12'23" (refer table no 2). This will reduce the worker effort, process time and increases the productivity. About 36.401% of time is reduce by this. By reducing distance and time efficiency came out to be 44.3005%.

## **VII. CONCLUSION**

From the above result and discussion, it is concluded that Productivity of company can be increased by using different industrial engineering techniques like SLP, Lead Time Reduction, and different types of chart like Operation process chart, Flow process chart, and activity relationship chart. In SLP technique existing plant layout is compared with revised plant layout which helps in reducing material handling time, labour cost, transportation cost and reduction in material handling. In lead time technique each and every activity of the worker is observed clearly and based on this observation worker unwanted activities are eliminated. Operation process chart gives information about the different types of operation done in a firm. Flow process chart give the complete idea for the material flow from starting to dispatch of product.

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#### **BOOK**

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