Efficient Plant Layout Design of a Small Scale Textile Industry-A case study

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***Abstract*— In today's competitive global market, effective utilization of industrial resources play a vital role. Here lies the importance of efficient layout or re-layout of the industry. The physical arrangement of all the departments, storage areas, utilities areas must be critically planned to avoid the wastages and the bottlenecks.**

This paper presents a case study undertaken to develop the efficient plant layout by using Systematic Layout Planning (SLP) technique, The basic analysis of existing layout was done by establishing relationship of different activities in the process flow. The material flow analysis was done by considering load matrix and cost matrix. After analysis of existing plant layout, three alternative layouts are developed by using SLP technique. The efficient plant layout developed has resulted in 55.25% savings in material handling distance and about 16.66% increase in productivity.

***Keywords*— Plant layout, SLP, load matrix, relationship**

I. INTRODUCTION

In competitive environment, productivity of the industrial unit has got ultimate importance. Efficient plant layout is one of the effective tool to enhance the productivity. Most plant layouts are designed for initial conditions of the business. However these layouts provide many bottlenecks during growth period. Hence as long as capacity grows, it has to adapt the internal and external changes for which efficient re-layout is necessary.

Many researchers have provided a number of techniques to optimise the layouts. The quantitative and the qualitative measure of the techniques may differ, however the objectives are same. Hence the selection of a best alternative technique is a matter of justification.

II. METHODOLOGY

To design or redesign the facility layout of a manufacturing process, it is possible to apply many techniques. Each one is based on a specific idea and goal to be achieved. The comparison can be made based on the production process parameters such as material flow, material handling cost, time, throughput etc.

In the case study of a small scale textile industry, the Systematic Layout planning technique is used to develop three alternative layouts. SLP is one of the most frequently used methods in the layout design of the facilities. It includes three specific phases :

i) Data collection and analysis
ii) Searching among the possible layout solution.
iii) Evaluating alternatives and selecting the best layoutt".

III. CASE STUDY

This paper refers to a small scale Textile Industry manufacturing Turkish towels and napkins.

The manufacturing process involves the flow of material as shown in the figure (1)

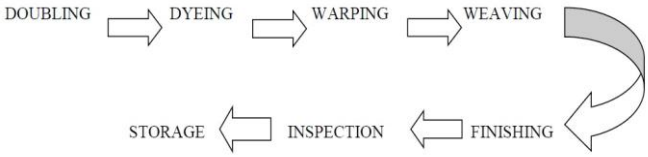

Figure 1: Manufacturing Process

IV. MOTION AND TRANSPORTATION

The term motion is used for movement of people and transportation for the movement of the material. Quantitative data was obtained to calculate the total distance travelled in terms of motion and transportation during the manufacturing process of existing plant layout. (Table 1). The table represents the distance between different locations for each major process in the manufacturing. The data serves as the baseline and is useful in determining the degree of closeness necessary between different departments for material flow. Efforts are made in the layout design to place the departments, having more material flow, close to each other to minimize the material handling cost. It was seen that in the existing plant layout (Fig. 2) the work flow was not optimum due to poor adjacency of the departments.

The various departments shown in the layout are

1. Administrative office
2. H .R .Office
3. Raw material storage
4. Doubling section
5. Dyeing section
6. Warping section
7. Power loom section
8. Finishing section
9. Inspection section
10. Packing section
11. Security
12. W/C

Development of alternatives by using SLP

By applying SLP technique and considering the constraints three possible alternative plant layouts A, B and C were developed as shown in Figure 2. The motion and transportation in modified plant layouts A,B and C are analysed and presented in the table 2.

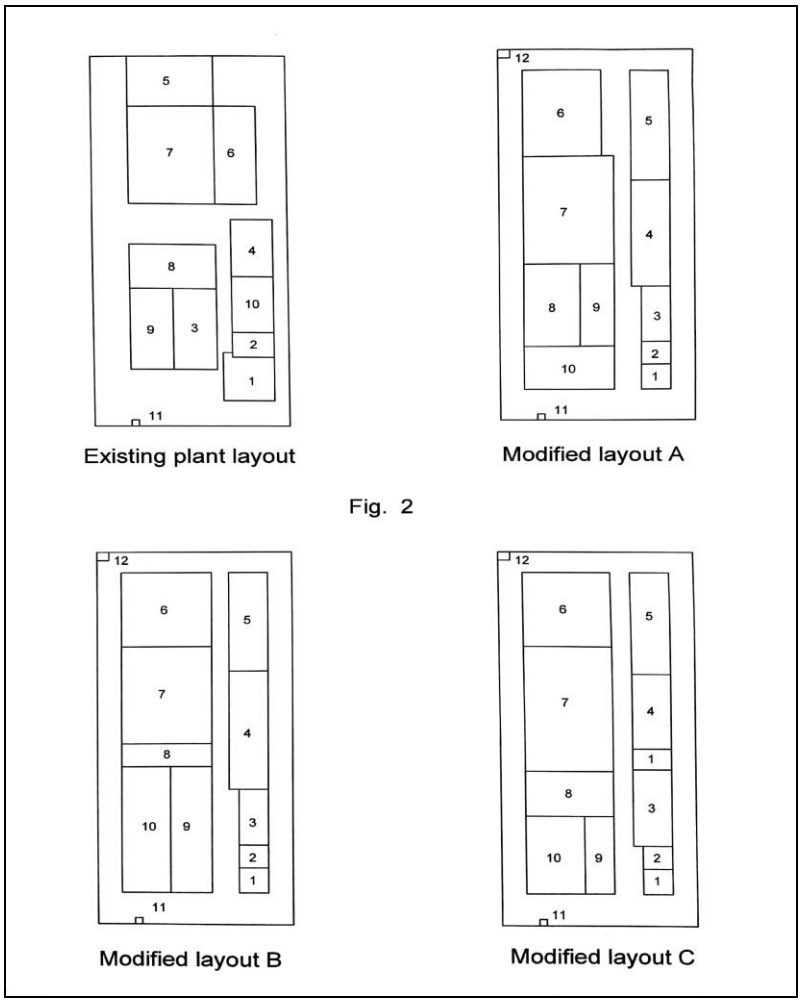

Fig. 2

Figure 2: Alternative Plant Layout

Table 1: Motion and transportation in existing plant layout

Sr. no	FROM (i)	TO (j)	Distance In meters	Number of Loads	Time in Second	Total distance	Total Time
01	Doubling	Dying	28.97	10	45	289.7	450
02	Dying	Warping	42.09	25	80	1052.25	2000
03	Warping	Power Loom	30.5	03	330	91.5	990
04	Power Loom	Finishing	18.3	32	30	585.6	960
05	Finishing	Inspection	3.66	30	06	109.8	180
				TOTAL		2128.85	4612

Table 2: Motion and transportation in new plant layouts A,B and C

Sr. no	FROM (i)	TO (j)	DISTANCE In meters			Number of Loads	Total Distance		
			A	B	C		A	B	C
01	Doubling	Dying	12	12	12	10	120	120	120
02	Dying	Warping	10	12	10	25	250	300	250
03	Warping	Power Loom	18	19	22	03	54	57	66
04	Power Loom	Finishing	23	13	16	32	736	416	512
05	Finishing	Inspection	07	02	02	30	210	60	60
						TOTAL	1370	953	1008

V. RESULTS

Comparing the results of new developed layouts A,B and C with existing layout, it is observed that :
Layout A results in 785.85 meters savings in total distance. (39.91%)
Layout B results in 1175.85 meters savings in total distance (55.23%)
Layout C results in 1120.85 meters savings in total distance (52.65%)

VI. CONCLUSION

In new layouts A,B and C all the departments are systematically arranged so that efficient material flow is obtained.
* Maximum material flow distance is saved in plant layout B (55.23%)
* Plant layout C is provided with effective utilization of available floor space in weaving section and thereby increasing the production by 33.33%
* Plant layout C is also provided with the flexibility to adapt Auto looms in weaving section which will result in great savings in labour requirement so that 31 labours are not required.
* Automation of material handling is suggested by using trolleys and beam lifting devices.

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