

# Productivity Improvement by Optimum Utilization of Plant Layout: A Case Study

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**Abstract:-** The objective of this research paper is to present an overview on a new combined methodology for the efficient improvement in productivity with the help of various tools, techniques and principles. Work study is one of the most influential & effective methodologies for eliminating obstructions in plant layout, machinery and flow process and thus obtain maximum productivity.

The existing plant layout and the operation process of each department (i.e. Reception dock, processing area, storage area, production area, packaging area and utilities etc.) have been observed and investigate w.r.t plant layout, material flow of each section is identified. Using the improved methods the suitable new proposed plant layout can decrease the distance of material flow

**Keywords:-** Time & Method Study, Time Reduction, Standardized Work, plant layout, material flow, production, IBT,MTM,PMTS.

## 1. INTRODUCTION

Productivity is generally defined as the ratio of an output to the unit of all of the resources used to produce this output. Productivity usually has different meaning commonly associated with departmental effectiveness in industry from production. Production concerning output over a given time period. Improving productivity w.r.t labour, capital, material, machine etc. and to do with people from different frames of an organization.

Most of the industries are implementing Work Study Methods along with industrial tools and methods to help eliminate wastes and increase productivity rather than depending on conventional processes and procedures. According to many researchers using this methodology is the best way to improve productivity by eliminating or reducing time consuming actions which are unnecessary in actual production. It is a way by which one can reduce the cost of production & increase productivity, which also increases annual profitability of the industry.

The willful efforts of industry and government, reflects through successful implementation of programs transformed India from its deficit state in production and processing. Taking example as India has largest milk feeding

animals contributing 96% of total milk production of Country. But there are few problems faced by small and medium dairy industry. The paper is intended to study, understand the problems/issue faced by these small industry and its implementational study on small plants among those one to improve its efficiency and reliability.

This research aims to improve the plant layout of milk industries to eliminate obstructions in material flow and thus obtain maximum productivity. The study of present plant layout, operation of process and material flow of each section w.r.t time provide idea to construct new optimized plant with rise in productivity.

The different optimized plant layout models has to be designed and their simulation using available software will result out the increase productive plant. These the importance of the plant layout design to bring about an increase in productivities. Actually optimization is complicated due to many related factors such as workflow, machine positions, and the relationship between machines and work. These mentioned factors result in plant layout improvement planning. Moreover, investment is required for machine positioning. Hence, the primary step for plant layout improvement should be started with identifying the problems of the current plant layout in order to maximize the productivities at the minimized investment but, it is important that products which have good quality products and meet customers' demand. This could be conducted under existing resources such as layout, machines and other facilities. However, plant layout improvement, could be one of the tools to response to increasing industrial productivities

## 2. ESSENTIALS

Day by day demand of milk products are increasing and in the same way small as well as medium production rate milk industry established to fulfill customer satisfaction and earn more profit but, due to lack of Industrial tools, technique, methods they are facing problem. This case study aims how to modify the existing plant to improve plant.

To study process of milk industry and find out possible way of improvement so, that losses can be minimize with increase in productivity of plant.

To study the tools, methods and physical arrangement of equipment and facilities within a Plant. Optimizing the Layout of a Plant to improve productivity, safety and quality of Products. Un-necessary efforts of materials handling can be avoided when the Plant Layout is optimized.

### 3. OBJECTIVES OF LAYOUT

An efficient plant layout is one that can be instrument achieving the following objectives:

- Proper and efficient utilization of available floor space
- To ensure that work proceeds from one point to another point without any delay
- Provide enough production capacity.
- Reduce hazards to personnel/hygienic
- Minimize the production time.
- Provision of safety and comfort zone for employee.
- Minimize cost of material handling.
- Facilitate the process.
- Facilitate the organizational structure.

Total production time per unit is short. There is a reduced material handling because the parts directly move from one to the other. So it does not have to be transported in trolleys and tracks to other departments. Required less operator skill and the training is therefore simple production, planning and control and less space for work. Also some of the features of a product layout are:-

- Smooth and logical flow lines.
- Small in process.
- Reduced material handling.
- Overall production time/cost is less.
- Simple planning.

### 4. LAYOUT PLANNING

There is a procedure which is called systematic layout planning. A general framework for how these process layouts are to be designed. This point (SLP) is important because this has now become the basis for many of the computerized layout planning algorithms which are available. Those procedures are actually base their inputs and operations on the SLP procedure. The input to the

process of planning a process layout is essentially inputting this kind of data about the product the process and schedule and from this input data the first step that is done is to identify the flow of material. The second step is to identify the activity relationship based on step one and step two. On the basis of space to develop the layout alternatives, you evaluate these alternatives and pick up the best layout alternative that you have. So this is the brad framework and it is a very systematic framework for a problem like designing a layout. You can see that you can divide this framework into three different phases. Up to here is the phase of analysis, up to this phase of analysis, where you're analyzing your data, finding out the flow of material activity relationships, depending upon the activity relationship diagram, the space required and the space available. Once the analysis part is over you search for the solutions. So from the space relationship diagram, you are developing layout and Select Best one Analyzed.

The basis and entry points for the research of plant layout problems can be generalized into five important elements according to the SLP method. These five elements are the "key" to the solution. They are:

**P-product** The product element includes the end product, raw materials, machining components and projects of the service. This element is the key factor affects the composition and relationship of all the facilities, equipment categories and material handling way.

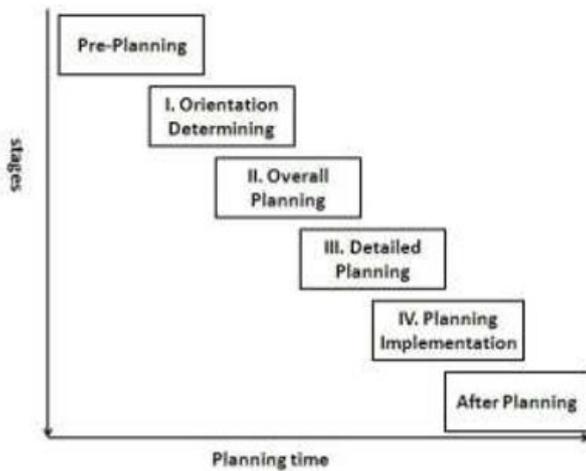
**Q-quantity** The quantity element indicates the amount of production, supply, utilization or service workload. All the information is provided by production statistics and design menu, and represented by piece, weight, volume and price. 3.

**R-route** In fact, the route element is the achievement of technological process design. It can be represented by plant layout diagram, process route diagram, process flow chart and so on. It affects the relationship among every work unit, material handling route and warehouse and store location.

**S-supporting service** The service element indicates public and ancillary service which includes tools, maintenance, propulsion, deliveries, and certain railway lines, health stations, changing rooms, canteens and toilets. The area of service department can be larger than the area of production department sometimes.

**T-time** The time element refers to when and how long the production is, in which includes the operating time of every procedure. besides the above five elements, the other related ones are needed to be gathered to finish the final layout design as well.

Stage structure for SLP method:-



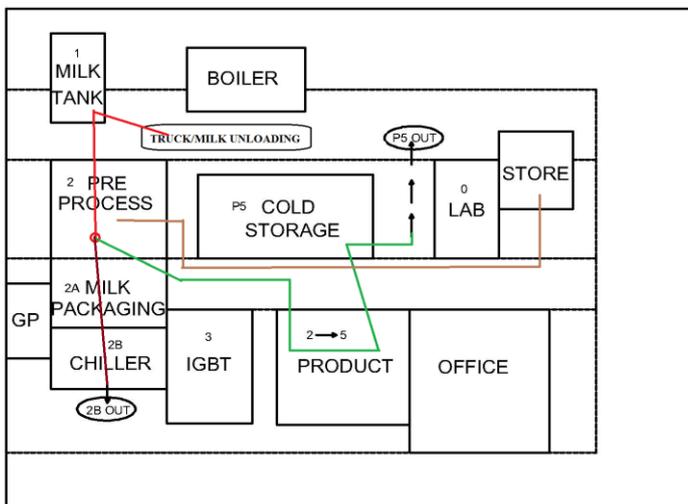
**5. CASE STUDY**

Case study is conducting at XYZ milk plant. This company produces milk packets and other milk products at its production plant and sells its products through malls, shops and small distributors

The main process and their sequence are:-

- i. Raw milk collection
- ii. Cleaning and de creaming
- iii. Homogenization
- iv. Fat standardization
- v. Heat treatment
- vi. Chilling
- vii. Immediate storage
- viii. Filling/packing
- ix. Cold storage
- x. Out/sells

**5.1 Present layout**



Presently the major operations are performed in the one area of building. Although company have sufficient space to locates individual operations in separate areas. Due to lack of systematic layout various problems which were encountered by company are:-

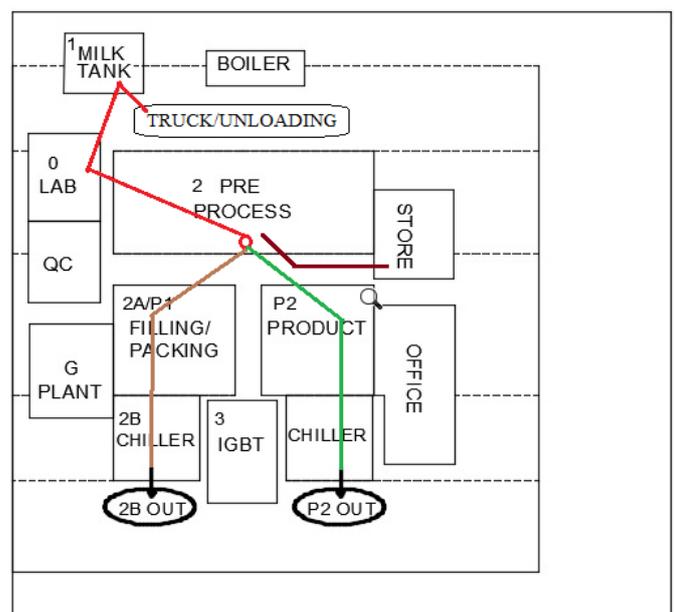
- utilization of available floor space
- Inefficient Delay in operations as same floor space is used
- Inefficient utilization of production capacity.
- Increase in material handling costs
- Increase hazards to personnel
- Unable to utilize labor efficiently
- Difficulty in supervision and control
- Maintenance difficulties
- Poor equipment utilization
- Reduction in productivity

These all factors leads to lower the productivity and consequently increases the final cost of its product. Since the competition in milk industry is very tough. If company reduces its product cost by adopting good and systematic layout, this will make the product more competitive in market.

**6. NEW OR ALTERNATE PLANT LAYOUT**

The data collected from the analysis phase of the layout planning was used in proposing new and alternate plant layouts which were checked for optimum flow of work through the processes.

**6.1 Proposed Layout**



**COMPAIRION BETWEEN PLANTS**

Sr. No	PRESENT LAYOUT	PROPOSED LAYOUT
1.	Loading of product 2B and P5 is at two different side of layout, which is inconvenient.	Loading of product 2B and P5 is at one side of layout, which is more convenient.
2.	Store is at long distance from pre-processing department.	Store is just close to pre-processing department.
3.	Flow of process for product P5 is unnecessary and wrong side of layout.	Flow of process for product P5 is streamlined and at perfect side of layout.
4.	Difficulty in supervision	Easy to supervised.
5.	Total distance travel for both product is maximum.	Total distance travel for both product is minimized.
6.	Ununiformed flow process layout	Uniformed flow process layout

Event	Total Distance (Meter)	
	Present Layout	Proposed Layout
1-2	15	15
2-2B	20	15
2-P5/P2	41	20
6-2	32	07

Where, 1= Milk pre storage after unloading  
 2=Pre-processing section  
 2B= Product 1 out  
 P5/P2= Product 2 out  
 6= Store

Advantages over Present layout:-

- i. improvement in process and procedure
- ii. improvement in plant layout
- iii. improvement in flow of production
- iv. reduction in unnecessary work
- v. standardization of flow
- vi. Efficient planning of the section
- vii. Efficient and fast material handling
- viii. Uniform and improved production flow
- ix. Higher productive efficiency

**7. LAYOUT ANALYSIS**

It is the next step in the layout planning is to analyze the flow of material. Mostly sequence of operations is basic for the flow analysis. The process charts is the most useful for analyzing the material movement within the layout during operations. Among these the principles of multiple process chart is one of the best techniques. When there are number of product uses combined processes. Operations are indicated by a symbol transport joining line them with the preceding operation, Form this the layout takes shape.

The Flow of raw materials were carried out with long distance and that means waste in time and energy resulting in high cost. According to study of manufacturing process, it was found that long distance could be reduced for moving material within plant and unless area could be eliminated. The way to improve plant to apply SLP method to make the flow continually by arranging the important sequence of operations.

Following tables shows the improvement in the distance between process or material handling for respective event.

**8. CONCLUSION**

The proposed layout was finally selected as the new optimized plant layout. With the new layout all disjointed department areas were made as one and efficient material flow was achieved. Shows the total overall distances travelled is reduced from 108m to 57m i.e. the total distance travelled for both product were reduced. Therefore in the optimized layout, the total distance reduced while overall manufacturing. By the application of SLP for the design of an optimized plant layout we were able to reduce the wastes due motion and transportation, therefore increasing the productivity of the plant.

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