

Review Paper on Factors Affecting Plant Layout Using Case Study on Olive Oil

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Abstract: In today's competitive environment optimal plant layout design plays a vital role in the cost reduction by improving the productivity. The type of layout utilized will largely depend on the nature of the manufacturing activities, including the volume and variety of the products being produced. The plant layout generation is challenging, especially for the process-oriented layout. It has become mandatory to have efficient plant layout for well-organized plant layout to utilize the basic resources within the organization. This paper provides a comprehensive review of the comparison between old and new plant layout. It provides the beneficial information of the new layout with new methods and implementing the new technology in the plant layout for increase the productivity.

Keywords— Plant Layout; Factors; Productivity.

I. INTRODUCTION

Plant layout defined as the physical arrangement of everything needed for the product or service (including machines, personnel, raw materials, and finished goods). Plant layout design is the fundamental basis of today's industrial plants which can influence parts of work efficiency.[1]

In general most plant layouts are designed properly for the initial conditions of the business. However these layouts provide many bottlenecks during saturation period. Hence as long as plant layout design proves to be efficient, it has to adapt the internal and external changes for which a re-layout is necessary.[2]

In order to achieve maximum returns from the capacity of facilities, it is very essential to optimize plant layout for proposed units or re-layout of existing manufacturing units as per the changing market scenario.[3]

One of the main goals of a manufacturing system is the maximization of its productivity. This depends upon several factors, such as the kind and the complexity of the product made, the quality of the raw materials, the complexity of the manufacturing process and the arrangement of the workstations constituting the production process.[4]

A layout has rarely appeared by a chance, but is the final product of a thorough planning where the governing factors are e.g. what products to make, how to make them, which components to make and which to buy from another manufacturer [5].

II. PLANT LAYOUT OBJECTIVES

Generally the typical plant layout should possess the following objectives:

- Economic demands such as investments in equipment and material handling cost are to be minimized.
- Requirement of product design and volume is to be satisfied.
- Requisite of process equipment and capacity such as minimize overall production time; maintain flexibility of arrangement and operations are to be justified.
- Different types of material handling equipment are to be facilitated in the manufacturing process.
- The quality of work life provided for employee convenience, safety and comfort; facilitate the organizational structure must be the basic priority.
- Requirement of building and site constraints such as utilizing existing space most effectively [6]

The important sequence of each activity was rearranged from the most important one to the least important one, followed the activity relationship chart. Based on SLP method the modifying plant layout and practical limitations was developed.[7]

The type of layout utilized will largely depend on the nature of the manufacturing activities, including the volume and variety of the products being produced. The plant layout generation is challenging, especially for the process-oriented layout. This paper will focus on plant layout generation for the job shop.[8]

III. IMPORTANT FACTORS OF PLANT LAYOUT

1. floor area availability
2. types of production system
3. types and number of machine
4. no. of product to be manufactured and management policy
5. manufacturing process and material handling.

IV. LITERATURE REVIEW

TABLE I.

Sr. No	Literature Review		
	Title of research paper	Author	Description
1	A Case Study Of Plant Layout: To Compare Production Efficiency Of Manual Plant Layout And Computerized Plant Layout Using Arena Software	Priyanka Yadav1, Suman Sharma2	These Studies Gave A Fantastic Change In Production Rate, Productivity & Plant Efficiency With Efficient Utilization.
2	Comprehensive Survey On Optimum Plant Layout Design	Dr. P.Sivasankaran	In Order To Obtain The Maximum Rate Of Return It Is Advisable The Change The Plant Layout Design To Achieve The Better Efficiency.
3	A Literature Review On Efficient Plant Layout Design	Sanjeev B. Naik Dr. Shrikant Kallurkar	In Today's Competitive Global Environment, The Optimum Facility Layout Has Become An Effective Tool In Cost Reduction By Enhancing The Productivity.
4	Layout Design For A Low Capacity Manufacturing Line: A Case Study	Filippo De Carlo1,*, Maria Antonietta Arleo2, Orlando Borgial And Mario Tucci1	The Result Of The Case Study Showed A Slight Advantage With The Lean Approach In Considering Such Efficiency Indicators.
5	A Model For Effective Development Of Plant Layouts And Material Handling Systems	Daniel Bäck, Peter Johansson	In This Thesis Was A Model Developed, In Order To Improve Deficiencies In Existing Literature Regarding The Layout Problem .
6	Optimization Of Assembly Line And Plant Layout In A Mass Production Industry-A Literature Survey	Parminder Singh, Manjeet Singh	It Provides A Detailed Analysis Of Different Aspects Of The Literature To Identify Trends Through Innovative Data Mining Approaches As Well As Insights Derived From The Review Process.
7	Improvement Plant Layout Based On Systematic Layout Planning	W. Wiyaratn, A. Watanapa, And P. Kajondecha	The Purpose Of This Research Was To Modify The Present Plant Layout Of Canned Fish.
8	Layout Planning: A Case Study On Engineering-To-Order Company	Mirosław Matusek	This Paper Presents The Practical Application Of Systematic Layout (SLP) In Engineering-To-Order Company.

VI CASE STUDY ON OLIVE OIL MANUFACTURING PLANT LAYOUT

A. PROCESS

1.1 Transport And Receiving: -

- Transportation to the oil mills is done in few hours, in individual boxes or basket to avoid the beating or damage of the fruit.
- It downloads the fruit in different bins according to quality and variety for weighing.



Fig. 1.1.1 Receiving of olive

1.2 Cleaning and Washing

- The olive is deposited on the conveyors belt for further cleaning and dust removal of branches and leaves of the fruit.
- Washing of the olives is performed to remove trace of dirt and dust adhering.
- Potable water is used.

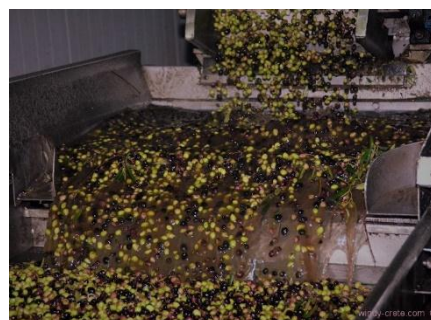


Fig 1.2.1 Washing plant

1.3 Milling Process: -

- The ground breaks the structure of the olive, without scrapping, to release the liquid. Hammer rotates on screen and beat olive to turn into dough.
- Once milled, the mass obtained in deposited in a blender machine that homogenizes it.



Fig (1.3.1) Milling machine



Fig 1.3.2 Milling process

1.4 Churning And Extraction: -

Here begins an important stage that will determine the final quality of the product.

SOLID PHASE – LIQUID :-

- It consists in introducing the resulting mass of the milling in an empty horizontal cylinder that rotates at high speed.
- In this way separation is obtained by difference in density, the various components that form the olive paste.
- This cold working process are kept intact all the organoleptic and nutritional properties of olive juice. For quality oils, the temperature of beaten mass must not exceed 27 - 29 degree Celsius, and the mixing time does not exceed 90 minutes.

LIQUID PHASE – LIQUID :-

- It separates the vegetation water oil in machine called “centrifuges vertical”.
- Although the liquid materials goes profiling, still contain small amount of solid which, obviously, must be eliminated.
- This new separation is done by decantation, centrifugation or through a mixed system that combines both.

1.5 Obtainment: -

- Olive oil is obtained from olive. Depending on the care and attendance used in the process, from the olive tree to the storage, we obtained current olive oil, which must be refined to be consumed.



Fig 1.5.1 Obtaining oil from container

1.6 Analysis: -

- Through the analysis process the olives oil are submitted it is possible to differentiate distinct types and qualities, as we have noted in pervious paragraph.



Fig 1.6.1 Testing process

1.7 Storage And Packaging :-

- The storage is done in stainless tanks.
- some of which incorporates nitrogen to prevent oxidation of olive oil.



Fig 1.7.1 Filling process

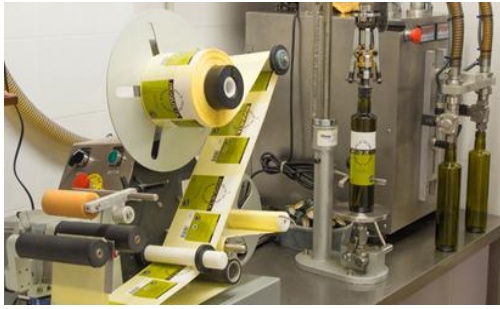


Fig 1.7.2 Packaging process

1.8 Comparisons Between Old and New Plant Layout

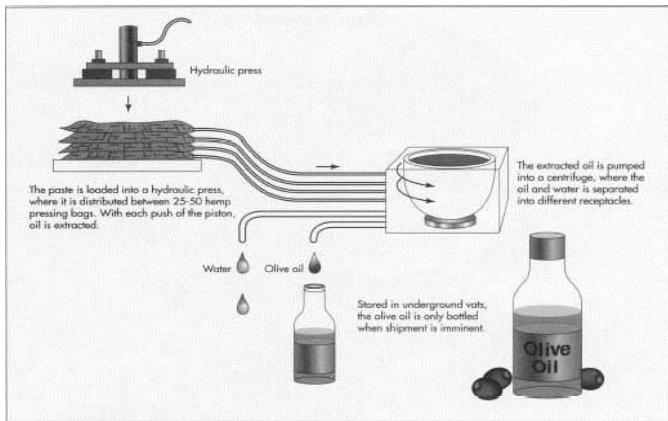


Fig 1.8.1 Old layout

- The upper figure consist of old plant layout, it consist of hydraulic press and pipes whose one end is connected with storage bags and and other end is connected with the extraction chamber.
- In this process the olives are filled in the no of bags and pipe is connected with it.
- This bags which are full of olives are kept under hydraulic press.
- With the help of hydraulic press the olives are crushed and oil and liquid substances are flow through pipe towards the extraction chamber.
- Hence from the extraction chamber the oil and water is separated. But the quality obtained from this process is low in compare to new modern process .
 - Cleanliness and safety is not maintained .
 - Consumed human effort
 - Consume more time and not used for mass production

1.9 New Layout

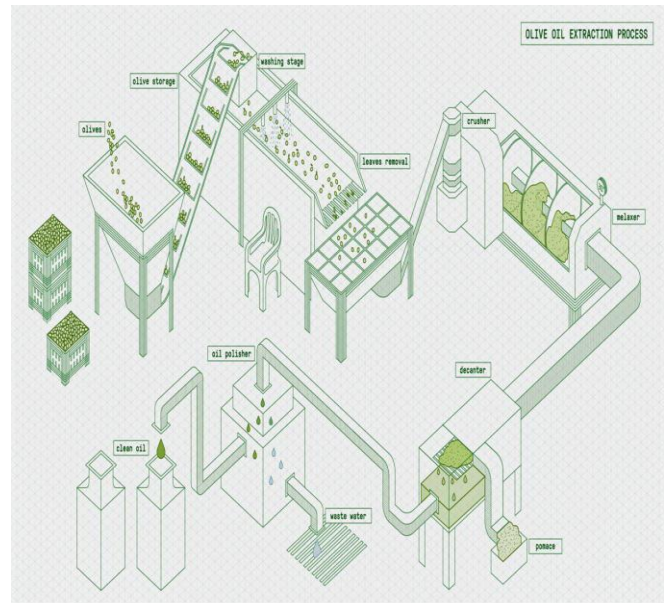


Fig 1.9.1 NEW LAYOUT

- The modern plant layout consists of new technology modern machine.
- The sequence is starting from the farm from collecting the olives from tree and filling in the carriage and transfer to the mill.
- Because it very necessary to select the best quality of the olive.
- Now second stages is washing and cleaning to remove the dirt.
- Now after washing the olives are deposited under milling machine to make a dough.
- The churning and extraction process need 27 to 29 degree Celsius, and time required is 90 mins for best quality.
- After this the oil is obtained and analysis is done and at last packaging is completed.
- The quality obtained from this process is high due to high technologies and modern machine
- The clean environment and safety is obtained.
- The process consists of automation and reduce human effort
- It is used for mass production and manufacturing time is less.

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