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AN APPROACH TOWARDS PLANT LOCATION AND PLANT LAYOUT

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ABSTRACT

For any kind of production one needs men, material and machinery. Men work on material with the aid of machinery and tools. In the process of production at least one of the three, men, material or machinery has to be moved depending upon the process and the product. If men, material and machinery all remain stationery there can be no production in the industrial sense. Then what is to be moved is the problem for the layout engineer. The most common element which is moved from place to place is material except when the material is big or difficult to transport, or when there is only one piece involved, or when the finished product is to remain fixed where it is to be produced. When tools and machinery are small, it is generally easy to move the tools and machinery and when machines and materials cannot be moved, the third element of production, the men are moved. There are various methods of grouping and production machinery, the common and classical types of the arrangement are fixed position layout, process layout and product layout. These classical layout are used with fabrication operations as well as in assembly, but most plants today are laid out using a combination of these classical layouts and are never seen in their pure form.

The paper basically is focused upon these different layouts and their efficient utilization in the production industries. The paper will enlighten different layouts and will also try to fetch the best layout for different existing condition of the industries.

INTRODUCTION

We have learnt how the entrepreneur conducts the detailed analysis comprising of technical, financial, economic and market study before laying down a comprehensive business plan. For implementation of this plan, he has to take various crucial decisions namely location of business, layout (the arrangement of physical facilities), designing the product, production planning and control and maintaining good quality of product. Investment in analyzing the aspects of plant location and the appropriate plant layout can help an entrepreneur achieve economic efficiencies in business operations. These decisions lay the foundation of the business of small entrepreneurs.

PLANT LOCATION

Every entrepreneur is faced with the problem of deciding the best site for location of his plant or factory. Plant location refers to the choice of region and the selection of a particular site for setting up a business or factory. But the choice is made only after considering cost and benefits of different alternative sites. It is a strategic decision that cannot be changed once taken. If at all, changed only at considerable loss, the location should be selected as per its own requirements and circumstances. Each individual plant is a case in itself. Businessman should try to make an attempt for optimum or ideal location. Now question arises that what is an ideal location? An ideal location is one where the cost of the product is kept to minimum, with a large market share, the least risk and the maximum social gain. It is the place of maximum net advantage or which gives lowest unit cost of production and distribution. For achieving this objective, small-scale entrepreneur can make use of location analysis for this purpose.

SELECTION CRITERIA

The important considerations for selecting a suitable location are as follows:

a) Natural or climatic conditions.
b) Availability and nearness to the sources of raw material.
c) Transport costs-in obtaining raw material and also distribution or marketing finished products to the ultimate users.

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d) Access to market: small businesses in retail or wholesale or services should be located within the vicinity of densely populated areas.
e) Availability of Infrastructural facilities such as developed industrial sheds or sites, link roads, nearness to railway stations, airports or sea ports, availability of electricity, water, public utilities, civil amenities and means of communication are important, especially for small scale businesses.
f) Availability of skilled and non-skilled labour and technically qualified and trained managers.
g) Locations with links: to develop industrial areas or business centers result in savings and cost reductions in transport overheads, miscellaneous expenses.
h) Strategic considerations of safety and security should be given due importance.
i) Government influences: Both positive and negative incentives to motivate an entrepreneur to choose a particular location are made available. Positive includes cheap overhead facilities like electricity, banking transport, tax relief, subsidies and liberalization. Negative incentives are in form of restrictions for setting up industries in urban areas for reasons of pollution control and decentralization of industries.

PLANT LAYOUT

The efficiency of production depends on how well the various machines; production facilities and employee's amenities are located in a plant. Only the properly laid out plant can ensure the smooth and rapid movement of material, from the raw material stage to the end product stage. Plant layout encompasses new layout as well as improvement in the existing layout. It may be defined as a technique of locating machines, processes and plant services within the factory so as to achieve the right quantity and quality of output at the lowest possible cost of manufacturing. It involves a judicious arrangement of production facilities so that workflow is direct. Plant layout refers to the arrangement of physical facilities such as machinery, equipment, furniture etc. within the factory building in such a manner so as to have quickest flow of material at the lowest cost and with the least amount of handling in processing the product from the receipt of material to the shipment of the finished product. According to Riggs, "the overall objective of plant layout is to design a physical arrangement that most economically meets the required output – quantity and quality." According to J. L. Zundi, "Plant layout ideally involves allocation of space and arrangement of equipment in such a manner that overall operating costs are minimized.

ESSENTIALS OF PLANT LAYOUT

An efficient plant layout is one that can be instrumental in achieving the following objectives:
a) Proper and efficient utilization of available floor space.
b) To ensure that work proceeds from one point to another point without any delay.
c) Provide enough production capacity.
d) Reduce material handling costs.
e) Reduce hazards to personnel.
f) Utilize labour efficiently.
g) Increase employee morale.
h) Reduce accidents.
i) Provide for volume and product flexibility.
j) Provide ease of supervision and control.
k) Provide for employee safety and health.
l) Allow ease of maintenance.
m) Allow high machine or equipment utilization.
n) Improve productivity

TYPES OF PLANT LAYOUT

As discussed so far the plant layout facilitates the arrangement of machines, equipment and other physical facilities in a planned manner within the factory premises. An entrepreneur must possess an expertise to lay down a proper layout for new or existing plants. It differs from plant to plant, from location to location and from industry to industry. As far as small business is concerned, it requires a smaller area or space and can be located in any kind of building as long as the space is available and it is convenient. Plant layout for Small Scale business is closely linked with the factory building and built up area. Plant layout for manufacturing can be classified as follows:

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(a) Product or line layout

Under this, machines and equipments are arranged in one line depending upon the sequence of operations required for the product. The materials move from one workstation to another sequentially without any backtracking or deviation. Under this, machines are grouped in one sequence. Therefore materials are fed into the first machine and finished goods travel automatically from machine to machine, the output of one machine becoming input of the next, e.g. in a paper mill.

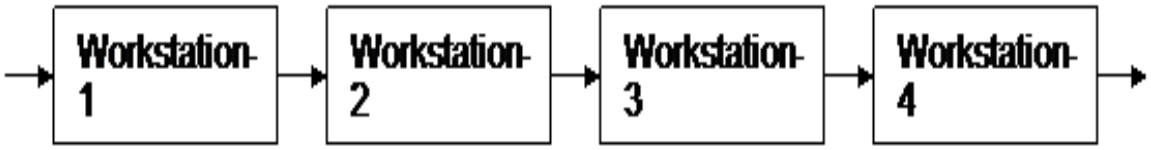

Fig. 1 Stages of Line Layout

A line layout for two products is given below.

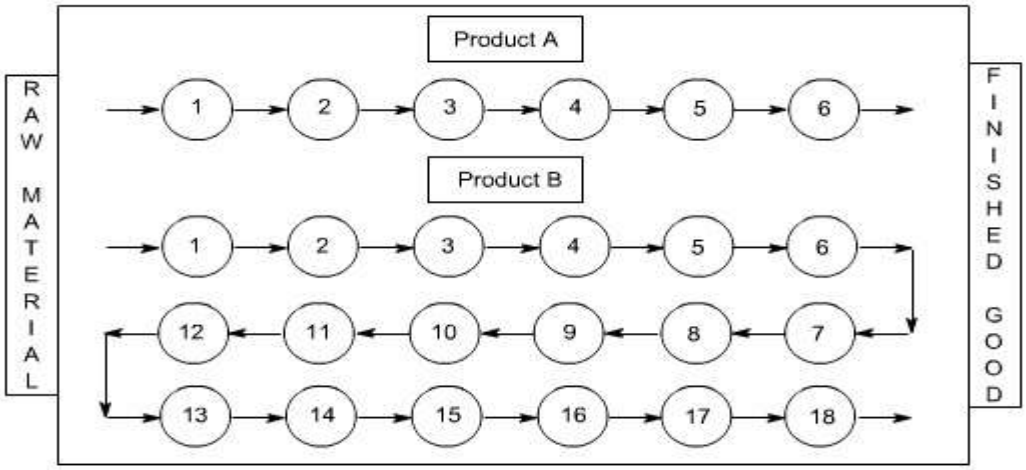

Fig. 2 Line Layout for two products

(b) Process layout:

In this type of layout, machines of a similar type are arranged together at one place, e.g. Machines performing drilling operations are arranged in the drilling department, machines performing casting operations be grouped in the casting department. Therefore the machines are installed in the plants, which follow the process layout. Hence, such layouts typically have drilling department, milling department, welding department, heating department and painting department etc. The process or functional layout is followed from historical period. It evolved from the handicraft method of production. The work has to be allocated to each department in such a way that no machines are chosen to do as many different job as possible i.e. the emphasis is on general purpose machine.

(c) Fixed position or location layout:

In this type of layout, the major product being produced is fixed at one location. Equipment, labour and components are moved to that location. All facilities are brought and arranged around one work center. This type of layout is not relevant for small scale entrepreneur.

(d) Combined or group layout:-

Certain manufacturing units may require all three processes namely intermittent process (job shops), the continuous process (mass production shops) and the representative process combined process [i.e. miscellaneous shops]. In most of industries, only a product layout or process layout or fixed location layout does not exist.

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Thus, in manufacturing concerns where several products are produced in repeated numbers with no likelihood of continuous production, combined layout is followed. Generally, a combination of the product and process layout or other combination are found, in practice, e.g. for industries involving the fabrication of parts and assembly, fabrication tends to employ the process layout, while the assembly areas often employ the product layout. In soap, manufacturing plant, the machinery manufacturing soap is arranged on the product line principle, but ancillary services such as heating, the manufacturing of glycerin, the power house, the water treatment plant etc. are arranged on a functional basis.

CONCLUSION

The purpose of this paper is to provide a good exposure to facility planning and layout designs for the improvement of the efficiency. The choice of which type of facility layout to adopt can have a significant impact on the long-term success of a firm. This decision, therefore, should not be considered lightly, but only after a thorough analysis of the operational requirements has been completed. A major issue to be addressed in facility layout decisions in manufacturing is: How flexible should the layout be in order to adjust to future changes in product demand and product mix. The study of layout has become extremely important. The most common objective of layout design, to minimize distance travelled, is not always suitable for all the manufacturing industries. Congestion in a specific area may have to be tolerated while maintaining minimum separation between facilities. Instead of criterion of minimizing total distance travelled, one may wish to minimize the total distance of the material travelled.

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