

TOPIC - 3

Layout - objectives, classical and practical layout

TYPES OF 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. But the basic principles governing plant layout are more or less same. 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. From the point of view of plant layout, we can classify small business or unit into three categories:

1. Manufacturing units
2. Traders
3. Service Establishments

1. Manufacturing units In case of manufacturing unit, plant layout may be of four types:

- (a) Product or line layout
- (b) Process or functional layout
- (c) Fixed position or location layout
- (d) Combined or group layout

(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, bamboos are fed into the machine at one end and paper comes out at the other end. The raw material moves very fast from one workstation to other stations with a minimum work in progress storage and material handling.

The grouping of machines should be done keeping in mind the following general principles.

- a) All the machine tools or other items of equipments must be placed at the point demanded by the sequence of operations
- b) There should no points where one line crossed another line.
- c) Materials may be fed where they are required for assembly but not necessarily at one point.
- d) All the operations including assembly, testing packing must be included in the line
- i) Lower cost of manufacturing per unit

Disadvantages: Product layout suffers from following drawbacks:

- a. High initial capital investment in special purpose machine
- b. Heavy overhead charges
- c. Breakdown of one machine will hamper the whole production process
- d. Lesser flexibility as specially laid out for particular product.

Suitability: Product layout is useful under following conditions:

- 1) Mass production of standardized products
- 2) Simple and repetitive manufacturing process
- 3) Operation time for different process is more or less equal
- 4) Reasonably stable demand for the product
- 5) Continuous supply of materials

Therefore, the manufacturing units involving continuous manufacturing process, producing few standardized products continuously on the firm's own specifications and in anticipation of sales would prefer product layout e.g. chemicals, sugar, paper, rubber, refineries, cement, automobiles, food processing and electronics etc.

(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 jobs as possible i.e. the emphasis is on general purpose machines. The work, which has to be done, is allocated to the machines according to loading schedules with the object of ensuring that each machine is fully loaded.

The grouping of machines according to the process has to be done keeping in mind the following principles

- a) The distance between departments should be as short as possible for avoiding long distance movement of materials
- b) The departments should be in sequence of operations
- c) The arrangement should be convenient for inspection and supervision

Advantages: Process layout provides the following benefits

- a) Lower initial capital investment in machines and equipments. There is high degree of machine utilization, as a machine is not blocked for a single product
- b) The overhead costs are relatively low
- c) Change in output design and volume can be more easily adapted to the output of variety of products
- d) Breakdown of one machine does not result in complete work stoppage
- e) Supervision can be more effective and specialized
- f) There is a greater flexibility of scope for expansion.

Disadvantages: Product layout suffers from following drawbacks

- a. Material handling costs are high due to backtracking
- b. More skilled labour is required resulting in higher cost.
- c. Time gap or lag in production is higher
- d. Work in progress inventory is high needing greater storage space
- e. More frequent inspection is needed which results in costly supervision

Suitability:

Process layout is adopted when

1. Products are not standardized

2. Quantity produced is small
3. There are frequent changes in design and style of product
4. Job shop type of work is done
5. Machines are very expensive

Thus, process layout or functional layout is suitable for job order production involving non-repetitive processes and customer specifications and nonstandardized products, e.g. tailoring, light and heavy engineering products, made to order furniture industries, jewelry. (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.

The following figure shows a fixed position layout regarding shipbuilding. Material Labour Equipment Ship building yard Finished Products (ship)

Advantages: Fixed position layout provides the following benefits

- a) It saves time and cost involved on the movement of work from one workstation to another.
- b) The layout is flexible as change in job design and operation sequence can be easily incorporated.
- c) It is more economical when several orders in different stages of progress are being executed simultaneously.
- d) Adjustments can be made to meet shortage of materials or absence of workers by changing the sequence of operations.

Disadvantages: Fixed position layout has the following drawbacks

- a. Production period being very long, capital investment is very heavy
- b. Very large space is required for storage of material and equipment near the product.
- c. As several operations are often carried out simultaneously, there is possibility of confusion and conflicts among different workgroups.

Suitability: The fixed position layout is followed in following conditions

1. Manufacture of bulky and heavy products such as locomotives, ships, boilers, generators, wagon building, aircraft manufacturing, etc.
2. Construction of building, flyovers, dams.

3. Hospital, the medicines, doctors and nurses are taken to the patient (product).

(d) Combined 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. 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.

2. Traders

When two outlets carry almost same merchandise, customers usually buy in the one that is more appealing to them. Thus, customers are attracted and kept by good layout i.e. good lighting, attractive colours, good ventilation, air conditioning, modern design and arrangement and even music. All of these things mean customer convenience, customer appeal and greater business volume. The customer is always impressed by service, efficiency and quality. Hence, the layout is essential for handling merchandise, which is arranged as per the space available and the type and magnitude of goods to be sold keeping in mind the convenience of customers.

There are three kinds of layouts in retail operations today.

1. Self service or modified self service layout

2. Full service layout

3. Special layouts The self-service layouts, cuts down on sales clerk's time and allow customers to select merchandise for themselves. Customers should be led through the store in a way that will expose them to as much display area as possible, e.g. Grocery Stores or department stores. In those stores, necessities or convenience goods should be placed at the rear of the store. The use of color and lighting is very important to direct attention to interior displays and to make the most of the stores layout. All operations are not self-service. Certain specialty enterprises sell to fewer numbers of customers or higher priced product, e.g. Apparel, office machines, sporting goods, fashion items, hardware, good quality shoes, jewelry, luggage and accessories, furniture and appliances are all examples of products that require time and personal attention to be sold. These full service layouts provide area and equipment necessary in such cases. Some layouts depend strictly on the type of special store to be set up, e.g. TV repair shop, soft ice cream store,

and drive-in soft drink stores are all examples of business requiring special design. Thus, good retail layout should be the one, which saves rent, time and labour. 3. Services centers and establishment Services establishments such as motels, hotels, restaurants, must give due attention to client convenience, quality of service, efficiency in delivering services and pleasing office ambience. In today's environment, the clients look for ease in approaching different departments of a service organization and hence the layout 106 should be designed in a fashion, which allows clients quick and convenient access to the facilities offered by a service establishment.