

PLANT LOCATION AND SITE SELECTON

The geographical location of the final plant can have strong influence on the success of the industrial venture. Considerable care must be exercised in selecting the plant site, and many different factors must be considered. Primarily the plant must be located where the minimum cost of production and distribution can be obtained but, other factors such as room for expansion and safe living conditions for plant operation as well as the surrounding community are also important. The location of the plant can also have a crucial effect on the profitability of a project.

The choice of the final site should first be based on a complete survey of the advantages and disadvantages of various geographical areas and ultimately, on the advantages and disadvantages of the available real estate. The various principal factors that must be considered while selecting a suitable plant site, are briefly discussed in this section. The factors to be considered are:

1. Raw material availability.
2. Location (with respect to the marketing area.)
3. Availability of suitable land.
4. Transport facilities.
5. Availability of labors.
6. Availability of utilities (Water, Electricity).
7. Environmental impact and effluent disposal.
8. Local community considerations.
9. Climate.
10. Political strategic considerations.
11. Taxations and legal restrictions

RAW MATERIALS AVAILABILITY:

The source of raw materials is one of the most important factors influencing the selection of a plant site. This is particularly true for the sulfuric acid plant because large volumes of sulfur is consumed in the process which will result in the reduction of the transportation and storage charges. Attention should be given to the purchased price of the raw materials, distance from the source of supply, freight and transportation expenses, availability and reliability of supply, purity of raw materials and storage requirements.

LOCATION:

The location of markets or intermediate distribution centers affects the cost of product distribution and time required for shipping. Proximity to the major markets is an important consideration in the selection of the plant site, because the buyer usually finds advantageous to purchase from near-by sources. In case of sulfuric acid plant, the major consumers are fertilizer industries and hence the plant should be erected in close proximity to those units.

AVAILABILITY OF SUITABLE LAND:

The characteristics of the land at the proposed plant site should be examined carefully. The topography of the tract of land structure must be considered, since either or both may have a pronounced effect on the construction costs. The cost of the land is important, as well as local building costs and living conditions. Future changes may make it desirable or necessary to expand the plant facilities. The land should be ideally flat, well drained and have load-bearing characteristics. A full site evaluation should be made to determine the need for piling or other special foundations

TRANSPORT

The transport of materials and products to and from plant will be an overriding consideration in site selection. If practicable, a site should be selected so that it is close to at least two major forms of transport: road, rail, waterway or a seaport. Road transport is being increasingly used, and is suitable for local distribution from a central warehouse. Rail transport will be cheaper for the long-distance transport. If possible the plant site should have access to all three types of transportation. There is usually need for convenient rail and air transportation facilities between the plant and the main company head quarters, and the effective transportation facilities for the plant personnel are necessary.

AVAILABILITY OF LABORS:

Labors will be needed for construction of the plant and its operation. Skilled construction workers will usually be brought in from outside the site, but there should be an adequate pool of unskilled labors available locally; and labors suitable for training to operate the plant. Skilled tradesmen will be needed for plant maintenance. Local trade union customs and restrictive practices will have to be considered when assessing the availability and suitability of the labors for recruitment and training.

AVAILABILITY OF UTILITIES:

The word “utilities” is generally used for the ancillary services needed in the operation of any production process. These services will normally be supplied from a central facility and includes Water, Fuel and Electricity which are briefly described as follows:

Water: -

The water is required for large industrial as well as general purposes, starting with water for cooling, washing, steam generation and as a raw material in the production of sulfuric acid. The plant therefore must be located where a dependable water supply is available namely lakes, rivers, wells, seas. If the water supply shows seasonal fluctuations, it's desirable to construct a reservoir or to drill several standby wells. The temperature, mineral content, slit and sand content, bacteriological content, and cost for supply and purification treatment must also be considered when choosing a water supply. De-mineralized water, from which all the minerals have been removed is used where pure

water is needed for the process use, in boiler feed. Natural and forced draft cooling towers are generally used to provide the cooling water required on site.

Electricity: -

Power and steam requirements are high in most industrial plants and fuel is ordinarily required to supply these utilities. Power, fuel and steam are required for running the various equipments like generators, motors, turbines, plant lightings and general use and thus be considered as one major factor is choice of plant site.

ENVIRONMENTAL IMPACT AND EFFLUENT DISPOSAL:

Facilities must be provided for the effective disposal of the effluent without any public nuisance. In choosing a plant site, the permissible tolerance levels for various effluents should be considered and attention should be given to potential requirements for additional waste treatment facilities. As all industrial processes produce waste products, full consideration must be given to the difficulties and cost of their disposal. The disposal of toxic and harmful effluents will be covered by local regulations, and the appropriate authorities must be consulted during the initial site survey to determine the standards that must be met.

LOCAL COMMUNITY CONSIDERATIONS:

The proposed plant must fit in with and be acceptable to the local community. Full consideration must be given to the safe location of the plant so that it does not impose a significant additional risk to the community.

CLIMATE

Adverse climatic conditions at site will increase costs. Extremes of low temperatures will require the provision of additional insulation and special heating for equipment and piping. Similarly, excessive humidity and hot temperatures pose serious problems and must be considered for selecting a site for the plant. Stronger structures will be needed at locations subject to high wind loads or earthquakes.

POLITICAL AND STRATEGIC CONSIDERATIONS

Capital grants, tax concessions, and other inducements are often given by governments to direct new investment to preferred locations; such as areas of high unemployment. The availability of such grants can be the overriding consideration in site selection.

TAXATION AND LEGAL RESTRICTIONS:

State and local tax rates on property income, unemployment insurance, and similar items vary from one location to another. Similarly, local regulations on zoning, building codes, nuisance aspects and others facilities can have a major influence on the final choice of the plant site.

PLANT LAY OUT

After the flow process diagrams are completed and before detailed piping, structural and electrical design can begin, the layout of process units in a plant and the equipment within these process unit must be planned. This layout can play an important part in determining construction and manufacturing costs, and thus must be planned carefully with attention being given to future problems that may arise.

Thus the economic construction and efficient operation of a process unit will depend on how well the plant and equipment specified on the process flow sheet is laid out. The principal factors that are considered are listed below:

1. Economic considerations: construction and operating costs.
2. Process requirements.
3. Convenience of operation.
4. Convenience of maintenance.
5. Health and Safety considerations.
6. Future plant expansion.
7. Modular construction.
8. Waste disposal requirements

COSTS:

The coat of construction can be minimized by adopting a layout that gives the shortest run of connecting pipe between equipment, and least amount of structural steel work. However, this will not necessarily be the best arrangement for operation and maintenance.

PROCESS REQUIREMENTS:

An example of the need to take into account process consideration is the need to elevate the base of columns to provide the necessary net positive suction head to a pump.

CONVENIENCE OF OPERATION:

Equipment that needs to have frequent attention should be located convenient to the control room. Valves, sample points, and instruments should be located at convenient positions and heights. Sufficient working space and headroom must be provided to allow easy access to equipment.

CONVENIENCE OF MAINTENANCE:

Heat exchangers need to be sited so that the tube bundles can be easily withdrawn for cleaning and tube replacement. Vessels that require frequent replacement of catalyst or packing should be located on the out side of buildings. Equipment that requires

dismantling for maintenance, such as compressors and large pumps, should be placed under cover.

HEALTH AND SAFETY CONSIDERATIONS:

Blast walls may be needed to isolate potentially hazardous equipment, and confine the effects of an explosion. At least two escape routes for operators must be provided from each level in process buildings.

FUTURE PLANT EXPANSION:

Equipment should be located so that it can be conveniently tied in with any future expansion of the process. Space should be left on pipe alleys for future needs, and service pipes over-sized to allow for future requirements.

MODULAR CONSTRUCTION:

In recent years there has been a move to assemble sections of plant at the plant manufacturer's site. These modules will include the equipment, structural steel, piping and instrumentation. The modules are then transported to the plant site, by road or sea.

The advantages of modular construction are:

1. Improved quality control.
2. Reduced construction cost.
3. Less need for skilled labors on site.

The disadvantages of modular construction are:

1. Higher design costs & more structural steel work.
2. More flanged constructions & possible problems with assembly, on site.

THE PLANT LAYOUT KEYWORDS

1. Raw material Storage
2. Maintenance Workshop
3. Process Site
4. Stores for maintenance and operating supplies
5. Product Storage
6. Canteen & Change house
7. Fire Station and Fire Brigade
7. Central Control Room
8. Security office
9. Administrative Building
10. Site for Expansion project
11. Effluent treatment plant
12. Power house
13. Emergency water storage
14. Plant utilities
15. Vehicle parking space
16. Library and Laboratories
17. Training Centre
18. Research and Development Centre
19. Green Belt Area

A detailed plant layout is drawn and submitted with this thesis report. This plant layout is just a reference plant layout. There may be a lot of changes in actual plant layout.