Rate of production :

One of the factors that has a major effect on the profits is the fraction of time a process is in operation. If equivalent stands idle for an extended period, raw materials and labour cost are usually low however many other cost , designated as fixed cost for eg maintenance , production and depreciation , continue even though the equipment is not in active use . more importantly anytime a plant is not producing a product, it is also not producing revenue . sometimes must be allowed periodically to perform scheduled routine maintenance however , down time kept to a necessary minimum , as it is one of the chief sources of profitability in process plant .

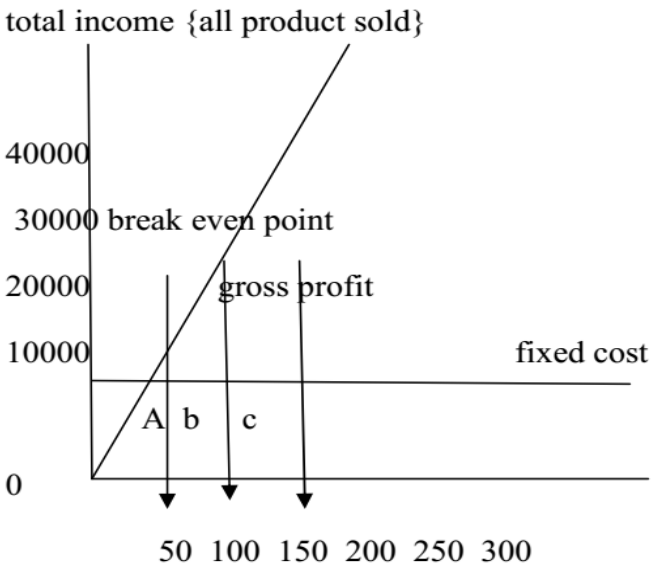
Sales demand rate of production and operating time are closely interrelated . the ideal plant should operate under a time schedule that gives the maximum production rate consistent market demand , safety , maintainability and economic operating conditions. In this way the total cost perunit of production is minimised because the variable cost average over time are very low .

If the production capacity of the process is greater than the sales demand , the operating can be operated continuously by reducing the capacity periodically at full capacity

This figure shows the effect on cost time profits based on the rate of production as indicated in this figure , the fixed cost remains constant and then total product cost increases as a rate of production increases. The point where the total product cost equals the total income is designated as break even point . under the condition , a desirable production rate for this chemical process plant should be approximately $5 \text{ X } 10^6$ kg / year , because this represents the point of maximum gross and net profit. By considering sales demand along with the capacity and operating characteristics of the equipment , the enginers are recommended the production rate and operating scheduled at will give optimum economic results .

Break even chart for optimum

Analysis of production



A – production schedule for break even condition

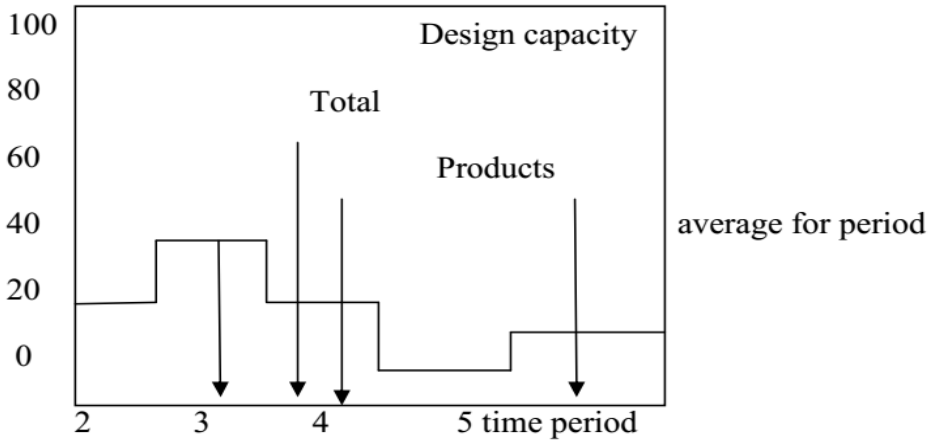
B - production schedule for minimum cost per unit

C – production schedule for maximum profit per day

This shows graphically how production rate affects cost and profits . the fixed cost remains constant while the total product cost , as well as the profit , increases with increased rate of production. The point where total product cost of equals totals income represents the break even point and the optimum production schedule must be at a production rate higher than that corresponding to the breaks even point .

Capacity factor

Capacity factor for two product for five days



Demand factor = Tm / c

Capacity factor = A / C

Load factor = A/M

Where RM ⟶ maximum instantaneous production of product R

S m = maximum instantaneous production of product S

T m = maximum instantaneous production of both products

Demand factor :

A demand factor may be defined as ratio maximum instantaneous production rate for which the equipment was designed. A plant that operators on one 8 hours shift at full capacity may have hundred percent . demand factor during that period, but over a period (1 year) it is operating at a capacity factor of 33 1/3 %. Since it could operate 24 hrs a day with a further decrease in total unit cost assuming that the same fixed cost would apply.

Capacity factor :

It is defined as the ratio of the average production rate for a given time period to the design production rate. The actual production rate (average)for a given period thus is equal to the capacity factor times of design factor .

For example ; if a plant is designed for a capacity of 1000 lb/hr, but it never produces more than 800 lb/hr , the demand factor is 0.8 or 80%. If the average production rate is 600lb/hr for a given time period of a month, the capacity factor is 0.6 for 60%

Load factor :

Load factor is also used for comparing the average production rate with the maximum instantaneous rate . process palnts are usually designed and operated at 100% but the capacity factor may be considerably less over a extended period of time .

Cost , earning profit and returns:

All cost will be considered to full in either of two groups. Those annual cost which can be considered to vary directly , more or less, with the annual production and which will be called variable cost and those which remain constant , more or less for the year regardless of the production rate and which will be called as fixed cost .

For example ; for variable cost =raw materials , direct labour , process services , maintenance , miscellaneous supplies, direct supervisions, laboratory charges, royalty, packaging et c

Example ; firxed cost = indirect plant cost , investment cost , depreciation , taxes, insurance , interest on inventories ,plant equipment etc

Over head charges: project , supplies ,rent etc

Management expenses : executive , research , legal

Selling expenses; cost of selling delivery and technical services

Cost index ;

Cost index is an index value for a given time showing the cost at that time relative to obtain base time of the cost at some time in the cost is known , the equivalent cost of present can be determined by multiplying the original cost by the ratio of the present index value to index value applicable when the original cost was obtained namely :

Present cost = original cost [index value at present /index value at time original cost was obtained]

Cost index can be used a given general estimate, but no index can taken into account all factors , such as special technological advancement or local conditions. The common index permit fairly accurate estimates it the period involved is less than10 years. Index is frequently used to extrapolate cost into the near future. Many different types of cost indexes are published regularly the most common of this indexes are ;

1. Marshell and swift equipment lost
2. Process – industry equipment indexes
3. The engineering news – record construction index
4. Nelsons – fairer refinary construction index

Distinguish variable cost with fixed cost :

Fixed cost ; expenses that do not vary with the volume of production are known as fixed cost. Eg managers salary , office rent , factory rent insurance

Variable cost : expenses that vary almost in direct proportion to the volumes of production or sales are called variable expenses. Ex fuel , packing expenses , materials, wages etc

FIXED COST	VARIABLE COST
They do not depend on the volume of production and sales	Depends upon the volume of production and sales
They do not normally charge up to full capacity of a firm	They are in the nature of changing as per capacity utilisation
Fixed cost perunit always changing	Variable cost per unit remains utilisation
Total fixed cost remains constant	Total of variable cost always varies