# Lecture 4: Variable Load and Load Curves

The function of a power station is to deliver power to a large number of consumers. However, the power demands of different consumers vary in accordance with their activities. The result of this variation in demand is that load on a power station is never constant; rather it varies from time to time. Most of the complexities of modern power plant operation arise from the inherent variability of the load demanded by the users. Unfortunately, electrical power cannot be stored and, therefore, the power station must produce power as and when demanded to meet the requirements of the consumers. On one hand, the power engineer would like that the alternators in the power station should run at their rated capacity for maximum efficiency and on the other hand, the demands of the consumers have wide variations. This makes the design of a power station highly complex.

## 4.1 Variable Load on Power Station

*The load on a power station varies from time to time due to uncertain demands of the consumers and is known as* variable load on the station.

A power station is designed to meet the load requirements of the consumers. An ideal load on the station, from stand point of equipment needed and operating routine, would be one of constant magnitude and steady duration. However, such a steady load on the station is never realized in actual practice. The consumers require their small or large block of power in accordance with the demands of their activities.

### Effects of variable load

**(i) Need of additional equipment.** The variable load on a power station necessitates to have additional equipment. In a modern power plant, there is much equipment devoted entirely to adjust the rates of supply of raw materials in accordance with the power demand made on the plant.

**(ii) Increase in production cost.** The variable load on the plant increases the cost of the production of electrical energy. An alternator operates at maximum efficiency near its rated capacity. If a single alternator is used, it will have poor efficiency during periods of light loads on the plant. Therefore, in actual practice, a number of alternators of different capacities are installed so that most of the alternators can be operated at nearly full load capacity.

### 4.2 Load Curves

*The curve showing the variation of load on the power station with respect to* (*w.r.t*) *time is known as a* load curve. The load on a power station is never constant; it varies from time to time. These load variations during the whole day (*i.e.,* 24 hours) are recorded half-hourly or hourly and are plotted against time on the graph. The curve thus obtained is known as *daily load curve* as it shows the variations of load *w.r.t.* time during the day.

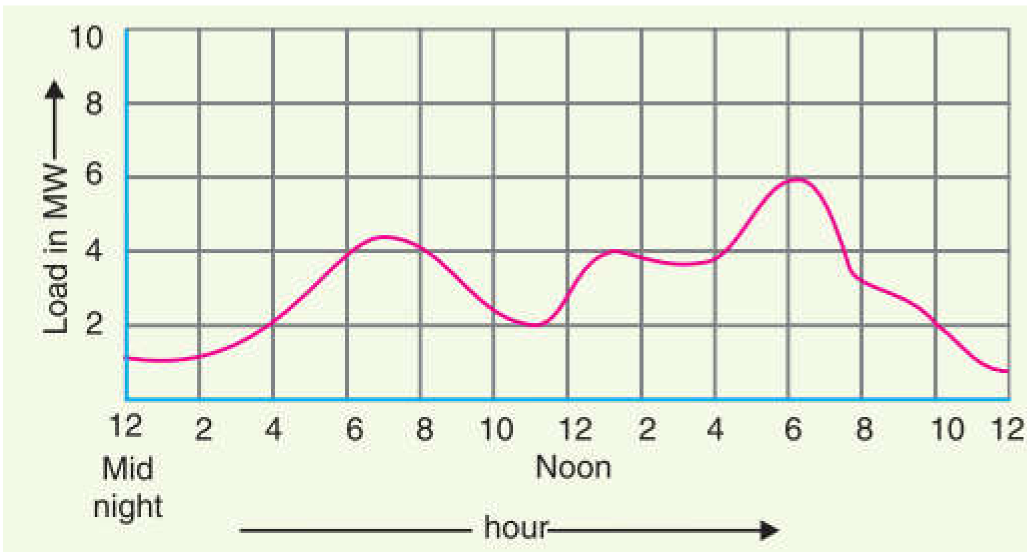


Figure 4.1

**Fig. 4.1.** Shows a typical daily load curve of a power station. It is clear that load on the power station is varying, being maximum at 6 P.M. in this case. It may be seen that load curve indicates at a glance the general character of the load that is being imposed on the plant.

The *monthly load curve* can be obtained from the daily load curves of that month. For this purpose, **average*** values of power over a month at different times of the day are calculated and then plotted on the graph. The monthly load curve is generally used to fix the rates of energy. The *yearly load curve* is obtained by considering the monthly load curves of that particular year. The yearly load curve is generally used to determine the annual load factor.

***For instance, if we consider the load on power station at mid-night during the various days of the month, it may vary slightly. Then the average will give the load at mid-night on the monthly curve.***

***Note:*** *The daily load curves have attained a great importance in generation as they supply the following information readily:*

i. ***T****he daily load curve shows the variations of load on the power station during different hours of the day.*

ii. *The area under the daily load curve gives the number of units generated in the day.*
*Units generated/day = Area (in kWh) under daily load curve.*

iii. *The highest point on the daily load curve represents the maximum demand on the station on that day.*

iv. *The area under the daily load curve divided by the total number of hours gives the average load on the station in the day.*

$$Average\ load\ = \frac{Area\ (in\ kWh)\ under\ daily\ load\ curve}{24\ hours}$$

v. *The ratio of the area under the load curve to the total area of rectangle in which it is contained gives the load factor.*

$$Load\ Factor = \frac{Average\ load}{Max.demand} = \frac{Average\ load\ \times 24}{Max.demand\ \times 24}$$

$$Load\ Factor = \frac{\text{Area (in kWh) under daily load curve}}{\text{Total area of rectangle in which the load curve is contained}}$$

vi. *The load curve helps in selecting the size and number of generating units. The number and size of the generating units are selected to fit the load curve. This helps in operating the generating units at or near the point of maximum efficiency.*

vii. *The load curve helps in preparing the operation schedule of the station. Operation schedule is the sequence and time for which the various generating units (i.e., alternators) in the plant will be put in operation.*

**4.3 Important Terms and Factors**

**(*i*) Connected load.** *It is the sum of continuous ratings of all the equipment connected to supply system.*

A power station supplies load to thousands of consumers. Each consumer has certain equipment installed in his premises. The sum of the continuous ratings of all the equipment in the consumer's premises is the "connected load" of the consumer.

**(*ii*) Maximum demand:** *It is the greatest demand of load on the power station during a given period.*

The load on the power station varies from time to time. The maximum of all the demands that have occurred during a given period (*say* a day) is the maximum demand.

**(*iii*) Demand factor.** *It is the ratio of maximum demand on the power station to its connected load i.e,*

$$Demand\ factor\ = \frac{Maximum\ demand}{Connected\ load}$$

The value of demand factor is usually less than 1. It is expected because maximum demand on the power station is generally less than the connected load. The knowledge of demand factor is vital in determining the capacity of the plant equipment.

**(*iv*) Average load.** *The average of loads occurring on the power station in a given period* (*day or month or year*) *is known as* **average load** *or* **average demand**

$$Daily\ average\ load\ = \frac{No.of\ units\ (kWh)\ generated\ in\ a\ day}{24\ hours}$$

$$Monthly\ average\ load\ = \frac{No.of\ units\ (kWh)\ generated\ in\ a\ month}{Number\ of\ hours\ in\ a\ month}$$

$$Yearly\ average\ load\ = \frac{No.of\ units\ (kWh)\ generated\ in\ a\ year}{8760\ hours}$$

**(*v*) Load factor.** *The ratio of average load to the maximum demand during a given period is known as load factor i.e,*

$$Load\ factor\ = \frac{Average\ load}{Max.demand}$$

If the plant is in operation for T hours,

$$Load\ factor\ = \frac{Average\ load\ \times T}{Max.demand\ \times T}$$

$$Load\ factor\ = \frac{Units\ generated\ in\ T\ hours}{Max.demand\ T\ hours}$$

*The load factor may be daily load factor, monthly load factor or annual load factor if the time period considered is a day or month or year. Load factor is always less than 1 because average load is smaller than the maximum demand. The load factor plays key role in determining the overall cost per unit generated. The higher the load factor of the power station, lesser will be the cost per unit generated. It is because higher load factor means lesser maximum demand. The station capacity is so selected that it must meet the maximum demand. Now, lower maximum demand means lower capacity of the plant which, therefore, reduces the cost of the plant*

**(vi) Diversity factor**. *The ratio of the sum of individual maximum demands to the maximum demand on power station is known as diversity factor i.e*

$$Diversity\ factor\ = \frac{Sum\ of\ individual\ max.demands}{Max.demand\ on\ power\ station}$$

*A power station supplies load to various types of consumers whose maximum demands generally do not occur at the same time. Therefore, the maximum demand on the power station is always less than the sum of individual maximum demands of the consumers. Obviously, diversity factor will always be greater than 1.* ***There is diversification in the individual maximum demands i.e., the maximum demand of some consumers may occur at one time while that of others at some other time. Hence, the name diversity factor.***

*The greater the diversity factor, the lesser is the cost of generation of power.* ***Greater diversity factor means lesser maximum demand. This in turn means that lesser plant capacity is required. Thus, the capital investment on the plant is reduced.***

**(*vii*) Plant capacity factor.** *It is the ratio of actual energy produced to the maximum possible energy that could have been produced during a given period i.e.*

$$Plant\ capacity\ factor = \frac{Actual\ energy\ produced}{Max.energy\ that\ could\ have\ been\ produced}$$

$$= \frac{Average\ demand \times T}{Plant\ capacity \times T}$$

$$= \frac{Average\ demand}{Plant\ capacity}$$

Thus if the considered period is one year,

$$Plant\ capacity\ factor = \frac{Annual\ kWh\ output}{Plant\ capacity \times 8760}$$

**4.4 Units Generated per Annum**

It is often required to find the kWh generated per annum from maximum demand and load factor. The procedure is as follows:

$$Load\ factor = \frac{Average\ load}{Max.demand}$$

Average load = Max. Demand × L.F

Units generated/annum = Average load (in kW) × Hours in a year

= Max. Demand (in kW) × L.F. × 8760

**4.5 Types of Loads**

A device which taps electrical energy from the electric power system is called a load on the system. The load may be resistive (e.g., electric lamp), inductive (e.g., induction motor), capacitive or some combination of them. The various types of loads on the power system are :

***(i) Domestic load***. Domestic load consists of lights, fans, refrigerators, heaters, television, small motors for pumping water etc. Most of the residential load occurs only for some hours during the day (i.e., 24 hours) e.g., lighting load occurs during night time and domestic appliance load occurs for only a few hours. For this reason, the load factor is low (10% to 12%).

***(ii) Commercial load.*** Commercial load consists of lighting for shops, fans and electric appliances used in restaurants etc. This class of load occurs for more hours during the day as compared to the domestic load. The commercial load has seasonal variations due to the extensive use of air conditioners and space heaters.

***(iii) Industrial load***. Industrial load consists of load demand by industries. The magnitude of industrial load depends upon the type of industry. Thus small scale industry requires load up to 25 kW, medium scale industry between 25kW and 100 kW and large-scale industry requires load above 500 kW. Industrial loads are generally not weather dependent.

***(iv) Municipal load***. Municipal load consists of street lighting, power required for water supply and drainage purposes. Street lighting load is practically constant throughout the hours of the night. For water supply, water is pumped to overhead tanks by pumps driven by electric motors. Pumping is carried out during the off-peak period, usually occurring during the night. This helps to improve the load factor of the power system.

***(v) Traction load.*** This type of load includes tram cars, trolley buses, railways etc. This class of load has wide variation. During the morning hour, it reaches peak value because people have to go to their work place. After morning hours, the load starts decreasing and again rises during evening since the people start coming to their homes.

***Example 4.1***

*The maximum demand on a power station is 100 MW. If the annual load factor is 40%, calculate the total energy generated in a year.*

Solution.

Energy generated/year = Max. Demand × L.F. × Hours in a year

$= (100 \times 10^3) \times (0{\cdot}4) \times (24 \times 365)$ kWh

$= 3504 \times 10^5$ kWh

***Example 4.2***

*A generating station has a connected load of 43MW and a maximum demand of 20 MW; the units generated being $61{\cdot}5 \times 10^6$ per annum. Calculate (i) the demand factor and (ii) load factor*

*Solution*

$$Demand\ factor = \frac{Max.demand}{Connected\ load} = \frac{20}{43} = 0.465$$

$$Average\ demand = \frac{Units\ generated\ /\ annum}{Hours\ in\ a\ year} = \frac{61.5 \times 10^6}{8760} = 7020kW$$

$$Load\ factor = \frac{Average\ load}{Max.demand} = \frac{7020}{20 \times 10^3} = 0.351\ or\ 35.1\%$$

***Example 4.3***

*A 100 MW power station delivers 100 MW for 2 hours, 50 MW for 6 hours and is shut down for the rest of each day. It is also shut down for maintenance for 45 days each year. Calculate its annual load factor.*

*Solution:*

Energy supplied for each working day
= (100 × 2) + (50 × 6) = 500 MWh
Station operates for = 365 - 45 = 320 days in a year
∴ Energy supplied/year = 500 × 320 = 160,000 MWh

$$Annual\ Load\ factor = \frac{MWh\ supplied\ per\ annum}{Max.demand\ in\ MW\ \times Working\ hours} \times 100$$

$$Annual\ Load\ factor = \frac{160{,}000}{(100) \times (\ 320 \times\ 24)} \times 100 = 20.8\%$$

**4.6 Load Duration Curve**

*When the load elements of a load curve are arranged in the order of descending magnitudes, the curve thus obtained is called a* **load duration curve**.

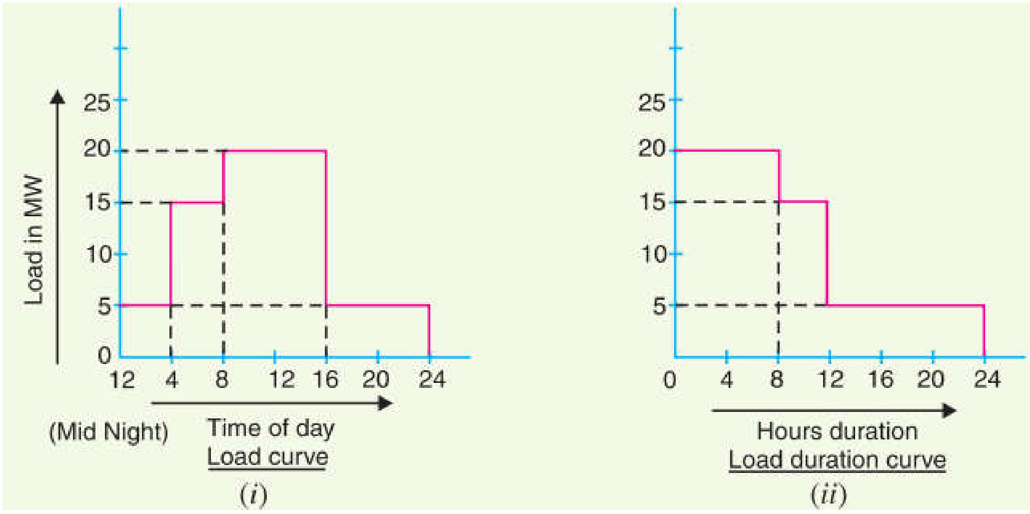


Figure 4.2

The load duration curve is obtained from the same data as the load curve but the ordinates are arranged in the order of descending magnitudes. In other words, the maximum load is represented to the left and decreasing loads are represented to the right in the descending order. Hence the area under the load duration curve and the area under the load curve are equal.

- Fig. 4.2 (*i*) shows the daily load curve. The daily load duration curve can be readily obtained from it.
- It is clear from daily load curve [See Fig. 4.2. (*i*)], that load elements in order of descending magnitude are : 20 MW for 8 hours; 15 MW for 4 hours and 5 MW for 12 hours. Plotting these loads in order of descending magnitude, we get the daily load duration curve as shown in Fig. 4.2 (*ii*).

Note the following about the load duration curve:

- The load duration curve gives the data in a more presentable form. In other words, it readily shows the number of hours during which the given load has prevailed.
- The area under the load duration curve is equal to that of the corresponding load curve. Obviously, area under daily load duration curve (in kWh) will give the units generated on that day.
- The load duration curve can be extended to include any period of time. By laying out the abscissa from 0 hour to 8760 hours, the variation and distribution of demand for an entire

year can be summarized in one curve. The curve thus obtained is called the ***annual load duration*** *curve.*

### 4.7 Typical Demand and Diversity Factors.

The demand factor and diversity factor depend on the type of load and its magnitude.

**TYPICAL DEMAND FACTORS**

| Type of consumer | | Demand factor |
|---|---|---|
| *Residence lighting* | $\frac{1}{4}$ kW | 1·00 |
| | $\frac{1}{2}$ kW | 0·60 |
| | Over 1 kW | 0·50 |
| *Commercial lighting* | Restaurants | 0·70 |
| | Theatres | 0·60 |
| | Hotels | 0·50 |
| | Schools | 0·55 |
| | Small industry | 0·60 |
| | Store | 0·70 |
| *General power service* | 0–10 H.P. | 0·75 |
| | 10–20 H.P. | 0·65 |
| | 20–100 H.P. | 0·55 |
| | Over 100 H.P. | 0·50 |

**TYPICAL DIVERSITY FACTORS**

| | *Residential lighting* | *Commercial lighting* | *General power supply* |
|---|---|---|---|
| Between consumers | 3 – 4 | 1·5 | 1·5 |
| Between transformers | 1·3 | 1·3 | 1·3 |
| Between feeders | 1·2 | 1·2 | 1·2 |
| Between substations | 1·1 | 1·1 | 1·1 |

Load and demand factors are always less than 1 while diversity factors are more than unity. High load and diversity factors are the desirable qualities of the power system. Indeed, these factors are used to predict the load.

**Simple Illustration**

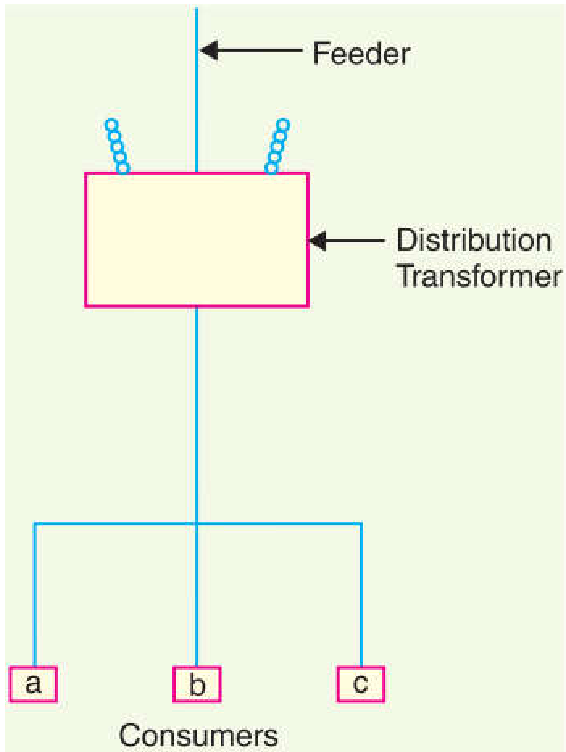


Figure 4.3

Fig. 4.3 shows a small part of electric power system where a distribution transformer is supplying power to the consumers. For simplicity, only three consumers *a*, *b*, and *c* are shown in the figure. The maximum demand of consumer *a* is the product of its connected load and the appropriate demand factor. Same is the case for consumers *b* and *c*. The maximum demand on the transformer is the sum of *a*, *b* and *c*'s maximum demands divided by the diversity factors between the consumers. Similarly, the maximum demand on the feeder is the sum of maximum demands on the distribution transformers connected to it divided by the diversity factor between transformers. Likewise diversification between feeders is recognized when obtaining substation maximum demands and substation diversification when predicting maximum load on the power station.

Note that diversity factor is the sum of the individual maximum demands of the subdivisions of a system taken as they may occur during the daily cycle divided by the maximum simultaneous demand of the system. The "system" may be a group of consumers served by a certain transformer, a group of transformers served by a feeder etc. Since individual variations have diminishing effect as one goes farther from the ultimate consumer in making measurements, one should expect decreasing numerical values of diversity factor as the power plant end of the system is approached. ***This is clear from the above table showing diversity factors between different elements of the power system.***

***Example 4.4***

*A power supply is having the following loads:*

| Type of load | Max. demand (k W) | Diversity of group | Demand factor |
|---|---|---|---|
| Domestic | 1500 | 1·2 | 0·8 |
| Commercial | 2000 | 1·1 | 0·9 |
| Industrial | 10,000 | 1·25 | 1 |

*If the overall system diversity factor is 1·35, determine* (*i*) *the maximum demand and* (*ii*) *connected load of each type.*

**Solution.**

(***i***) The sum of maximum demands of three types of loads is = 1500 + 2000 + 10,000 = 13,500 kW. As the system diversity factor is 1·35,

∴ Max. Demand on supply system = 13,500/1·35 = **10,000 kW.**

(***ii***) Each type of load has its own diversity factor among its consumers.

Sum of max. Demands of different domestic consumers

= Max. Domestic demand × diversity factor

= 1500 × 1·2 = 1800 kW

∴ Connected domestic load = 1800/0·8 = **2250 kW**

Connected commercial load = 2000 × 1·1/0·9 = **2444 kW**

Connected industrial load = 10,000 × 1·25/1= **12,500 kW**

***Example 4.5***

*A generating station has the following daily load cycle:*

| Time(Hours) | 0-6 | 6-10 | 10-12 | 12-16 | 16-20 | 20-24 |
|---|---|---|---|---|---|---|
| Load(MW) | 40 | 50 | 60 | 50 | 70 | 40 |

*Draw the load curve and find*

*(i)* *Maximum demand*

*(ii)* *Units generated per day*

*(iii)* *Average load and*

*(iv)* *Load factor.*

**Solution.** Daily curve is drawn by taking the load along *Y* -axis and time along *X*-axis. For the given load cycle, the load curve is shown in Fig. 3.6.

*(i)* It is clear from the load curve that maximum demand on the power station is 70 MW and occurs during the period 16— 20 hours. ∴ Maximum demand = **70 MW**

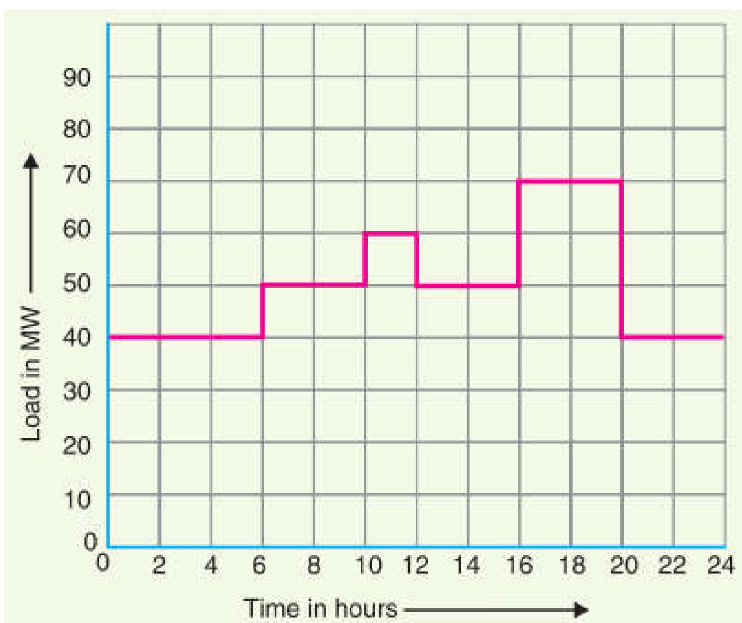


Fig.4.4

*(ii)* Units generated/day = Area (in kWh) under the load curve.

$= 10^3 [40 \times 6 + 50 \times 4 + 60 \times 2 + 50 \times 4 + 70 \times 4 + 40 \times 4]$

$= 10^3\ [240 + 200 + 120 + 200 + 280 + 160]$ kWh

**$= 12 \times 10^5$ kWh**

$$(iii)\ Average\ Load = \frac{Units\ generated/day}{24\ hours} = \frac{12\times10^5}{24} = 50{,}000kW$$

$$(iv)\ Load\ Factor = \frac{Average\ load}{Max.Demand} = \frac{50000}{70\times10^3} = 0.714 = 71.4\%$$

***Example 4.6***

*The daily demands of three consumers are given below:*

| *Time* | *Consumer 1* | *Consumer 2* | *Consumer 3* |
|---|---|---|---|
| *12 midnight to 8 A.M.* | *No load* | *200 W* | *No load* |
| *8 A.M. to 2 P.M.* | *600 W* | *No load* | *200 W* |
| *2 P.M. to 4 P.M.* | *200 W* | *1000 W* | *1200 W* |
| *4 P.M. to 10 P.M.* | *800 W* | *No load* | *No load* |
| *10 P.M. to midnight* | *No load* | *200 W* | *200 W* |

*Plot the load curve and find*

*(i)* *Maximum demand of individual consumer*

*(ii)* *Load factor of individual consumer*

*(iii)* *Diversity factor and*

*(iv)* *Load factor of the station.*

Solution. Figure 4.5 shows the load curve.

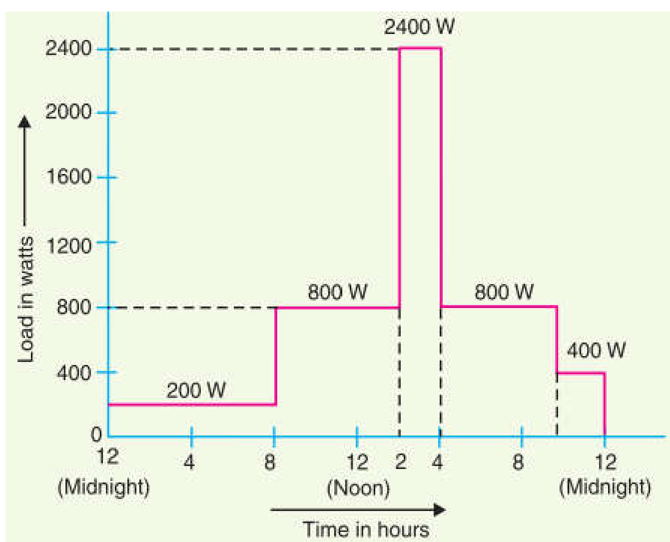


Fig.4.5

***(i)*** Max. Demand of consumer 1 = **800 W**

Max. Demand of consumer 2 = **1000 W**

Max. Demand of consumer 3 = **1200 W**

***(ii)*** $L.F.of\ conusmer\ 1 = \frac{Energy\ consumed/day}{Max.Demand \times Hours\ in\ a\ day} \times 100$

$$= \frac{600 \times 6 + 200 \times 2 + 800 \times 6}{800 \times 24} \times 100 = 45.8\%$$

$$L.F.of\ conusmer\ 2 = \frac{200 \times 8 + 1000 \times 2 + 200 \times 6}{1000 \times 24} \times 100 = 16.7\%$$

$$L.F.of\ conusmer\ 3 = \frac{200 \times 6 + 1200 \times 2 + 200 \times 2}{1200 \times 24} \times 100 = 13.8\%$$

***(iii)*** The simultaneous maximum demand on the station is 200 + 1000 + 1200 = 2400 W and occurs from 2 P.M. to 4 P.M.

$$Dviversity\ factor = \frac{800 + 1000 + 1200}{2400} = 1.25$$

***(iv)*** $Station\ load\ factor = \frac{Total\ energy\ consumed/day}{Simultaneous\ Max.Demand \times 24} \times 100$

$$= \frac{8800 + 4000 + 4000}{2400 \times 24} \times 100 = 29.1\%$$

### 4.8 Load Curves and Selection of Generating Units

The load on a power station is seldom constant; it varies from time to time. Obviously, a single generating unit (i.e., alternator) will not be an economical proposition to meet this varying load. It is because a single unit will have very ***poor**** efficiency during the periods of light loads on the power station. Therefore, in actual practice, a number of generating units of different sizes are installed in a power station. The selection of the number and sizes of the units is decided from the annual load curve of the station. The number and size of the units are selected in such a way that they correctly *fit the station load curve.* Once this underlying principle is adhered to, it becomes possible to operate the generating units at or near the point of maximum efficiency.

**** The efficiency of a machine (alternator in this case) is maximum at nearly 75% of its rated capacity. Refer to Lecture 3. Energy Efficient Electrical Services Part 2, section on Motors.***

***Illustration.***

The principle of selection of number and sizes of generating units with the help of load curve is illustrated in Fig. 4.6. In Fig.4.6 (*i*), the annual load curve of the station is shown. It is clear from the curve that load on the station has wide variations; the minimum load being somewhat near 50 kW and maximum load reaching the value of 500 kW. It hardly needs any mention that use of a single unit to meet this varying load will be highly uneconomical.

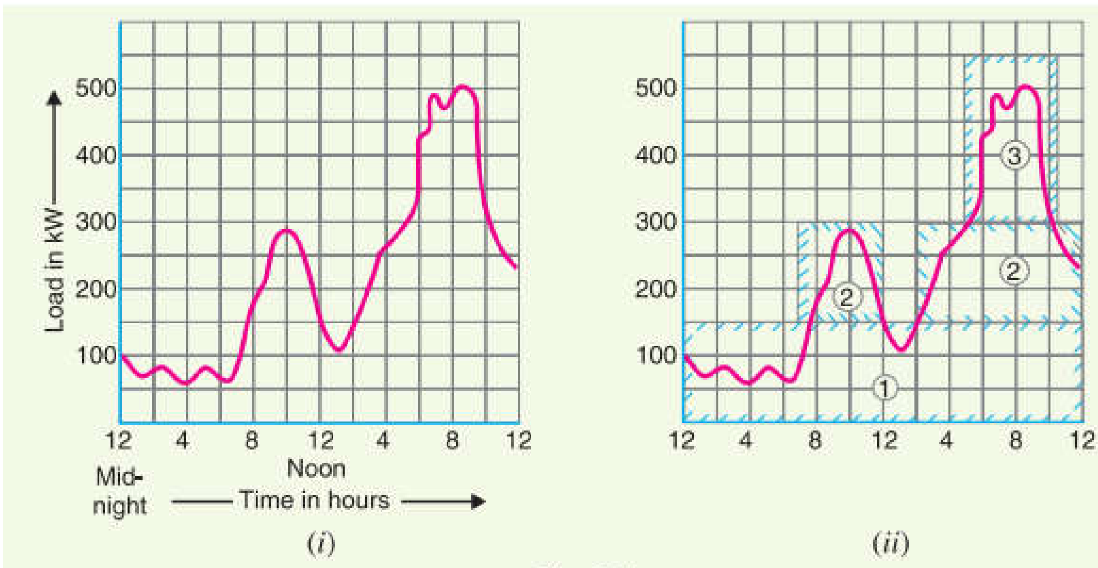


Fig. 4.6

As discussed earlier, the total plant capacity is divided into several generating units of different sizes to fit the load curve. This is illustrated in Fig. 4.6(*ii*) where the plant capacity is divided into ***three**** units numbered as 1, 2 and 3. The cyan colour outline shows the units capacity being used.

***{* It may be seen that the generating units can fit the load curve more closely if more units of smaller sizes are employed. However, using greater number of units increases the investment cost per kW of the capacity}.***

The three units employed have different capacities and are used according to the demand on the station. In this case, the operating schedule can be as under:

| ***Time*** | ***Units in operation*** |
|---|---|
| From 12 am to 7 A.M. | Only unit no.1 is put in operation. |
| From 7 A.M. to 12.00 noon | Unit no. 2 is also started so that both units 1 and 2 are in operation. |
| From 12.00 noon to 2 P.M. | Unit no. 2 is stopped and only unit 1operates. |
| From 2 P.M. to 5 P.M. | Unit no. 2 is again started. Now units 1 and 2 are in operation. |
| From 5 P.M. to 10.30 P.M | Units 1, 2 and 3 are put in operation |
| From 10.30 P.M. to 2.00am | Units 1 and 2 are put in operation. |

Thus by selecting the proper number and sizes of units, the generating units can be made to operate near maximum efficiency. This results in the overall reduction in the cost of production of electrical energy.

**Note that:**

***(i)*** The number and sizes of the units should be so selected that they approximately fit the annual load curve of the station.

***(ii)*** The units should be preferably of different capacities to meet the load requirements. Although use of identical units (i.e., having same capacity) ensures saving* in cost, they often do not meet the load requirement.

***(iii)*** The capacity of the plant should be made 15% to 20% more than the maximum demand to meet the future load requirements.

***(iv)*** There should be a spare generating unit so that repairs and overhauling of the working units can be carried out.

***(v)*** The tendency to select a large number of units of smaller capacity in order to fit the load curve very accurately should be avoided. It is because the investment cost per kW of capacity increases as the size of the units decreases.

***Example 4.7***

*A generating station is to supply four regions of load whose peak loads are 10 MW, 5 MW, 8 MW and 7 MW. The diversity factor at the station is 1·5 and the average annual load factor is 60%. Calculate:*

*(i)* *The maximum demand on the station.*

*(ii)* *Annual energy supplied by the station.*

*(iii)* *Suggest the installed capacity and the number of units.*

*(i)* $Max. Demand\ on\ station = \frac{Sum\ of\ Max.demands\ of\ the\ regions}{Diversity\ factor}$

$$= \frac{10 + 5 + 8 + 7}{1.5} = 20MW$$

*(ii)* $Units\ generated\ per\ annum = Max. Demand \times L.F \times Hours\ in\ a\ year$

$$= (20 \times 10^3) \times (0.6) \times (8760)kWh$$

$$= 105.12 \times 10^6 kWh$$

*(iii)* The installed capacity of the station should be 15% to 20% more than the maximum demand in order to meet the future growth of load. Taking installed capacity to be 20% more than the maximum demand,

Installed capacity = 1·2 × Max. Demand = 1·2 × 20 = 24 MW

Suitable unit sizes are 4, each of 6 MW capacity.

**4.9 Base Load and Peak Load on Power Station**

The changing load on the power station makes its load curve of variable nature. Fig. 4.7. Shows the typical load curve of a power station. It is clear that load on the power station varies from time to time. However, a close look at the load curve reveals that load on the power station can be considered in two parts, namely

***(i)*** Base load

***(ii)*** Peak load

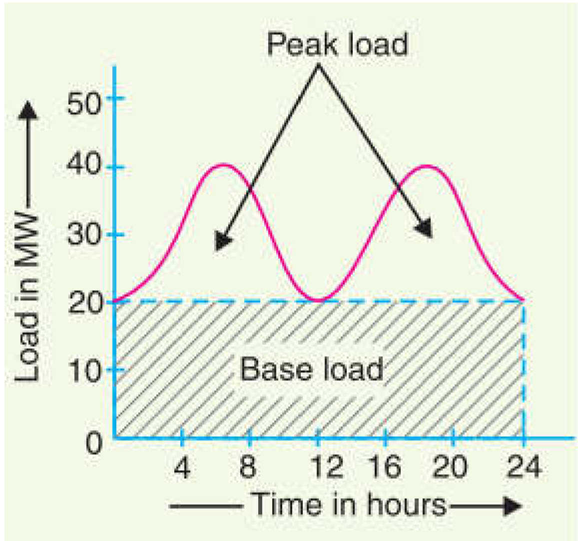


**Fig. 4.7**

(i) Base load. The unvarying load which occurs almost the whole day on the station is known as base load. Referring to the load curve of **Fig. 4.7,** it is clear that 20 MW of load has to be supplied by the station at all times of day and night i.e. throughout 24 hours. Therefore, 20 MW is the **base load** of the station. As base load on the station is almost of constant nature, therefore, it can be suitably supplied without facing the problems of variable load.

(ii) Peak load. The various peak demands of load over and above the base load of the station is known as peak load.

Referring to the load curve of **Fig. 4.7**, it is clear that there are peak demands of load excluding base load. These peak demands of the station generally form a small part of the total load and may occur throughout the day.

**4.10. Method of Meeting the Load**

The total load on a power station consists of two parts viz., base load and peak load. In order to achieve overall economy, the best method to meet load is to interconnect two different power stations. The more efficient plant is used to supply the base load and is known as base load power station. The less efficient plant is used to supply the peak loads and is known as peak load power station. There is no hard and fast rule for selection of base load and peak load stations as it would depend upon the particular situation. For example, both hydro-electric and steam power stations are quite efficient and can be used as base load as well as peak load station to meet a particular load requirement.

**Illustration**

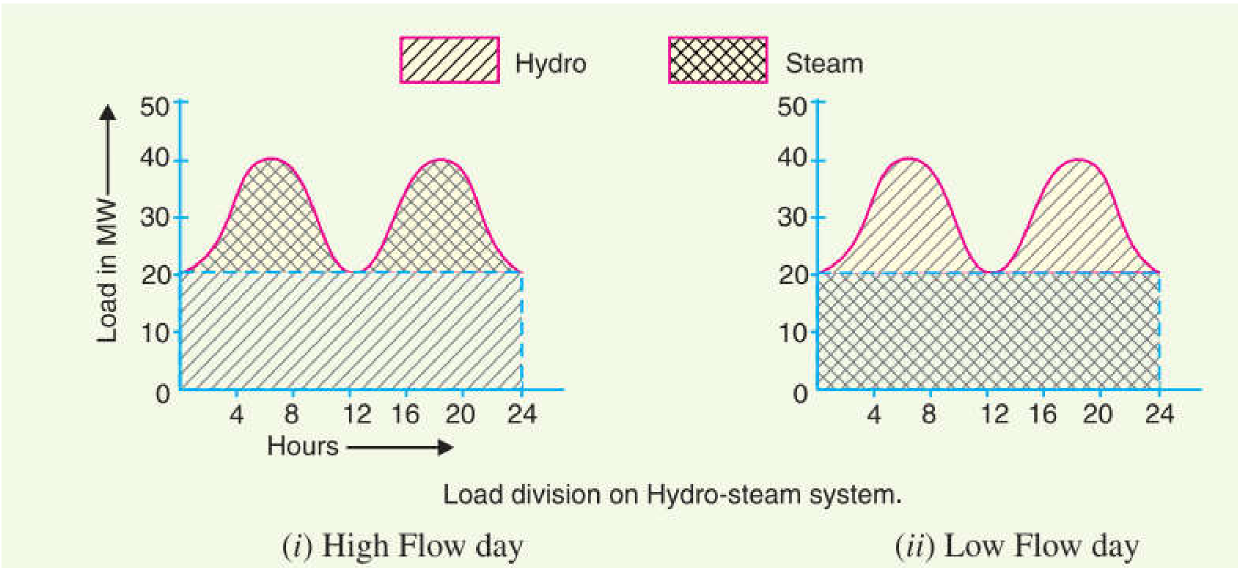


**Fig. 4.8**

The interconnection of steam and hydro plants is a beautiful illustration to meet the load. When water is available in sufficient quantity as in rainy season, the hydroelectric plant is used to carry the base load and the steam plant supplies the peak load as shown in Fig 4.8 (i).

However, when the water is not available in sufficient quantity as in winter, the steam plant carries the base load, whereas the hydroelectric plant carries the peak load as shown in Fig. 4.8 (ii).