TYPES OF LOAD

1. Linear Loads:

- Load impedance is always constant regardless of the applied voltage

- The load current increases proportionately as the voltage increases and decreases as the voltage decreases

- Examples of linear loads are motor, incandescent lighting, heating loads etc.

2. Motor load:

- Induction motors are most commonly used loads. During the starting of an induction motor, a very large current is demanded from the power source, which is known as the starting current. For selecting suitable alternators, the following guidelines can be referred for Motor loads :

Method of Starting	Starting current
Direct on line (DOL)	6~7 times full load current of motor
Star / Delta	2 ~ 2.5 times full load current of motor
Rotor resistance	1.5 ~ 2 times full load current of motor
Auto transformer starting	
40% Tapping	1.2 times full load current of motor
60% Tapping	4 times full load current of motor
80% Tapping	4.5 times full load current of motor

3. Non Linear Loads :

- Load current is not proportional to the instantaneous voltage. Often load current is not continous

- Essentially electronic loads such as computers, UPS, Variable speed motor drives etc.

- UPS & Telecom load controlled by a 12 pulse Thyristor bridge plus a filter (Load should not exceed 90% of alternator rating)

- UPS & Telecom load controlled by a 6 pulse Thyristor bridge plus a filter (Load should not exceed 60% of alternator rating)

- UPS & Telecom load controlled by a 3 pulse Thyristor bridge plus a filter (Load should not exceed 35% of alternator rating)

- Variable speed 6 pulse Thyristor bridge controlled drive (load should not exceed 50% of alternator rating)

4. Special Loads :

- **Lift application** : In this application since the starting motor is very frequent (S4 duty). The starting current of the lift motor should be less than 75% of the rated current of the alternator when there is no base load. In other words Kva rating of the alternator is to be taken as 3 times that of HP rating of thelift motor.

- **Reciprocating compressor application :** Maximum of 66% load current can be of reciprocating compressor motor (Slip ring type with rotor resistance starter) **or**

  Maximum of 33% load current can be of Reciprocating compressor motor (Squirrel cage induction Motor)

APPLIANCES & POWER REQUIREMENT

ITEM	STARTING POWER	ACTUAL POWER
Bulb (60 w)	-	60 VA
Tubelight	80 VA	50 VA
Ceiling fan	-	60 VA
Air conditioner (1.5T)	5000 VA	1800 VA
Refridgerator (165L)	1000 VA	280 VA
1 HP Motor	2000 VA	750 VA
Computer	-	250 VA
Laser printer	-	200 VA
Fax	-	45 VA
Xerox	-	1500 VA
29" TV	-	100 VA
Mixie	-	450 VA
EPABX	-	40 VA
Music system	-	60 VA
Iron Box	-	750 VA
Water Heater	-	1500 VA

Note : The wattages mentioned above are approximate indicators. The wattages may vary from brand and size.

SAMPLE LOAD CALCULATION - 1

A1) Three phase motors

SN	Description	Qty	Rating in Kva	Starting Kva rating (6 time cont. Kva)
1	Center Lathe	1	2.75	16.5
2	Vertical Drilling M/c.	1	1.875	11.25
3	Vertical Milling M/c.	1	0.938	5.65
4	Vertical Milling M/c.	1	3.75	22.5
5	Compressor	1	3.75	22.50
	Total		**13.06**	**22.50**

A2) Single phase motors

SN	Description	Qty	Rating in Kva	Starting Kva rating (6 time cont. Kva)	Total KVA
1	Hand Grinder 1.5 Kw each	1	1.875	11.25	1.875
2	Hand Drilling 1.5 Kw each	2	1.875	11.25	3.75
3	Fans 60 Watt each	6	0.075	1.6	0.45
	Total	**-**	**-**	**11.25**	**6.08**

A3) Other Loads : Single phase

SN	Description	Qty	Total Kva
1	Tubelights (40 watts)	10	0.4
	Total	-	0.4

Total single phase load (B) = A2 + A3

= 6.08 + 0.4 = 6.48 Kva

Since the total single phase load is distributed equally on all three phases, the load on each phase is = 6.48 / 3 = 2.16 Kva

Corresonding 3 phase load © = 1.732 * 2.16 = 3.74 Kva

Total continuous Kva Load (L) = A1 + C = 13.06 + 3.74 = 16.80 Kva

Assuming that the largest motor is started last,

base load on DG is = 16.8 – 3.75 =13.05 Kva

KVA load required while starting last m/c = 13.05+22.5 Kva = 35.55 Kva

Final recommendation is 15 KVA (13.05 + 20% reserve)

Alternator is capable of taking 2.5 times the rated Kva (ie) in this case 37.5 Kva. Hence load required for starting the last machine 35.55 KVA is available.

SAMPLE LOAD CALCULATION - 2

The following loads are used in Anna Nagar BPCL's company owned company operated outlet.

A) Three phase load (compressor) 3.7 KW = 4.625 KVA.

B) Single phase load

• Split A/C	: 3 KW	= 3.75 kva.
• Water pump	: 0.75 KW	= 0.93 kva.
• Diesel & petrol pump motor	: 3 x 0.56 KW =1.68 KW	= 2.10 kva.
• Tube lights	: (50 x 60 w)/1000 =3 KW	= 3.75 kva.
• Halogen lamps	: 10 x 1KW =10 KW	=10.00 kva.
• Computer	:	0.50 kva.
Total Single phase load		= 21.00 KVA

Single phase load is distributed equally on all three phases.

So 21/3 = 7 KVA.

Corresponding 3 phase load = 1.732 x single phase load
= 1.732 x 7 KVA = 12 KVA

Total KVA required = A+B = 4.625 + 12 = 16.75 KVA

Reserve for future (20%) = 3.4 KVA

Total KVA recommended = 20 KVA

SAMPLE LOAD CALCULATION - 3

The following loads are used in IBP Co.`s dealer outlet at Koyambedu.

A) Three phase load (comprerssor) = 3.7 kw = 4.625 kva.

B) Single phase load:

- Diesel & Petrol pump motor = 6 x 0.7 KVA = 4.20 kva
- Water pump =1 x 0.93 KVA = 0.93 kva
- Mercury vapour lamp = 3 x 500 w = 3.50 kva
- Halogen lamp = 8 x 500 w = 4.00 kva
- Water cooler = 1 x 600 w = 0.60 kva
- Tube lights = 100 x 60 w = 5.40 kva

Total single phase load = 18.63 KVA

Load per phase = 18.63 / 3 = 6.21 KVA

Corresponding three phase load =1.732 x single phase load

= 1.732 x 6.21= 10.75 KVA

Total KVA required A+B = 4.625+10.75 =15.375 KVA

Reserve for future 20 % = 3.2 KVA

Total KVA recommended = 20 KVA