



## Steps in Sizing a generator

The first step in sizing and selecting a generator set is to establish the following parameters.

- ◆ **Minimum generator set load/capacity** : Running a generator set under light load can lead to engine damage, reducing reliability.
  - ◆ Manufacturers do not recommend running generator sets at less than 30 percent of rated load. Load banks should supplement the regular loads when loading falls below the recommended value.
- ◆ **Voltage Dip** - Various pieces of electrical equipment have different tolerances for voltage dip. (Manufacturer's specification sheets should be consulted for the allowable drop in input voltage). The starting load of electric motors can be six times running load. Starting loads can affect the generator's voltage regulator system by reducing the voltage available. Generators must be sized large enough to ensure the maximum allowable voltage drop to the system is not exceeded. Choosing lower allowable voltage dip requires a larger generator set.
- ◆ **Frequency Dip** - Generator sets produce a nominal frequency. Excessive loads can overload an engine's governor system, reduce engine speed and hence generator frequency. The system designer has to take account of the maximum transient drop in speed and frequency the system will permit. As you reduce the maximum allowable frequency dip, you increase the size of the generator set needed.
- ◆ **Ambients** - An engine requires a certain quantity of air for combustion to achieve its rated power. Altitude, temperature and humidity will all affect the air density. An engine's power rating assumes an nominal altitude of less than 1000 feet, ambient temperature less than 85°F, and humidity less than 75%. Manufacturers detail the percentage reduction in available power for ambients conditions that exceed those assumed for the nominal rating.
- ◆ **Duty cycle** : Generator set size is also influenced by whether the application is for standby power, prime power or utility paralleling.
  - ◆ Standby is an intermittent rating. It assumes no overload capability. Standby ratings given by manufacturers can range 10% to 20% higher than prime ratings. Standby ratings assume the set will only have to run for a temporary period during main power interruption and are not for continuous operation or prime power.
  - ◆ Prime power systems generally have a minimum of 10 percent overload capacity for one hour in any 12 hours of operation.
  - ◆ Continuous power systems are designed to operate extended hours at steady constant load. They should not be operated in excess of the continuous rating.
  - ◆ In Pakistan, most if not all applications, are of unlimited prime nature. The genset should be sized with an average load factor of 70% (maximum 80%).
- ◆ **Fuel** : The preference for gas, diesel, or LP will affect generator set choices. Often, generator sets running on gas or LP must be oversized due to derating.
- ◆ **Phase** : Select either single- or three-phase. The three-phase selection permits single-phase loads but the assumption is that the single-phase loads will be balanced across the three phases to limit voltage imbalance.
- ◆ **Frequency** : Either 50 Hz or 60 Hz.
- ◆ **Voltage** : Voltage choices are usually a function of selected frequency.
  - ◆ The next and most important step in sizing a generator set is to identify every type and size of load the generator set will power. In general, when non-linear loads are present, it may be necessary to oversize the alternator.