



Understanding The Difference Between Three-Phase And Single Phase Generators

◆ Choosing Between Single-Phase and Three-Phase Generators:

- ◆ The output of single-phase generators is usually limited to 25 kVA. At higher ratings, it is less expensive to draw single-phase power supply from a three-phase generator than to buy dedicated single-phase units for higher loads.
- ◆ The choice between a single-phase and a three-phase output is solely dependent on the kind of application to be powered. Single-phase generators are best suited for single-phase output whereas a three-phase generator can easily provide both single- and three-phase power. If all your appliances operate on single-phase power, it makes sense to choose a single-phase generator. If you need to operate appliances that work on different phases, a three-phase generator will serve you best. However, it is essential to account for load balances while stepping up a single-phase generator to a three-phase unit.
- ◆ To understand the conversion of a three-phase generator to a single-phase one and vice versa, let us first take a brief look at the internal configuration of these two kinds of generators.

◆ Single-Phase Generators:

- ◆ In a single-phase generator, the stator has a number of windings connected in series to form a single circuit across which the output voltage is generated.
 - ◆ Equal voltage across all stator windings in phase with each other
For instance, in a 4-pole generator, the four poles of the rotor are evenly spaced around the frame of the stator. At any given point in time, each rotor pole is in the same position relative to the stator windings as any other rotor pole. Hence, the voltages induced in all the stator windings are of the same value and amplitude and also in phase with each other at every time.
 - ◆ Series connection of stator windings
In addition, since the windings are connected in series, the voltages produced in each winding add up to produce a final generator output voltage that is four times the voltage across each of the individual stator windings.
- ◆ Single-phase power distribution is commonly used in residential areas and in rural areas where loads are small and uncommon and the cost of setting up a three-phase distribution network is high.

◆ Three-Phase Generators:

- ◆ In a three-phase generator, three single-phase windings are spaced such that there is a phase difference of 120° among the voltages induced in each of the stator windings. The three phases are independent of each other.
 - ◆ Star or Y Configuration
In a star or Y connection, one lead from each winding is connected to form the neutral. The opposite end of each winding, known as the finish end, is connected to a line terminal each. This produces a line voltage greater than the individual voltage across each winding.
 - ◆ Delta Configuration
In a delta configuration, the start end of one phase is connected to the finish end of the adjacent phase. This produces a line voltage equal to the phase voltage. Electrical utilities and commercial generators produce three-phase power.