



How Power Factor can influence the sizing of generator sets for motor starting loads

- ◆ Power Factor (PF) in an AC circuit is the ratio between apparent power measured in volt-amperes and real power measured in watts. This difference is expressed as a percentage. For example, 0.8 PF equals 80%.
 - ◆ Real power is the actual capacity of the electrical power source to power the equipment it is connected to.
 - ◆ Apparent power is the product of the current and voltage within a circuit. Reactive loads such as inductors and capacitors have energy storage within the load producing a time difference between the current and voltage wave forms. The stored energy returns to the source and is not available to power the load, hence apparent power.
 - ◆ An electrical system with a low power factor (less than 0.8) will require higher currents to deliver to the connected load a required quantity of real power than a system with a high power factor. Hence, lower PFs require larger alternators or generator sets to properly serve the load.
 - ◆ It's important to note the utility company supplies their customers with volt-amperes, but charges them for watts.
 - ◆ To overcome inertia during the start period, starting kW can be six times running kW. Much lower starting power factors result in higher starting kVAs.
 - ◆ The generator sizing program will calculate the kW for the engine to have sufficient horsepower and generator size to manage the higher starting kVA.
 - ◆ If the load is just one large, motor it may be necessary to determine the engine size and match it to a generator with a higher-rated starting kVA capacity.

- ◆ **Leading Power Factors:**
 - ◆ Capacitive loads, overexcited synchronous motors, etc. cause leading power factor, where current leads voltage. Lagging power factor, where current lags voltage, is more generally the case and is a result of the inductance of the circuit. Three-phase generator sets are rated for 0.8 PF loads and single-phase generator sets for 1.0 PF loads.
 - ◆ Caution should be used whenever applying generator sets to leading power factor loads. Only slightly leading power factor can cause generator sets to lose voltage control.
 - ◆ A reasonable guideline is that a generator set can carry up to 10 percent of its rated kVAR capability in leading power factor loads without being damaged or losing control of output voltage.
 - ◆ The most common sources of leading power factor are lightly loaded UPS systems with input filters and power factor correction devices for motors.
 - ◆ Loading the generator set with lagging power factor loads prior to the leading power factor loads can improve stability.