

kW Explained

Overview

When you start comparing industrial generators, one of the first things you will notice is the kW rating. Kilowatts are the standard measurement of a generator's electrical capacity. Understanding what kW means, how it relates to load, and how it affects performance is essential for selecting the right generator for your facility.

What a kW Rating Means

A kilowatt is a measure of real electrical power. The kW rating tells you how much usable power the generator can produce at its rated voltage and frequency. If the generator is listed as a 200 kW unit, that means it can support up to 200 kilowatts of connected load under normal conditions. This includes everything the generator will power, such as motors, pumps, lighting, cooling systems, computers, and emergency equipment.

Understanding Starting Load (Inrush Current)

One of the biggest mistakes buyers make is assuming that kW is the same as the total amount of equipment they want to run. Loads must be calculated carefully, and many types of equipment draw more power when starting than they do while running. This is known as starting load or inrush current. Motors, compressors, HVAC units, and pumps can demand two to three times their running load during startup. Your generator must have enough capacity to handle these surges without dropping voltage or shutting down.

kW vs kVA

The difference between kW and kVA also matters. Generators are rated in both kW and kVA, and the relationship between the two depends on power factor. Most commercial facilities operate at a standard power factor of 0.8. This means that a 250 kVA generator provides 200 kW of usable power. The kW rating is what you rely on for real load support. Power factor becomes more important in facilities with many inductive loads such as motors and pumps.

Environmental Derating

Environmental conditions also affect the usable kW output. High temperatures reduce engine efficiency. High altitude reduces available oxygen. Both can cause a generator to derate, meaning it cannot produce its full rated kW under those conditions. This is important for regions such as Colorado and Wyoming where altitude has a direct impact on generator performance. Proper sizing accounts for these factors so the generator delivers the capacity you expect during an outage.

Fuel Type and Load Behavior

Fuel type can also influence performance under load. Diesel engines typically handle inrush loads and sudden changes in demand more effectively than natural gas engines. Natural gas units provide strong long term runtime and lower emissions, but facilities with heavy motor loads often choose diesel for its surge handling capability.

Why You Need Headroom

The most important point is that your generator should not match your exact load. You need margin above your highest expected running load to cover starting loads, seasonal demand changes, equipment expansion, and derating factors. Many facilities size their systems to run at roughly 60 to 80 percent of rated capacity during normal operation. This provides enough headroom for surges and future growth.

Why kW Matters

Understanding kW helps you choose a generator that will support your facility safely and reliably. With accurate load measurements, proper planning for starting currents, and awareness of environmental conditions, you can select a system that delivers stable power during any outage. This knowledge also helps prevent undersizing, which is one of the most common causes of generator failure and overload shutdowns.