Consultant's Corner: Silicon Controlled Rectifiers

consultants corner

Silicon controlled rectifiers and how they affect your standby load profile

The load profile found in today's hospitals, offices and public buildings requires very high-quality power. However, non-linear loads caused by variable-speed drives or uninterruptible power supplies (UPS) serving data processing systems can greatly affect line current and voltage. While utility power can often accommodate these changes, standby generating systems can be greatly affected if they are undersized or designed incorrectly.

The cause of many non-linear load problems result from silicon-controlled rectifiers (SCR) used in systems to convert AC to DC Power. These devices inherently affect the system's sine wave form. If the distortion is great enough, the gen set cannot adequately hold voltage and current output. The gen set engine speed will vary, attempting to seek the correct rpm to meet the load requirements. This can set up further line disturbances that can affect connected loads. It also creates excessive heat in the generator and may create heating in SCRs.

Solutions to SCR concerns

The most common way to handle non-linear load concerns today in data processing and computer centers is to use a static uninterruptible power supply. This device uses an AC to DC converter, a battery system and an AC to DC inverter. These units can tolerate wide swings in voltage and current, yet still provide high-quality power to the connected loads. These systems also can affect waveform and should be filtered to reduce their harmonic output. However, these systems are designed to allow input power to bypass the critical load directly, so it's important that the power source (utility or gen set) can provide good quality power. For gen sets, that means sizing is critical.

Sizing criteria

Sizing criteria used in the past for gen sets and transformers are not adequate for the non-linear loads found in today's load profiles. Following is a method to better size for these loads:

1. Establish UPS and/or non-linear load input kW. The UPS input kW is equal to its output, divided by the UPS and/or non-linear load input kW. The UPS input kW is equal to its output, divided by the UPS efficiency, plus any battery recharging that takes place while the gen set is operating.

2. Multiply the kW by the following k-factors if:

· The gen set will ONLY power the UPS or non-linear load system:

Pulse Rectifier system	k-factor
6	1.6
12	1.4

· The gen set will power UPS/non-linear loads AND other loads:

Pulse Rectifier system	k-factor
6	1.15
12	1.10

3. Add the resulting kW rating based on the k-factor to the kW needed for additional loads (if applicable) to determine the minimum kW rating for a gen set.

Don't forget motor starting

Because of high motor skVA, it's imperative to include these in your sizing exercise or develop a strategy to minimize its effect on the total motor load.

We stand ready to help you combine these factors to help you select the best gen set for the application. Please call us.