

# Consultant's Corner: Definition of Voltage Dip



## consultants corner

### **Voltage dip: Comparing apples with apples**

Today, much controversy surrounds voltage dip. The two areas of controversy center around how best to define it and what are considered acceptable levels of voltage dip under good engineering practices.

With any specification process, it's important to base decisions on fair comparisons. Voltage dip is one area, our customers tell us, where apples-to-apples comparisons are difficult to achieve.

### **The definition**

Voltage dip is defined by NEMA MG1-16.48 as the maximum voltage deviation from rated generator output voltage. These dips are caused by inrush currents at motor start-up or by heavy block loads which slow engine speed and lower excitation to the main field.

As the cause and remedy for instantaneous voltage dips differ from those due to block loads, they are measured and analyzed separately.

The maximum dip due to motor inrush current occurs within five cycles and can only be measured with an oscilloscope, due to its instantaneous nature. Dip due to heavy block loads which slow engine speed can be measured by mechanical recorders.

Thirty percent instantaneous voltage dip is regarded as the standard throughout most of the gen set industry, depending on what equipment is already on line. Commercially acceptable recovery time is usually two or three seconds, or at maximum, 15 seconds, depending on the load.

### **Sustained dip confusion**

It's difficult to compare some gen set brands because voltage dip is defined differently in company literature. Sustained voltage dip, which rates the dip at a lower, yet longer recovery curve, is offered instead of instantaneous voltage dip.

A reasonable comparison of motor-starting voltage dip can be obtained with a comparison of subtransient reactances of two generators with equal AVR response times. Two machines with identical subtransient reactances will have about the same voltage dip when starting the same motor.

Consequently, suppliers using sustained voltage dip as a measure of voltage dip will only offer a flat "yes" or "no" answer as to whether their gen set will indeed meet instantaneous voltage dip standards that are specified by other manufacturers.

### **Our recommendation**

We strongly advise engineers to ask for instantaneous voltage dip ratings in specifications, and then stick to them.

It's the only way to make sure you will get comparable bids on projects you specify.