

RATING FACTORS FOR AC LOAD BANKS

July 23, 2008

This information is general in nature and intended to give the reader an overview of the issues involved. Specific recommendations can only be made after a review of the equipment involved, installation parameters, and applicable codes and national standards by competent personnel. Please consult Avtron Loadbank, Inc. with comments or questions about the information contained herein.



LOAD BANK RATING FACTORS

Load banks are designed to provide a specific capacity at a rated voltage. They cannot be operated at a voltage higher than their rating without risking damage to the load bank. Load banks may be operated at lower voltages with de-rated capacity.

VOLTAGE

The ability of the load bank to dissipate power is a direct proportion to the square of the applied voltage. Voltages lower than the rated load bank voltage can be applied with de-rated load carrying capability. Voltages higher than rated will cause over heating and damage to the elements and control devices. The de-rated capacity can be calculated by the following formula:

$$\text{APPLIED VOLTAGE}^2 / \text{RATED VOLTAGE}^2 \times \text{RATED CAPACITY} = \text{REDUCED RATING}$$

For instance we have a 400 KW load bank which can operate at either 240 or 480 volts. If we want to test a 200 KW generator set rated at 208 volts, three phase and can we use the load bank to test the generator set?

$$(208 \text{ volts})^2 / (240 \text{ volts})^2 = (43264/57600) = 0.75$$

$$0.75 \times 400 \text{ KW} = 300 \text{ KW}$$

The load steps are also de-rated by the same amount. If we have 5 KW load steps on the load bank the load steps would de-rate to 3.75 when loaded with 208 volts and operated in the 240 volt configuration. This ability can also be used to create very fine resolution by utilizing the higher voltage setting on the load bank. If we wanted to test a 240 volt load bank with small load steps we could operate the load bank in the 480 volt configuration and the 5 KW, 480 volt load steps would be 1.25 KW when load at 240 volts.

SINGLE PHASE

Three phase load banks can be used for testing single phase power sources. Most single phase generator sets are 240 volts so we would use the 240 volt configuration on the load bank. Two load bank phases would be connected together (for instance: Phase B and Phase C) to allow for a two-thirds rating. One lead from the power source is connected to Phase A and the other lead is connected to the Phase B and C connection point. In this configuration the load bank single phase capacity would be reduced to two-thirds of the three phase capacity. If the power source is operating at a different voltage than the load bank the appropriate voltage de-rate will need to be calculated.

FREQUENCY

Generally resistive load banks are not affected by the difference between 50 and 60 hertz sources being tested. The load bank elements do have some small inductance but this factor is not significant. It may be a more important consideration of a 50 Hz source is used to power the cooling air blower. Since the blower will run slower with a 50 Hz source the cooling capacity is also reduced (50Hz / 60 Hz = 83%). 400 Hz sources will require special consideration due to the higher frequency.



Reactive load banks are affected by frequency and must be derated as shown:

$$\text{(Applied Frequency / Rated Frequency) X Rated KVAR = Derated KVAR}$$

Both voltage and frequency factors must be used if reactive load banks are to be used at ratings other than their design ratings. A reactive load bank rated for 480 Volts, 60 Hz and used to test at 380 volts, 50 Hz would be rated:

$$\text{(380 Volts X 380 Volts) / (480 Volts X 480 Volts) X (50 Hz / 60 Hz) = 52\%}$$

ALTITUDE

Load banks installed below 10,000 feet above sea level do not require special rating considerations for altitude. If a load bank is to be installed or used above 10,000 feet the cooling and load carrying capability of the load bank may be affected and Avtron should be consulted to review the operating parameters.

The proper application of a load bank can be used to effectively determine the operating capability of the engine generator system and used to maintain the system and extend its useful life. Avtron can provide practical solutions to these problems and the support to assure you that your power system will provide many years of safe operation.

For Additional Information Contact:

Dick Scott, Mid-South Regional Manager
Avtron Loadbank, Inc..
6255 Halle Drive, Cleveland, Ohio 44125
PH: 216 573-7600 x 2279
FX: 216 573-5953
Email: dscott@avtron.com
Web: www.load-bank.com

