White Paper

Benefits of Networking Load Banks

ASCO Power Technologies®

Benefits of Networking Load Banks

Networking can be used to connect multiple load banks to facilitate communication and testing using a single control system. This document describes networking benefits, identifies common communication protocols, and provides examples of load bank networking applications.

REASONS FOR NETWORKED LOAD BANKS

Networked load banks can provide advantages in a wide range of applications. The following sections describe benefits offered by this approach.

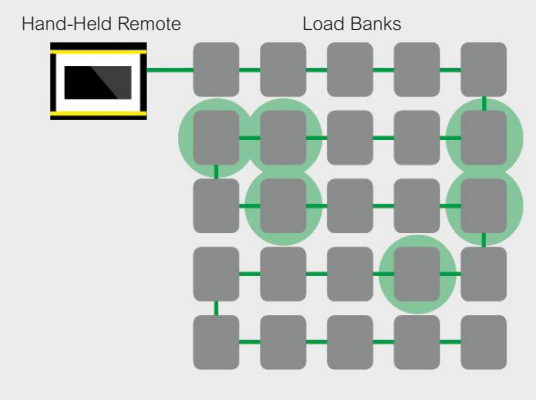

Figure 1: Load can be applied proportionally to all or specific load banks connected in a network.

Increased Available Capacity

Networked load banks enable operators to combine the capacities of connected units. For example, if three 100 kW load banks connect through a network, the available load testing capacity is 300 kW. High load test capacities can be applied to power systems according to the number and capacities of the load banks in the network.

Provide High-Capacity in Access-Restricted Facilities

Back-up diesel generators are commonly located on rooftops or in basements. Elevators and stairways often render these areas inaccessible to large equipment. At rooftop locations, large equipment is typically positioned with a crane. When located in basements, long cable runs may be required to connect load banks to other equipment.

Lower capacity, portable load banks can fit through single access doors to access rooftop and basement locations via lifts or stairways. Multiple smaller units can be networked together to create capacity equivalent to a larger unit. Leading load bank manufacturers can network 40 or more units together to provide sufficient capacity for testing high capacity diesel generating sets.

Non-Unity Power Factor Testing

Networking allows combinations of load types to test systems at non-unity power factors. Separate resistive, inductive, and capacitive load banks can be networked to present a range of load profiles. By combining different types of load banks, facilities can apply resistive and inductive loads to test lagging power factors, resistive and capacitive loads to test leading power factors, and all three types of loads for resistive, inductive, capacitive (RLC) testing. Networking provides the capability to test a variety of sources according to customer requirements.

Fine Load Step Resolution

Lower capacity load banks typically offer smaller load steps than higher capacity units. By combining low-capacity and high-capacity units, a network can apply incrementally smaller load steps when performing high-capacity testing. Fine load step resolution enhances testing precision and enables an operator to apply specific percentage loading. This capability is often required to meet stringent regulatory standards within the National Fire Protection Agency (NFPA) and the international standards organization (ISO).

Redundancy

In mission critical environments, diesel generating sets often require test durations between 8 and 24 hours. Because it is essential to supply consistent and reliable load, multiple load banks can be networked to provide n+1 redundancy. If one load bank then loses communication or cannot provide load, supporting units will remain online to provide the required load and allowing the test to proceed as designed. This avoids wasting fuel, time, and equipment wear-and-tear associated with re-testing.

Firmware Updates

Load bank testing continually evolves to accommodate new load test types and serve additional customer applications. Firmware updates enable existing load bank software to apply new test parameters. When load banks are networked, firmware updates can be concurrently applied to all of the units. This saves the time and effort of individually updating every unit.

A single remote can control many load banks together or individually.

Two 6 MVA containerized load banks networked together.

NETWORK TYPES AND DIFFERENCES

The application of network communication protocols depends on numerous variables such as the load test type, size, and the distance between load banks. Leading load bank manufacturers typically offer a variety of network communication protocols suited to the application.

CAN Bus

For smaller, non-permanent load banks, the Controller Area Network (CAN) bus network protocol offers advantages. CAN bus offers a fast response time of approximately 250 kilobit per second (kbps), which is advantageous when many smaller portable units are networked at distances less than 250 meters. Load steps are applied instantaneously throughout the network to simulate real-life load stresses on various supplies.

RS485

RS485 networks operate at a lower speed of approximately 19.2 kbps, but can communicate over distances of 1000 meters plus. RS485 is often used on higher capacity, permanently installed units, where fewer load banks require simultaneous control.

Ethernet

Ethernet is one of the most common communication protocols and provides separate IP addresses to each load bank and the means of remote control over vast distances. Most industrial facilities utilize Ethernet as a means of communication for the Building Management System for various equipment including compressors, gen-sets and transformers. Load banks are setup and controlled either manually or autonomously from a facility control room.

Leading manufacturers offer the flexibility of different types of communication protocol to suit the required application type.

PROPORTIONAL AND INDIVIDUAL UNIT NETWORK CONTROL

Proportional Control

A standard load bank networks apply load proportionally to the network. For example, a 100 kW load bank and a 200 kW load bank can be networked to test a 300 kW supply. When 150 kW of total load is applied, 50 kW is drawn from the 100 kW unit and 100 kW is from the 200 kW unit. Proportional control ensures the load banks are utilized equally to reduce calculation complexity and prevent high strain on particular units.

Individual Control

Many load test system can assign discrete loads to individual load banks, or to specific groups of load banks within a network. When load is allocated proportionally between the units, the control system can select specific load banks and apply load accordingly.

Individual load bank control is common in data center applications. Because additional heat is produced as higher loads are applied, individual load bank control can accurately simulate hot spots in data center facilities to test air conditioning and ventilation systems.

TYPICAL NETWORKING APPLICATIONS AND SOLUTIONS

Rental Applications

Load Banks:

- Two Resistive
- One Inductive
- One Capacitive

Load Testing Application:

Equipment versatility is vital for rental companies. Machinery that performs multiple functions enables rental providers to utilize equipment more often, accelerating return on investment. Networking load banks increases their versatility.

A rental company may use a single resistive load bank for a simple load test. Another resistive unit can be networked to test higher capacity power sources. By adding inductive or capacitive units to the network, a facility can also test variable lagging or leading power factors. Connecting all three types provides complete RLC testing capabilities. The ability to network load banks enables rental companies to meet a wide range of customer load test criteria.

Generating Set Test Cells

Load Banks:

- Two 500 kW Resistive
- One 1000 kVAr Inductive

Load Testing Application:

Generator manufacturers use test cells to verify the function and performance of the units they produce. Flexible load capacity testing is vital to ensuring that every unit is load tested as required. For instance, a manufacturer uses three load banks to test gen-sets before shipping. It possesses two 500 kW resistive load banks and one inductive 1000 kVAr load bank. Each unit is moveable and networkable.

For smaller gen-sets, the 500 kW load banks provide a resistive test to certify function and performance. For larger high-capacity mission critical gen-sets, the resistive load banks are networked to provide 1000 kW of load. Networking these units with the 1000 kVAr inductive load bank provides a 0.8 lagging power factor when necessary. The load bank's advanced built-in software automatically tests to manufacturer gen-set specifications.

Networking provides flexibility for testing a wide range of gen-sets using the same load banks. Networking facilitates using smaller moveable load banks to accommodate whatever type of gen-set is produced by the manufacturer. Because the load banks can be reconfigured to test new models, including high-capacity units, networking will typically be more cost effective than purchasing a new high-capacity load bank.

Data Center Commissioning

Load Banks:

- Ten 100 kW portable resistive units

Load Testing Application:

Ten 100 kW load banks operated by a single control system can be strategically positioned throughout a data center to simulate server heat production. Testing enables optimization of ventilation and cooling systems before server racks are installed in a facility. Networking of multiple load banks allows easy movement within multiple data center locations. The same ten load banks can also be utilized to test the facility's 1000 kW diesel gen-set, verify UPS operation and circuit breaker trip points. Another benefit of networking is that load control can be individual and fast. Networking eliminates the need for technicians to radio each other when they need to manually activate toggle based load switches. The configuration and versatility of networked load banks provides all of the loading required for the facility's critical equipment testing and maintenance programs during commissioning and or general maintenance.

SUMMARY

Load bank networking capabilities are now offered by many manufacturers. Networking enables operators to combine and configure a facility's load banks for applications requiring a range of capacities and load types. In addition, networking can enable the combined use of smaller units to provide high-capacity testing at facilities where large load banks cannot be installed. Networked load banks provide versatility that maximizes cost effective testing for both low-capacity and high-capacity power sources.

ASCO Power Technologies | Avtron
6255 Halle Drive
Cleveland, OH 44125
Tel: 216.573.7600
LBsales@ascopower.com

ASCO Power Technologies | NJ Froment & Co. Ltd
Easton-on-the-Hill
Stamford, PE9 3NP
United Kingdom
Tel: +44 1780 480033
froment.sales@ascopower.com

loadbanks.ascopower.com

whitepapers.ascopower.com
customercare@ascopower.com

ASCO. Innovative Solutions.