Outline:

• What is a Load Bank?
• Why do you need a Load Bank?
• Types of Load Banks
• Load Banks for Health Care Market
• Building Load vs Load Banks
• Load Bank Controls
• Regulations
• Website
• Resources
What is a Load Bank?

A Load Bank provides a **consistent** and **repeatable** electrical load, that can be **accurately controlled**, **measured** and **recorded**.

**SIGMA.** The ASCO load bank control and instrumentation platform.
What is a Load Bank?

In our market, all industrial load banks utilize a fan and use the corresponding airflow to cool the resistive elements.
Using a Load Bank on a diesel generator set helps the engine run at proper temperatures. This prevents fuel build up and promotes cleaner emissions.

Load Banks test power sources so they run efficiently. This efficiency helps with lower emissions and to reduce energy waste.

Load Banks can also test other power sources to help determine if their carbon footprint is as small as it can be.

Load Banks help ensure the proper running of emergency backup power equipment in the event of power outages.
### Types of Load Banks:

A solution for virtually any requirement and application

#### Resistive
- Suitable for full engine testing at unity power factor (1.0pf).

#### Combined
- Resistive/Inductive – suitable for full engine, alternator and distribution test usually at 0.8pf lagging.
- Resistive/Capacitive – suitable for full engine, alternator and distribution test usually at 0.8pf leading.
- Resistive/Inductive/Capacitive – suitable for full engine, alternator and distribution test at unity, lagging and leading pf.

#### Medium Voltage (MV)
- For applications above 690V AC – 3.3kV up to 24kV
- Can be either purely resistive or combined

#### Direct Current (DC)
- Purely resistive units for direct current applications such as battery discharge testing.
1000 SERIES – Suited Features

Cost Effective Supplemental Loading

- **Ratings.** 50-70% of Generator kW.
- **Specific Sizing.** Each 1000 Series is designed to fit over genset radiator.
- **Automatic Load Control:** Standard option allows load bank to maintain minimum load on generator set.
- **BMS Interface:** Optional remote I/O or pilot relays for interface to existing Building Management System.
2000 SERIES – Suited Features

Compact and Portable

- **Manoeuvrability.** Load Bank fits through doors and into elevators.
- **Lightweight.** Easy for one operator to move with swivel casters, fork pockets, and lifting eyes.
- **Best-in-Class Packaging.** 100kW weighs only 105 lbs.
- **SIGMA LT.** Controls allow for flexibility, features, benefits and capabilities when compared to competitive digital control platforms.
- **Networking:** SIGMA LT allow 25 load banks to be networked together for increased total capacity.
4000 SERIES – Suited Features

High Capacity Resistive Load Bank

- 50-3000 kW
- 208, 240, 400, 415, 480 and 600 Volt, 3 Phase ratings
- Single phase ratings also available
- Horizontal and Vertical discharge models
- Continuous outdoor operation
- Control options available to interface with existing building protocol
- Site Load Correction available to maintain minimum load on power source.
- Low dBA models available
6000 SERIES – Suited Features

Resistive Reactive testing

- Folded and welded construction with galvanized fork pocket lift and crash frame.
- Double Insulated Doors
- Separate Enclosures
- Non-Finned Stainless Steel Elements
- Optional Breakers
- Combined Resistive/Reactive
- Variable power factor testing
- **SIGMA.** Provides high level instrumentation, data capture, and verification to ISO8528 and has the ability to network multiple units.
8000 SERIES – Suited Features

High Capacity Containerised

- ISO containerised construction in 10, 15 or 20ft
- Low noise options
- Separate Enclosures
- Non-Finned Stainless Steel Elements
- Optional Breakers
- Combined Resistive/Reactive
- Test to variable power factors
- Control room – easy access and maintenance
- **SIGMA.** Provides high level instrumentation, data capture, and verification to ISO8528 and has the ability to network multiple units.
Load Bank Utilization in the Healthcare Sector

**Code Compliance Testing**
- **Portable Load Banks** – Mobile units that allow network testing in multiple locations
- **Permanent Load Banks** – Dedicated units installed outdoors for backup power testing
- **Radiator Mounted Load Banks** – Dedicated units mounted on radiator generator set for backup power testing
- **Combined Resistive & Reactive Load Banks** – Designed for 0.8 pf testing and verification of power source(s)

**Uninterruptible Power Supplies (UPS) Testing**
- Inverter performance

**Back-up Battery String**
- DC Load Banks for battery capacity testing

**Commissioning**
- Load test critical power components to identify any performance issues.
- Ensure power system is working as designed.
- UPS systems and testing inverter output

**Maintenance/Periodic Testing**
- Service Schedules and Diagnostics
- **Gen-Set Health**
  - Wet Stacking Prevention
  - Ensuring Tier Emission Standards are Met
  - Diesel Particulate Filter (DPF) Burn Off
## HealthCare Viability – Load Banks

<table>
<thead>
<tr>
<th>Key Features</th>
<th>Key Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>High capacity (kW) in a small mobile design.</td>
<td>Test multiple power sources in various locations.</td>
</tr>
<tr>
<td>Accurate and recordable load data with Sigma Control Platform</td>
<td>Essential for Code Compliance.</td>
</tr>
<tr>
<td>Resistive and Resistive/Reactive Load Banks available</td>
<td>Allows for steady and controllable 0.8 PF testing compared to unsteady building load</td>
</tr>
<tr>
<td>Load Dump Circuitry</td>
<td>Load bank will automatically drop its load when emergency back up power is activated</td>
</tr>
<tr>
<td>Portable load banks can easily fit thru man doors and into freight elevators</td>
<td>Easy to move and transport.</td>
</tr>
<tr>
<td>Radiator mounted load banks for supplemental loading of generator set</td>
<td>Cost effective means to keep a minimum supplemental load on generator set to reduce wet stacking of exhaust system.</td>
</tr>
</tbody>
</table>
HealthCare Viability – Load Banks

Why not use Building Load for Testing?

The load can be sourced from building load, but that may cause interruptions when transferring from utility to generator (not ideal in a mission critical healthcare facility). It also does not allow the load to be applied in precise steps, where performance can be monitored and recorded.

Other disadvantages of using building load for compliance testing is as follows:

• Depending on the time of day, building load could rarely get over the required 30% load.

• The challenge with relying only on the building load is availability and duration. (Can you guarantee to meet 75% of the load for the full test?)

• Inability to properly discharge UPS batteries.

• It is generally agreed that, utilizing a load bank is the preferred method of load testing a generator system.
Reactive load testing is primarily important at health care facilities, life safety, and mission critical applications where the need to demonstrate the capability to provide electrical power as intended is prescribed by regulatory standards and codes specified by the designers.

Examples of typical emergency power sources include:

- Gas- and diesel-fueled reciprocating engine generators
- Liquid- and gas-fueled turbine generators
- Rotary UPS
- Battery UPS systems.
## HealthCare Viability – Load Banks

### Resistive Only and Resistive/Inductive Load Bank Testing Comparison

<table>
<thead>
<tr>
<th>Resistive Load Bank Testing</th>
<th>Resistive/Inductive Load Bank Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>kW = kVA at unity power factor</strong></td>
<td><strong>Inductive power component</strong></td>
</tr>
<tr>
<td>Tests the prime mover (engine) at 100% load</td>
<td>Tests the alternator and voltage regulator at its fully rated (kVA/kVAR) capacity</td>
</tr>
<tr>
<td>Tests the full delivery system operation at maximum rating and fuel consumption</td>
<td>Simulates the actual load (kW, kVA, and kVAR) for which the systems are specified and designed</td>
</tr>
<tr>
<td>Demonstrates the cooling system operation at the gensets full operating capacity</td>
<td>Simulates transient loads to provide voltage and frequency response characteristics</td>
</tr>
<tr>
<td>Allows the exhaust and after-treatment system to reach normal operating temperatures</td>
<td>Simulates and verifies synchronizing, load sharing, and voltage regulation on multiple unit paralleled systems under actual load conditions</td>
</tr>
<tr>
<td>Eliminates exhaust wet-stacking by burning off built-up carbon deposits from unburned fuel and oil, and reseats the rings when partial- or low-load conditions are encountered during periodic testing</td>
<td>Allows thermographic/infrared inspection of the electrical systems; identification of potential hot spots; and the condition of cables, terminations and buss work</td>
</tr>
<tr>
<td>Evaporates moisture from the engine oil, which reduces wear-causing acid formation</td>
<td>Identifies deficiencies that can be corrected with proper maintenance and repair before failure, avoiding downtime and additional expenses</td>
</tr>
</tbody>
</table>

### Resistive and Resistive/Inductive Load Bank Comparison

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Resistive Load Bank</th>
<th>Resistive/Inductive Load Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime Mover Capacity (kW)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Prime Mover Controls</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Alternator Capacity (kVAR)</td>
<td>Limited</td>
<td>Full Load</td>
</tr>
<tr>
<td>Alternator Controls</td>
<td>Limited</td>
<td>Yes</td>
</tr>
<tr>
<td>Load Sharing Controls</td>
<td>kW only</td>
<td>kW and kVAR</td>
</tr>
<tr>
<td>Distribution Buss</td>
<td>Limited</td>
<td>Full Load</td>
</tr>
<tr>
<td>Transient Response (Hz)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Transient Response (Voltage)</td>
<td>Limited</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Best-in-Class Control

- SIGMA LT & SIGMA 2 Options suited for any load test application
- Networking multiple units of any size and type with individual unit control where required.
- Fast, automated data capture and reporting.
- Integration to into existing BMS systems.
- Reporting to ISO8528.
- Automated testing.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<td>Time Stamp</td>
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<td>Voltage L2-L3</td>
<td>Voltage L3-L1</td>
<td>Voltage L1-N</td>
<td>Voltage L2-N</td>
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<td>277.4</td>
<td>276.3</td>
<td>277.4</td>
<td>59.8</td>
</tr>
</tbody>
</table>
Load Bank Control

The SIGMA Digital Control Platform facilitates:

- Interfacing with EcoStruxure to provide the customer with “single pane of glass” view
- The collection and presentation of power quality information downstream of power infrastructure
- The use of data and communication with other power products to make enhanced decisions
Regulations

Specifying Engineers and Facility Managers should have access to the latest versions of these NFPA standards. They are available online at www.nfpacatalog.org. Individual states and localities also have standards, codes, and regulations.

Applicable NFPA resources include:

- NFPA 70: National Electrical Code (2011)
- NFPA 70B: Recommended Practice for Electrical Equipment Maintenance (2010)
- Joint Commissions (formerly JCAHO).

Specific regulations such as NFPA 101, Article 7.9.2.4 require that emergency generators be installed, tested, and maintained in accordance with NFPA 110. Provisions dealing with maintenance and testing of emergency generators can be found in NFPA 99, Article 4.4, which deals with issues such as:

- Test criteria
- Test conditions
- Test personnel
- Maintaining and testing circuitry
- Battery maintenance.
Regulations

- In most cases, emergency power generating systems must comply with a number of different code requirements based on National Fire Protection Association (NFPA) 110,
- Joint Commission,
- Environmental Protection Agency (EPA) Tier regulations, and
- National Electrical Code (NEC) specifications.

Regular load bank testing can help meet the Joint Commission, ASHE, NEC, and NFPA major industry standards and codes that cover emergency power generation and testing in healthcare facilities.

The Joint Commission is a United States based nonprofit organization that accredits more than 21,000 US healthcare organizations and programs. Their standards for Emergency Power Testing are summarized as follows:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 02.05.07 EP 4</td>
<td>Generators tested 12 x yr (not&lt;20 days or &gt;40 days apart) for 30 continuous minutes under load</td>
<td>Monthly</td>
</tr>
<tr>
<td>EC 02.05.07 EP 5</td>
<td>Generator test performed with 30% or greater of nameplate rating dynamic load or the exhaust gas temperature during test meets manufacturer’s recommendations. If not, a test is performed every 12 months using a supplemental load bank as per EC 02.05.07 EP 5</td>
<td>Annual if required</td>
</tr>
<tr>
<td>EC 02.05.07 EP 6</td>
<td>Transfer switches 12 x yr (not &lt;20 days or &gt;40 days apart)</td>
<td>Monthly</td>
</tr>
<tr>
<td>EC 02.05.07 EP 7</td>
<td>Test generator 4 continuous hours every 36 months</td>
<td>36 Months</td>
</tr>
</tbody>
</table>
### CHART 1: Emergency Power Testing Standards (part 2 of 2)

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 02.05.07 EP 8</td>
<td>36 month tests performed with a dynamic or static load of at least 30% of nameplate rating or the exhaust gas temperature during test meets manufacturer’s recommendations.</td>
<td>See EC 02.05.07 EP 7</td>
</tr>
<tr>
<td>EC 02.05.07 EP 9</td>
<td>If a required emergency power system test failed, measures were implemented to protect patients, visitors and staff until repair or corrections are completed</td>
<td>As applicable</td>
</tr>
<tr>
<td>EC 02.05.07 EP 10</td>
<td>If a required emergency power system test failed, a retest was performed after repairs are made</td>
<td>As applicable</td>
</tr>
</tbody>
</table>
Load testing is vital to replicate and verify operation of critical backup power systems. We manufacture load banks that excel in a range of test applications and environments. Rugged and built to last, we offer models from compact and portable to high capacity containerized solutions. Combined with best-in-class Sigma control, ASCO provides comprehensive testing, monitoring and reporting capabilities with unrivaled ease, efficiency and value for money.

### ASCO 8000 SERIES Load Banks

8000 SERIES load banks provide resistive only, resistive and inductive (lagging) or resistive and capacitive (leading) load for testing AC supplies at unity power factors, DC battery discharging and UPS testing. Based on a ISO 1081 and 229...

### ASCO AVTRON 1000 SERIES Load Banks

Our 1000 SERIES radiator mount load banks are designed and manufactured for radiator or duct mounting on diesel engine generator sets. Available for indoor, outdoor, or horizontal applications.
Website: loadbanks.ascopower.com

Files available on the web site

**BROCHURES AND DATA SHEETS**
- ASCO Avtron 2000 Series Load Bank Brochure
- ASCO Combined Avtron and Froment Load Bank Overview Brochure

**TECHNICAL SPECIFICATIONS**
- ASCO Avtron 2705 Load Bank Data Sheet
- ASCO SIGMA LT Load Bank Control Brochure

**WARRANTIES**
- ASCO Avtron 2 Year Warranty

**DRAWINGS**
- ASCO Avtron 2700LT Load Bank Outline
Website: loadbanks.ascopower.com
**Website:** loadbanks.ascopower.com

### White Papers

<table>
<thead>
<tr>
<th>Topic</th>
</tr>
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<tbody>
<tr>
<td>Load Bank</td>
</tr>
<tr>
<td>Application of Resistive/Reactive Load Banks for kVA Testing</td>
</tr>
<tr>
<td>Advances in Load Bank Controls</td>
</tr>
<tr>
<td>Load Banks for Power System Testing</td>
</tr>
<tr>
<td>Load Bank Testing to Ensure Generator Set Performance</td>
</tr>
<tr>
<td>Load Bank Utilization in Data Centers</td>
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<tr>
<td>Radiator Mounted Load Banks</td>
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<tr>
<td>Load Banks for Test Cell Applications</td>
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<tr>
<td>Load Banks for Hospitals and Healthcare Facilities</td>
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<tr>
<td>Applications for Capacitive Load Banks</td>
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<tr>
<td>Direct Current Load Banks for Battery Capacity Testing</td>
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<tr>
<td>Benefits and Applications of Containerized Load Banks</td>
</tr>
<tr>
<td>Load Bank Rating Factors</td>
</tr>
<tr>
<td>Benefits of Networking Load Banks</td>
</tr>
</tbody>
</table>
Largest depth & breadth …
ASCO Load Bank offers a solution virtually for any requirement or application.

Industry leading warranty…
Standard 2 Year Parts and Labor Warranty.

Best-in-class controls…
Innovative digital control and networking platforms.

Low whole-life cost…
Optimized design and construction means product that is fit for purpose in any environment.

In stock and ready to go…
A wide selection of portable load banks available immediately from stock.
HealthCare Sector Key Benefits – Service and Support

Support

- Worldwide Network – Extensive Pre- and Post-Sales Support
- ASCO Services Inc. Multiple Domestic Locations
- Industry Exclusive 2 Years Parts & Labor Warranty
- ASCO Load Banks are Built to the Highest Standards (UL, cUL, CSA, CE, IEC, ISO9001)
Resources


Product Bulletins
Technical Documents
Engineering Specs
White Papers
Sales Contacts
Service Contacts

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Thank You For Your Time!

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