Maintaining Load Banks for Reliability and Longevity

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Load banks provide years of reliable service. To ensure they operate reliably and test power supplies precisely, load banks must be regularly serviced and maintained. This paper describes how and why load banks should be serviced and explains the implications of inadequate preventive maintenance.

**EFFECTS OF INADEQUATE OR INCORRECT MAINTENANCE**

Understanding the implications of infrequent or incorrect load bank maintenance is essential to designing and implementing an adequate service plan. In mission-critical applications such as hospitals or data centers, an under-performing load bank can affect the performance of an entire backup power system.

Load banks are a primary tool for testing diesel generator sets. If a load bank operates incorrectly due to lack of maintenance, a generator set may not be properly tested. Using a load bank to apply load raises the engine to its manufacturer-specified operating temperature and verifies overall generator set performance. If a generator is not adequately tested under load, latent equipment conditions and operational issues may not become known. Correct testing with load banks helps avoid generator set failure during emergency backup power events.

Testing diesel generators with inadequate load can lead to problematic conditions such as “wet-stacking”, where unburned fuel residues accumulate in diesel exhaust systems. Using load banks to properly load generators during tests avoids these effects. For additional information, please see our white paper entitled *Adverse Effects of Low Load Operation on Diesel Generating Sets*.

**INSPECTION AND SERVICE FREQUENCY**

Adequate maintenance ensures effective operation and reliable electrical testing throughout the service life of a load bank. The frequency and scope of maintenance may vary according to the application and usage of the unit and environmental factors such as ambient temperature and humidity ranges. Leading manufacturers provide guidance for maintaining and servicing load banks and recommend corresponding service intervals.

**PERSONNEL QUALIFICATIONS AND SAFETY**

Load banks should be serviced only by qualified personnel who are fully aware of associated hazards and who have implemented adequate safety precautions. All electrical supplies leading to load banks and associated equipment must be isolated before inspecting, removing, or replacing parts. For an overview of safety practices and regulations, read our white paper entitled *Best Practices for Load Bank Testing*. Always consult site safety plans and local and national health and safety codes and regulations for specific requirements and further guidance. Major load bank manufacturers and third-party providers such as industry associations offer training and safety classes.
SCOPE OF MAINTENANCE

Visual Inspections

Before energizing a load bank, qualified personnel should inspect its enclosure and components. Instruction manuals and circuit drawings should be readily available to ensure technicians can efficiently check and maintain the unit. Inspections typically include the following tasks:

- Cleaning and inspecting painted surfaces for damage or corrosion. Noticeable corrosion or damage should be promptly repaired to avoid further deterioration.

- Checking for dirt or debris on the load elements. Debris on load elements can cause hot spots or fires, leading to reduced service life for elements and increase costs for premature replacement.

- Checking that fans rotate freely. If a fan provides insufficient airflow, elements and enclosures can overheat and damage internal electrical components.

- Checking that fan blades are tight and that fan bosses are securely fastened to motor shafts.

- Checking any inductive and resistive load element terminals for tightness and evidence of overheating. Replacing suspect elements or inductor terminals ensures consistent and reliable operation.

- Opening load bank cabinets to inspect wiring, fuses, and contactors. Evidence of overheating is a sign of incorrect operation, which should be evaluated and resolved to avoid performance impacts.

- Inspecting door seals for damage. Replacing them when necessary ensures correctly sealed doors that will prevent dust and moisture ingress that may affect operation of electronic components.
Testing

Service typically includes testing the load bank and its internal components to verify that they operate according to manufacturer specifications. The scope of this testing varies by load bank design and manufacturer. A common test is the **Load Bank Contactor and Element Check**, which verifies the proper operation of vital contactors and elements and confirms that they can properly absorb and dissipate heat. Typical steps include:

1. Connecting a supply at a load bank’s rated voltage to the load bank
2. Applying loads of 30, 60, and 100 percent while recording the power values displayed on instrumentation or external metering
3. Verifying that the resulting power values are within 5% of the load set on the controller
4. Testing and resolving causes of out-of-specification results

Technicians should consult manufacturer service recommendations and then implement the full range of tests verify that load banks perform to nameplate values.

Calibration

The load bank component that is most likely to require calibration is its digital instrumentation, which should accurately display the values for the electrical characteristics of the power source under test. Over time, instrument calibration may deviate by small amounts due to ageing of components, temperature changes, and other causes. Part 6 of *ISO8528 - Reciprocating Internal Combustion Engine Driven Alternating Current Generating Sets - Part 1: Application, Ratings and Performance* provides generator set voltage and frequency tolerances. If a load bank is improperly calibrated, the load applied to a generator may deviate from the ISO standard. As a result, a noncompliant generator set could falsely show values within specified tolerances. Consequently, leading manufacturers usually recommend performing and recording annual calibration checks.

Calibration is especially important for mission-critical and test cell environments, which require precise load values to meet standards and regulations. Properly trained technicians calibrate load banks, supply calibration certificates, and ensure instrumentation performs within standard tolerances.

Record Keeping

If a load bank fails, service documentation will be essential to evaluating causation. Facilities without adequate service records will be noncompliant with regulations and best practices. Market-leading load bank suppliers provide built-in diagnostic software that typically logs and displays load bank usage, service dates, and the number of contactor switches. This allows the technicians to schedule component checks, calibrations, and replacements accordingly.

Leading load bank manufacturers offer service and maintenance plans.
SELECTING A SERVICE PROVIDER

With the ever-growing need for reliable backup power, the risks and costs associated with failure significantly outweigh the costs of adequate preventive service and testing. Manufacturers offer load bank service programs that should be implemented to ensure the accurate and efficient load testing required for reliable operation.

SERVICE PROGRAM IMPLEMENTATION

NFPA 70B - Recommended Practice for Electrical Equipment Maintenance prescribes preventive maintenance for electrical and electronic communication systems and equipment to prevent failures and worker injuries. This standard also guides facility managers in developing an effective maintenance program for all types of equipment and assemblies. Contractors reference NFPA 70B for information about proper servicing procedures, and designers reference it to develop installation and maintenance specifications.

The Personnel Safety provisions in Chapter 7 of NFPA 70B should be understood before electrical work begins. Chapter 7 refers to NFPA 70E - Standard for Electrical Safety in the Workplace for detailed electrical safety recommendations that must be followed. Preventive maintenance should be performed only when equipment is placed in an electrically safe work condition. Electrical work practices must be conducted according to applicable safety regulations.

SUMMARY

Backup power has never been so important, and reliable load bank operation is an important element of backup power testing and compliance programs. Effective load bank maintenance requires inspection and adequate intervals by qualified technicians qualified for the work. Maintenance protocols require effective visual inspection, cleaning, maintenance, testing, calibration, and recordkeeping. Guidance for these tasks are provided by NFPA 70, manufacturer recommendations, and the practice described herein.

REFERENCES

ASCO Power Technologies Inc. Adverse Effects of Low Load Operation on Diesel Generating Sets, 2018
ASCO Power Technologies Inc. Best Practices for Load Bank Testing, 2018