

**Load Banks
for
Prevention of Wet-Stacking
in
Diesel Generator Sets**

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



Wet-Stacking

Wet-Stacking is a common problem with diesel engines which are operated for extended periods with light or no loads applied. When a diesel engine operates without sufficient load it will not operate at its optimum temperature. This will allow unburned fuel to accumulate in the exhaust system, which can foul the fuel injectors, engine valves and exhaust system, including turbochargers, and reduce the operating performance. Providing additional load from the building load may not be practical with critical computer, life safety or communication equipment. Any interruption of power to these loads may cause a loss of data, operations or jeopardize personal safety.

In order for a diesel engine to operate at peak efficiency it must be able to provide fuel and air in the proper ratio and at a high enough engine temperature for the engine to completely burn all of the fuel. The proper load can be achieved by adding additional building load or by providing supplemental load through the use of a resistive load bank. These can be small portable load banks designed to be rolled up to the generator under test or they may be larger trailer mounted load banks for generator sets in the 1-3 MW range.

Wet-Stacking does not usually cause any permanent damage and can be alleviated if additional load is applied to relieve the condition. It can reduce the system performance and increase maintenance. Applying an increasing load over a period of time until the excess fuel is burned off and the system capacity is reached usually can repair the condition. This can take several hours to burn off the accumulated unburned fuel.

Portable load banks can be provided for generator sets up to about 700 KW. Since they are used for temporary testing they can be rented and brought to the generator location. Most portable



load banks will include metering and small enough load steps to test a wide range of generator sizes. They are simple to set up and require only basic operational instruction. They do require a large supply of fresh air for cooling and must be ventilated to remove the exhaust heat from the load bank area. Many smaller load banks (up to 200 KW) may be provided with single phase cooling air blowers to allow for testing single phase generator sets where there is no three phase power available. These are practical for annual testing but do require additional labor for transportation, set up and connection of the load bank to the generator under test.

The supplemental load can be permanently installed so that the building operators can perform regular, periodic testing, under load, by utilizing an outdoor, pad-mounted load bank. The pad-mounted load bank is installed outside in an area away from traffic so that noise and heat will be dissipated. Radiator duct mounted load banks may also be a practical option to provide this supplemental load. With a permanently installed load bank provided for the power system, regular testing can be performed as well as repair verification without interrupting the building load. This can be especially important for those building where the generator system serves critical communications, financial or life safety systems.

As manufacturer of load banks used for this purpose we would first recommend that you consult the manufacturer of the equipment to be tested for their specific requirements. A review of the appropriate equipment manuals is important to fully understand the maintenance and testing requirements.

Generally the major manufacturers suggest a minimum load of 30 percent of nameplate to prevent wet stacking.



Another source for information that is nationally recognized is the NFPA standard 110, *Standard for Emergency and Standby Power Systems* which includes both testing recommendations and maintenance charts. Copies can be purchased from the NFPA at 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101. NFPA 110, Chapter 8, section 8.4.2 recommend testing at least monthly for a minimum of 30 minutes at not less than 30 percent of nameplate rating. Health care facilities need to be aware of additional requirements placed on them by local, regional or national authorities and insurance companies.

The proper installation and use of a load bank can prevent loss of capacity and increased maintenance caused by unburned fuel due to wet-stacking. 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.

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