

## KEEP YOUR STANDBY GENERATOR WORKING WHEN YOU NEED IT MOST:

# FIVE COMMON GENERATOR PROBLEMS AND HOW TO AVOID THEM

When a hurricane or another disaster strikes, widespread power outages often leave the affected areas without electricity for weeks, sometimes months. As a result, standby generators become a necessity until the power grid can be fully restored.

While standby generators may not be used for long periods of time between storms, the number one reason for failure of this equipment when it is needed, is lack of regular maintenance. That's why it's important to be aware of the problems that cause a generator to break down or fail to start, then take proactive steps to avoid them.



# NOW

### First Things First: Steps to take during an emergency

During an emergency, you should take these steps immediately to ensure that the generator will operate reliably for as long as you need it:

1. Shut down non-critical electrical equipment to allow the generator to operate at lower loads—preferably at 80% load, or less.
2. Conduct a visual inspection every 8 hours to check for irregularities in operating conditions such as temperature, vibrations, abnormal noises, alarms or to detect leaks.
3. Make sure that technical personnel or maintenance contractors are available so problems can be corrected or repairs can be made quickly if needed.

If more than one emergency generator is available, alternate operation of units during low-consumption hours. You can then perform a detailed inspection on the unit taken out of service for cooling water levels, and the unit can cool down slowly. Also, during periods of high power demand, be sure to distribute the load evenly between the units that are in operation.



## Here are some of the common reasons for standby generator malfunctions:



### Breakdown by Overloading or Overheating

If a standby generator is operated consistently for longer than the prescribed number of hours, it will likely break down frequently. The typical rating for a standby engine should be sized for a maximum of 70% to 80% average load factor, and roughly 200 hours per year, which includes less than 25 hours per year of running time at the standby rating.

There are two important elements to consider to prevent standby generator breakdown:

- The generator's maximum required load
- Whether the generator sets will run isolated from, or concurrently with a public utility source. It is important to note that standby-rated generators should not be run concurrently with a public utility source.

Standby power ratings should never be applied except in true emergency outage situations. This provides the advantages of allowing standby units to cool down naturally when not in operation, and maintenance can be performed as needed. However; in emergencies, the generator can be pushed to deliver 100% output for critical circuits.



### Failure to Start

Standby generators can fail to start if the fuel is contaminated by sludge (or water if firing diesel). This also contaminates the fuel tank and clogs fuel lines, filters, strainer baskets and fuel injectors.

The first step in preventing sludge in the fuel tank is proper tank design to restrict the entrance of water through vents, leaks and fill boxes. Sidewalk fill-boxes and in-wall fill-boxes are very common; these must be designed to keep rainwater (and potentially seawater) from entering the fuel tank. Fill caps must be watertight, especially in underground fill-boxes where water can pool.

Even with proper fuel system design, it is possible to get water in the fuel tank as part of the delivered fuel, and by condensation through fuel vent lines. Condensation is an especially serious problem in coastal regions where the relative humidity tends to be high, and ambient temperature changes are frequent. Most fuel filtration systems include a coalescing filter or separator to remove water from fuel.



### Dead or Weak Starting Batteries

Battery failure is a leading cause of failure-to-start incidents. Replacing batteries every three to four years and proper battery maintenance are recommended steps. In addition, battery connections can become loose or corroded and charging systems can fail or be turned off inadvertently, resulting in dead or undercharged batteries. Regularly scheduled generator tests provide the opportunity to test the battery systems as well.



## **Failed Engine Cooling Systems with Coolant Level Alarms/Shut-down**

Failed coolant systems or low coolant levels are common problems when a generator fails to start. These are often caused by either an external or internal leak.

Coolant systems need to be part of a regularly scheduled maintenance and inspection procedure. A typical inspection regimen consists of visually inspecting the coolant system for leaks, drips, puddles or crusty areas that indicate evaporated engine coolant. A visual inspection of cooling hoses should be conducted as well. Worn, cracked or loose hoses should be repaired or replaced.



## **Coolant Leaks in Block Heaters**

Coolant leaks commonly occur in the block heater hoses. The block heaters produce high temperatures that cause the heater hoses to fatigue more quickly.

The block heater heats the coolant, which circulates around the engine block; keeping the engine block warm prevents the oil from becoming too thick in cold temperatures. A common misconception is that the engine does not need a block heater in warm climates; however, a block heater does more than help the engine to start in cold weather. Due to the dissimilar metals used to build engines, accelerated wear can occur during start up. The pistons, normally made of aluminum, will expand at a faster rate than the iron cylinder liners. This rapid expansion of the pistons can lead to scuffing of the piston skirt. Block heaters relieve most of this scuffing by maintaining the cooling system temperature and keeping the cylinder liners expanded.

Low Coolant Temp Alarms are mainly the result of faulty block heaters. These heaters run 24 hours a day, 7 days a week, which can cause them to fail periodically.

## **FM Global is Here to Help**

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## Design Elements to Consider Before Generator Installation

### ENVIRONMENTAL FACTORS:

- **Ambient conditions:** All generators, regardless of the fuel that powers them, require adequate air for combustion. Decreased air levels can lead to start-up failure.
- **Temperature:** High temperatures are also associated with lower air density. This affects not only the output of the generator, but can also lead to overheating and complete failure of the engine.
- **Humidity:** In conditions of extreme humidity, water vapor in the air displaces oxygen. Low oxygen levels impair ignition.
- **Altitude:** The availability of ambient air helps facilitate heat dissipation from the generator.

### FLOOD FACTORS:

Due to flooding created by hurricanes, many generators fail because they are underwater shortly after the storm hits. A good design practice is to elevate diesel generators and fuel tanks above typical storm-surge levels and 100-year levels. Wind and impact load should also be considered in generator design.

## The Importance of Preventive Maintenance

The number one cause of generator failure is the lack of a planned maintenance.

### ROUTINE, SCHEDULED MAINTENANCE SHOULD INCLUDE THE FOLLOWING:

- Full visual inspection
- Cables and connections
- Checking for worn parts
- Checking all fluid levels
- Changing fuel, oil, air and coolant filters
- Checking control panel readings and indicators
- Load bank testing and regular exercise
- Changing spark plugs
- Check for leakage

### OTHER ITEMS TO CHECK DURING MAINTENANCE:

- **Overfilled fuel tank:** High fuel level alarms are often required by government regulations to prevent the overfilling of a fuel tank. The alarm should activate when the fuel tank reaches between 90%-95% capacity.
- **Low fuel level:** Mechanical fuel level gauges may not always be accurate. They occasionally stick in a position until vibrations break them free. Some generators are equipped with “Low Fuel Level Shutdown” or “Critical Fuel Level Shutdown”. The control panel may shut the generator down.
- **High Fuel Level Alarm:** The natural thermal expansion of the fuel may cause the alarm to activate, such as during hot weather. High fuel level alarms may or may not clear themselves when the fuel level drops below the set point. The alarms may have to be manually reset when the fuel level drops.
- **Controls Not in Automatic mode:** Generators have a control or “an enunciation” panel, which controls all aspects settings, operation and shutdown of the generator. Many service calls for control issues are the result of the unit being in “Not in Auto” mode.

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