



**TOTAL  
POWER**

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**The Top 10 Reasons Why  
Your Generator Might Not  
Start When You Need It To**

Does your facility or property absolutely need the generator to start when the power goes out? Are you 100% confident it will? Power interruptions and power quality problems are an everyday occurrence. Our 21st century digital society is more dependent than ever on a reliable source of quality electric power. For many power interruptions can cause loss of revenue, impair business operations, or worse, jeopardize human life and safety.

Every facility or property manager should understand the common reasons for emergency power system failure and should realize why proper maintenance will help prevent those failures. While your personnel may be able to perform many weekly maintenance items, a qualified service provider can add great value by performing the higher-level maintenance required at the longer intervals.

In the March/April edition of Powerline Magazine, Jim Ellis and Lisa Phillips highlight the following ten most common problems encountered with power generation equipment in backup or emergency standby applications:

## **1. Battery System Problems**

Analysis of emergency generator set failures shows that battery problems cause at least half of all failures to start. Most battery failures are attributed to the buildup of crystalline lead sulfate on the battery's lead plates (aka "sulfation"). This is a normal result of battery charging and discharging that worsens if batteries are not maintained at full charge. Batteries that are older, that have been through multiple charge/discharge cycles, or that have not been maintained at full charge must be replaced periodically. As batteries near the end of their service life, effective performance degrades more rapidly. Proactive replacement of lead-acid type batteries every three years should be part of an overall maintenance strategy.

Routine maintenance is critical for best battery performance. Connections must be regularly cleaned and tightened. It is necessary to monitor the electrolytes in wet lead-acid batteries. Charging depletes the water in the electrolytes, and topping up with distilled or deionized water is required — even under optimum conditions.

## **2. Control System Problems**

A common issue related to generators not starting when needed is the master control set for "Auto" (automatic) operation is not set or mistakenly leaving the Emergency Stop Pushbutton depressed. After any activity is performed on or near a unit, always double check to assure that the generator set controls are set for automatic operation.

**Life Safety Code CSA C282-05**

**Does it apply to  
you?**

Generators and back-up power systems that provide power to your lighting systems, elevators, stairway pressurization fans, fire pumps, and fire alarm systems, within your building structure are classified as life safety.

Provincial fire codes have adopted the national CSA C282-05 standard for emergency power for buildings which covers:

- Design
- Installation
- Operation
- Maintenance

### **3. Cooling Systems Problems**

- **Hoses and Belts:** The most common cooling system problems are associated with deteriorating hoses and belts. Hoses on jacket water heaters are especially vulnerable and have a relatively short service life. Hose failure during a run cycle is very likely to cause serious engine failure due to a rapid loss of engine coolant. This risk can be minimized with timely proactive replacement of hoses.
- **Plugged Radiator Core:** A plugged radiator core, either externally with dust, oil, and debris or internally with corrosion and/or dirty coolant, will cause engine overheating. Radiators should be inspected regularly for any debris or dirt in or on the radiator core, and the coolant should be monitored regularly to assure cleanliness and correct chemical composition. A typical recommended cooling system service interval is every three years for engines in standby service. Engines with normal glycol-based coolant, should be drained, flushed, and filled with new coolant at this interval.

### **4. Fuel System Problems**

It only takes six short months for diesel fuel to become jeopardized, thereby hindering generator performance, and peace of mind when you need it most. Today's high performance diesel engines require a reliable and clean source of fuel. Water is the biggest enemy to diesel fuel and can be introduced from the supplier or simply from normal condensation within the fuel storage tank(s). Keeping tanks topped up with fuel and using fuel stabilizers can help to protect the fuel. When water contamination is present, bacteria or microbial growth in the tank is a threat. Microbial growth, sediment, and particulates can plug engine fuel filters causing a generator engine to starve for fuel. Water or moisture in fuel can damage diesel engines and can affect overall engine performance. A fuel sample should be taken semi-annually and inspected for discoloration and/or abnormal smell, both indications of water contamination and/or presence of organic debris. A formal fuel quality test shall be performed at least annually using tests approved by ASTM standards.

Nothing stops your standby generator set faster than running out of fuel. You should know how long the standby system will operate when the system tank(s) are full. Monitor the fuel level and calculate how long the system will operate with present fuel levels. Some generator set engines are equipped with "low level shutdown" or "critical fuel level shutdown" lockouts. This is to prevent the fuel system from drawing in air when running out of fuel is eminent. Avoid that sinking feeling in the middle of the night, and make your standby power system more reliable by having the fuel tanks topped off long before they reach empty.

## **5. Automatic Transfer Switch (ATS) or Switchgear Problems**

Most ATS controllers today are microprocessor based. System settings, date, and timing functions are often maintained by a small backup battery. The most common preventable issue is a dead backup battery. Annual replacement of the backup battery is a low-cost preventative solution. Dirt and Dust Accumulation: Dirt, dust and moisture can cause malfunctions in the transfer equipment. Dust should be removed annually by wiping and vacuuming. A small space (anti-condensation) heater can prevent accumulation of moisture inside equipment enclosures.

Loose connections increase resistance, causing hot spots. Extreme cases can cause broken connections, short circuits, and even equipment fires. It is recommended to check at a minimum annually for loose connections with the use of infrared thermography during an emergency power system load test.

Automatic transfer switches (ATS's) and switchgear have moving parts and with that are susceptible to mechanical failure. Moving parts can seize if they remain in one position for long periods. It is best to ensure that moving parts will continue to operate smoothly with a monthly exercise that includes electrically operating the transfer switch with a loaded generator run. Performing actual outage tests that cause the ATS or switchgear to function will aid in exposing potential problems. Periodic lubrication of bearing points and inspection for electrical contact erosion are essential to good equipment health.

## **6. Circuit Breaker Problems**

Large circuit breakers have adjustable trip settings that must be set to match the loads they are to carry. In new installations or when existing loads have changed, it may be necessary to readjust circuit breaker trip settings to prevent nuisance tripping. This is particularly true when transformers make up all or a part of the circuit load, as a transformer can cause a current surge of up to twenty times its nameplate rating when first energized. Such current surges can easily cause nuisance tripping of incorrectly adjusted circuit breakers.

Reliable operation requires planned preventative maintenance. This includes cleaning, adjusting, lubricating, and testing circuit breaker(s). Annual inspection for loose connections is part of a comprehensive maintenance plan. Other common issues related to circuit breakers are failure to reset tripped breakers or leaving a circuit breaker in the open position. However, if a breaker trip has occurred, be sure that the cause of the trip is determined and resolved prior to reclosing the breaker.

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- Proven expertise in Life Safety Applications and Code Compliance
- Service programs suited specifically to your needs

We understand that generator alarm conditions can be stressful. We are committed to provide you "Peace of Mind" during these times.

Total Power is built on honesty, integrity and commitment to excellence.



## **7. Intake/Exhaust Value Problems**

Like the human body, an engine must be able to inhale and exhale. Intake and exhaust valves control this process. Timing of the opening and closing, as well as the proper seal of these valves, is extremely critical to managing fuel economy and engine operating temperatures. Improperly adjusted valves can fatigue and erode or fracture over time, often with tragic consequences. Debris from a valve failure can flow through the engine and cause damage to some of the most expensive components of the engine: cylinder liners, cylinder heads, turbochargers, pistons, and after coolers. Inspection and adjustment of valves and valve operators is recommended after an engine "break-in" period, usually at the first oil change, and then every two years for engines in standby service.

## **8. Generator Winding Problems**

With all the attention being paid to an engine, one must not forget that the generator end of the machine also needs attention. Depending on the environment, generator windings can become coated with dust, dirt, oil, and grime. Daily temperature fluctuations can allow moisture to condense on windings, in the same way that dew forms on windows of an automobile left outside overnight. Accumulated dirt tends to retain the moisture, and the combination can cause insulation breakdown, loss of insulation resistance, and possibly corrosion of winding metal itself. These, in turn, can lead to a short circuited or a grounded winding. Insulation testing should be done at least annually to establish a trend. When test results indicate insulation deterioration, corrective action can be taken to avoid a major and costly breakdown.

## **9. Lubrication Problems**

Bad things can happen to lubricating oil when an engine is operating, and bad things can happen to lubricating oil when an engine sits idle. A full service, including lubricating oil and filter change and a fuel filter change should be performed annually for generator sets in emergency standby service. Lubricating oil is the "life blood" of an engine, and it has a limited life inside of the engine. As the engine runs, the lubricating oil accumulates and binds contaminants, which could be harmful to the engine if not properly contained. Since standby systems rarely run for very many hours, they are especially vulnerable to the moisture and acids that form in the engine. These contaminants must be neutralized to prevent them from attacking bearings and engine wear surfaces. Operating an engine with contaminated lubricating oil can be very detrimental to engine components. Buildups of carbon and corrosive damage can occur, which can cause excessive bearing wear, crankshaft damage, wear surface seizure and other severe engine failure. Periodic lubricating oil and oil filter changes are very effective at preventing these problems and extending engine life.

## **10. Wet Stacking & Carbon Buildup Problems**

Diesel-powered generators are prone to problems associated with operating for extended periods with little or no load applied. This primarily results from over-sizing of the generator set to accommodate future loads and from maintenance test running that is necessary. Conditions such as accumulation of lubricating oil and unburned fuel in the exhaust stack (wet stacking) and carbon buildup in combustion chambers, on injector nozzles, piston rings, turbo chargers, exhaust piping and silencers commonly develop. For total peace of mind, load banking is the method of choice to verify system operation, commissioning, and maintenance as well as certify system capacity. An annual load bank test at full generator set rated load will help prevent or regress these negative effects, will give owners renewed confidence in their equipment, and will prove proper operation of the entire generator set installation, including the starting system, the fueling system, and the ventilation and cooling systems. Annual load bank testing is required practice for hospitals and other critical applications. Load bank testing should not be considered an option, but rather a critical element of your emergency preparedness plan.

The common problems that can cripple an emergency standby power system are avoidable. Be proactive! Do it now, before you're left in the dark!

To read this full article and more great power generation resources check out Power Line Magazine.

### **Total Power POWERGUARD Services**

Total Power has become one of the largest dedicated generator service organizations with the most highly trained and committed service team there is. We stand behind your power generator systems with our PowerGuard program to provide the advantage of extra measure of protection and care to your critical power equipment.



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