

Annual Maintenance Contract: Ten Commandments

"A good maintenance program will consist of daily, weekly, monthly, quarterly, and annual maintenance items" (NFPA 110). Operator performs daily and many weekly maintenance items. A Company like ESL adds value beyond measurement by performing the higher-level jobs. They are equipped with special tooling, unique experience, and are trained to detect problems using their experience. They offer a one stop shop and provide professional documentation to help assure critical, historical recordkeeping is maintained. This article discusses "Ten Commandments" of good generator maintenance. Let's take a look:



Safe Maintenance

Saves Time >> Saves Money >> Saves Lives

1. LUBRICATION PROBLEMS

Proper and timely lubrication, filter change and attention to cleaning is half the generator maintenance or even more. Lubricating oil, oil filter and fuel filter change should be performed every 250 hours and / or six months whichever is earlier. As the engine runs, the lubricating oil becomes contaminated. This contamination must be removed to prevent it from attacking bearings, cause crankshaft damage, and engine wear surface seizure etc.

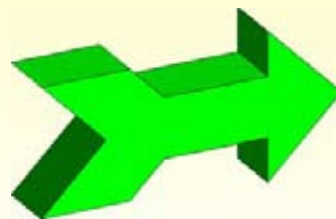
Lubrication = **1/2** **Proper  Maintenance**

2. BATTERY SYSTEM PROBLEMS:

"Analysis of generator failures shows battery problems cause at least half of them"

50%

FAILED

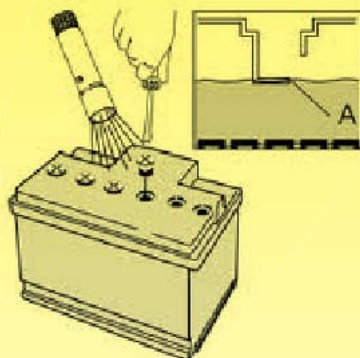


BATTERY

Old batteries: Most battery failures are because of the buildup of fungus like material on the battery's lead plates. 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. As batteries near the end of their service life manifested by ability to reach only 80% of rated capacity, their effective performance degrades more rapidly. Replacement of lead-acid type batteries every year or a year and a half is highly recommended for superior performance.



Battery maintenance: Connections must be regularly cleaned and tightened. It is necessary to monitor the electrolyte in wet lead-acid batteries. Charging dries the water in the electrolyte, and topping up with distilled water is compulsory.



Battery charger: Control systems of modern generators continuously draw power from the starting battery system. This power must be provided by the trickle battery charger, or else the starting batteries will soon discharge and fail to start the generator when needed.

Frequently, battery failure is a result of an open or tripped battery charger circuit breaker. Over- or under-charging of batteries also creates problems and this can be caused by an improperly adjusted battery charger or possibly by an internal component failure.



3. COOLING SYSTEM PROBLEMS

Radiator Core: In hot, humid, dusty, sandy conditions, radiator core is a major source of generator stoppages / inefficient operations. A choked radiator core, either externally with dust, oil, and debris or internally with corrosion and/or dirty coolant, causes engine overheating. Radiators should be inspected regularly for any debris or dirt in or on radiator core, and the coolant should be monitored regularly to assure cleanliness and correct chemical composition. Engine cooling systems use distilled or de-ionized water mixed with antifreeze containing Supplemental Coolant Additives (SCA's). The coolant mixture should be a minimum of 30% antifreeze to a maximum of 50% antifreeze, depending upon the freeze resistance required. Improper coolant mixture properties can lead to internal radiator core and engine water jacket corrosion and scaling, liner pitting due to cavitations etc. Recommended cooling system service interval is once every year. At this time, engines with normal glycol-based coolant should be drained, flushed, and filled with new coolant. Also thermostats; drive belts, and hoses should be thoroughly checked and / or replaced.

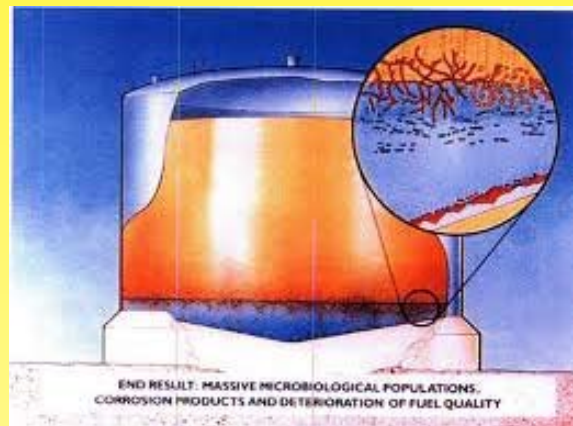


Hoses and Belts: Another common problem relates to hoses and belts. Hose failure while running can cause serious engine failure due to a rapid loss of engine coolant. This risk can be minimized with timely proactive replacement of hoses. Drive belts should also be regularly inspected for wear and correct tension.



4. FUEL SYSTEM PROBLEMS

Contaminated 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 can help to protect the fuel. When water contamination is present, bacterial growth in the tank is a threat. Microbial growth, sediment, and particulates can plug engine fuel filters causing engine to starve for fuel. Water or moisture in fuel can damage diesel engines affecting overall engine performance. A fuel sample should be taken every six month and inspected for discoloration and/or abnormal smell, both indications of water contamination and/or presence of organic debris. Alternatively, annual fuel tank cleaning is recommended to reverse the degradation process of the fuel.



Out of fuel: Monitor the fuel level of your engine 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 unavoidable. Make your prime power system more reliable by having the fuel tanks topped up long before they reach empty.



5. INTAKE / EXHAUST VALVE ADJUSTMENT PROBLEMS

An engine must be able to inhale and exhale. Intake and exhaust valves control this function. Timing of the opening and closing, as well as the proper seal of these valves, is extremely critical to the fuel economy and engine operating temperatures.



Improperly adjusted valves can erode or fracture over time, often with tragic results. Pieces from a valve failure can flow through the engine and damage some of the most expensive parts of the engine: cylinder liners, cylinder heads, turbochargers, pistons, and after-coolers. Inspection and adjustment of valves is recommended after an engine “break-in” period, usually at the first oil change, and then once every year.

6. OPERATIONS AT LOW LOADS & CARBON BUILDUP PROBLEMS

Diesel generators face problems associated with operating for extended periods of time with little or no load applied. 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, turbochargers, exhaust piping and silencers commonly develop. Annually testing generator with full rated load (live or load bank) will help prevent or regress these negative effects.



7. CONTROL SYSTEM PROBLEMS

Controls “Not in Auto”: Common issues involve simply not having the master control set for “Auto” operation or mistakenly leaving the Emergency Stop Pushbutton depressed. After an activity, always check to assure that generator set controls is set for automatic operation.



8. AUTOMATIC TRANSFER SWITCH (ATS) OR SWITCHGEAR PROBLEMS

Controller: Most ATS controllers today are micro-processor based. Annual replacement of the backup battery is a low-cost preventive solution for most Controller and ATS problems.



Dirt and dust accumulation: Dirt, dust and moisture can cause malfunctions in the ATS. 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: 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 least once a year for loose connections.



Mechanical Failure: Moving parts in ATS and switchgear can seize if they remain in one position for long periods of time. Performing actual outage tests that cause the ATS or switchgear to function will help in exposing problems. Periodic lubrication of bearing points and inspection for electrical contact erosion are essential to good equipment health.



9. CIRCUIT BREAKER PROBLEMS



Breaker Trip Settings: Large circuit breakers have adjustable trip settings that must be set to match the loads they carry. In new installations or when existing loads have changed, it may be necessary to readjust circuit breaker trip settings to prevent nuisance tripping.

Maintenance: This includes cleaning, adjusting, lubricating, and testing circuit breaker(s). Annual inspection for loose connections should be a part of a maintenance plan.

Open Circuits: Other common issues related to circuit breakers are failure to reset tripped breakers or leaving a circuit breaker in the open position. But if a breaker trip has occurred, be sure that the cause of the trip is determined and resolved prior to reclosing the breaker.

10. GENERATOR WINDING PROBLEMS

Depending on the environment, generator windings can become coated with dust, dirt, oil etc. Daily temperature fluctuations, allow moisture to condense on windings. 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 can lead to a short circuit or a grounded winding. When a generator is heavily loaded, the temperatures in the generator windings can exceed the boiling point of water, causing pockets of moisture to flash into steam.

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This action can result in a portion of the winding insulation being blown away, allowing a harmful path for electrical current. A costly failure or even safety issue can result. Professional help is required to evaluate the condition of the winding insulation and determine if there is a harmful buildup of dirt or moisture in the windings. 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.



The common problems that can cripple your generator are avoidable. Please contact ESL at customercare@eslpk.com and / or support@eslpk.com to review your power system maintenance practices today.

