Information Sheet # 129

Total Energy Systems, LLC

Your Reliable Guide for Power Solutions

To fulfill our commitment to be the leading supplier in the power generation industry, the Total Energy Systems, LLC. team ensures they are always up-to-date with the current power industry standards as well as industry trends. As a service, our **Information Sheets** are circulated on a regular basis to existing and potential power customers to maintain their awareness of changes and developments in standards, codes and technology within the power industry.

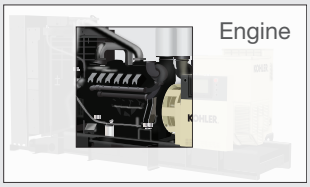
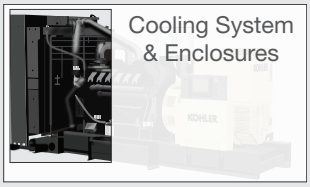
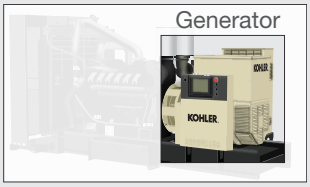
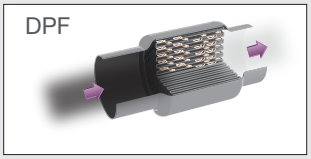
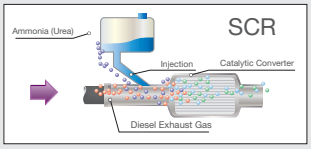
Standby Generator System Service - Ensuring it is Ready to Provide Power

1.0 Introduction:

A standby generator system is a combination of many components, as for any multi-component system, total system reliability is only as good as the weakest link. Standby generator systems frequently provide backup power to life and economically critical applications. Overtime service procedures have been established to ensure all the components within a generator system are fully operational, ensuring the generator can accept the load when the primary system, usually the utility supply, goes offline. Many applications are subject to service requirements set by the National Fire Protection Agency (NFPA). Defined services are subject to changes as additional components are added, i.e. exhaust aftertreatment devices.

This information sheet discusses all the areas of routine, minor, and major service required to ensure a generator system is maintained in a continuous state of readiness. (Continued over)

Figure 1 **Routine, Minor and Major Service Requirements to Ensure Reliable Standby Generator Systems**

Components		Routine/Daily	Minor Service	Major Service
 Engine	*Figure 1A* **Engine**	Visual inspection	Check air filter/s	Take oil sample
		Check for oil leaks	Check oil filter/s	Fuel polishing (Diesel)
		Check for fuel leaks	Check belt tension	Change oil and filters
		Check abnormal vibration	Verify battery amperes	Change air filters
		Ensure area is clear	Check hose connections	New battery if over 3-years
 Cooling System & Enclosures	*Figure 1B* **Cooling System & Enclosure if Fitted**	Visual inspection	Check coolant level	Take coolant sample
		Check for coolant leaks	Verify coolant alarms	Change coolant
		Check hose connections	Check radiator cap	
		Check for obstructions	Check enclosure vents	
		Ensure area is clear	Check fitting of enclosure	
 Generator	*Figure 1C* **Generator End**	Visual inspection	Verify voltage	Load bank to NFPA
		Check for obstructions	Verify frequency	Note readings for various loads
		Ensure area is clear	Check connections	
		Note vibration/noise	Check circuit breaker	Test generator operation at various loads
 DPF	*Figure 1D* **Diesel Particulate Filter (DPF)**	Visual inspection	Check for back-pressure alarms	Schedule load banking
		Check for exhaust leaks		
		Check connections		Regenerate DPF to remove carbon build up
 SCR	*Figure 1E* **Selective Catalytic Reduction (SCR)**	Visual inspection	Check Urea level and top-off as required	Schedule load banking
		Check for exhaust leaks		
		Check connections	Check sensor connections	
 ATS & Controls	*Figure 1F* **ATS, Controls & Switchgear**	Visual inspection	Check indicator lights	Complete transfer test of controls and ATS functions
		Check ATS enclosure	Check voltage sensing	
		Verify test switch function	Inspect enclosures	Blow out dust and debris that has accumulated
			Check wiring insulation	

2.0 Maintaining a State of Readiness & Reasons to Check:

A standby generator system ensures vital loads of the application still have power available when the primary power, usually the utility, goes off-line. Even though the generator may only run for a few hours in a year, deterioration can still occur, for example:

2.1 Diesel Fuel Deterioration – Diesel fuel is subject to waxing when cold and deteriorating when water is present, particularly in humid environments. Also, the tanks have to be replenished if the set has been operational.

2.2 Batteries – They can lose their charge is sat stationary for long periods and exposed to extreme cold.

2.3 Corrosion – All equipment exposed to the elements is subject to corrosion and water damage.

2.4 Extraneous Reasons – Equipment left unattended is subject to theft, vandalism, vermin damage, impact, etc.

2.5 Adverse Weather – Damage due to wind, rain, ice, lighting snow and ice.

Most equipment tends to perform better when it is regularly used; equipment that remains stationary has to be run occasionally to ensure the complete system is operational and in a state of readiness to perform as it is designed to.

3.0 Reasons to Implement a Planned Service Program:

Planned service programs are designed to identify issues with any components within the system that can lead to failure of the total system. Servicing of a total system falls under several categories:

3.1 Predictive Life Span – Various components within a system have a designed and known shelf life. Filters will have to be replaced after a period of hours of operation. Certain moving components are subject to wear such as belts and bearing surfaces, and components wear due to vibration, all have been tested and have a predictive life-span.

3.2 Examination – Service also includes visual examination to not only check for premature wear but for unforeseen failure, extraneous damage, contamination of environment (debris, waste storage, etc.) and corrosion.

3.3 Operational Testing – Even with replacing components as predicted and visual examination only fully operating the generator equipment under load will confirm that it is fully operational.

A planned service program ensures that the equipment is ready to operate when it is needed to do so. This requirement is driven by best practice management of maintaining the equipment in a state of readiness. In many applications, especially critical ones that are subject to entities, specified standards of service will apply.

4.0 Frequency of Type of Service/Inspection:

The generator industry has established best practice service protocols and they usually follow the recommended service intervals recommended by NFPA and other regulatory bodies setting standards for generator service for a variety of critical applications.

Frequency of service is influenced by the type of application and the predicted hours of annual operation. A standby generator system providing backup power to the utility in most areas of the US will probably run less than 100-hours a year. For standby applications there are three periods of service covering examination, test and operation as detailed below and shown in ***Figure 1***.

4.1 Daily/Weekly – Not all standby applications are manned; for example, a telecommunications tower. But when personnel are available onsite it is best practice to weekly, and even daily, have a walk-around examination to include:

- **Visual check of overall condition** - This includes checking site contamination, obstructions, weather damage, etc.
- **Snap Checks** - Look for coolant, fuel and, oil leaks.

4.2 Minor Service Program – A minor will vary by application and operator, but most range from 3 to 6-months. A network service supplier covering service of hundreds, if not thousands, of sites in a network will split maintenance into Minor and Major categories. The objective of a minor service plan is to ensure the equipment appears operational and to note any items that indicate a possible unplanned shutdown during operations. Minor service is more than routine and includes:

- **Filter Check/Change** - Oil, fuel, and air-filters will be checked and changed if they have met their planned life cycle.
- **Belt tensions** - Any mechanical items subject to movement and wear will be checked and tightened; this includes pulley belts and hose connections.
- **Top-off** - Coolant and fuel tank levels will be checked and topped-off as required. Installation with SCR, see ***Figure 1E***, will have the Diesel Exhaust Fluid (DEF) tank level checked.
- **Battery Status** - Most installations will have an automatic float charger connected to the battery. During a minor service, the battery condition and connections will be checked.
- **ATS and Controls** - The generator will be started and control functions and indicators verified. All wiring connections will also be checked; see ***Figure 1F***.

4.3 Major Service Program – A major service as for minor service varies upon the application. The principal difference between a minor and major service is that the generator system will be tested under full load to verify all components are working as within their designed parameters. While a minor test will identify the majority of issues that could result in failure, only a full load test will confirm the unit is fully operational.

It is not practical, or required, to conduct major services frequently; usually they are undertaken every year to 18-months.

A major service will incorporate all the tests of a minor plus the following:

- **Load Bank Testing** - The service provider will bring in a load bank and connect it to the generator to apply degrees of load up to the generators rated full load for the applications connected load. During operation all functions of the system will be tested including the controls, transfer switch, and other components.
- **Rental Generator** - Some major service programs also include bringing in a mobile generator. The mobile unit through a docking station is connected to the load and acts as the standby generator while the actual standby unit is disconnected from the system for load bank testing.

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