Information Sheet # 39

Predicting Generator Failure Issues by Remote Monitoring

Your Reliable Guide for Power Solutions

1.0 Introduction:

A generator system is a complex assembly of mechanical and electrical components. For maximum reliability, all of these components must function as intended and be kept in an operational state of readiness. This is particularly critical in backup systems. Manufacturers and distributors responsible for generator systems use many processes to ensure reliability. The latest technology now provides system operators with sophisticated tools to predict possible system failures before they occur.

These new technologies track deterioration within individual system data-points so that potential system or component failure can be corrected with planned maintenance before the failure occurs.

This Information Sheet discusses the latest remote monitoring technology for predicting generator systems issues: *(Continued over)*

Generator System Monitoring of Data-Points to Predict Failure

1 - Trending of Critical Generator System Data:
- Oil pressure & temperature
- Coolant level and temperature
- Alternator frequency & voltage parameters
- Fuel level and filtration

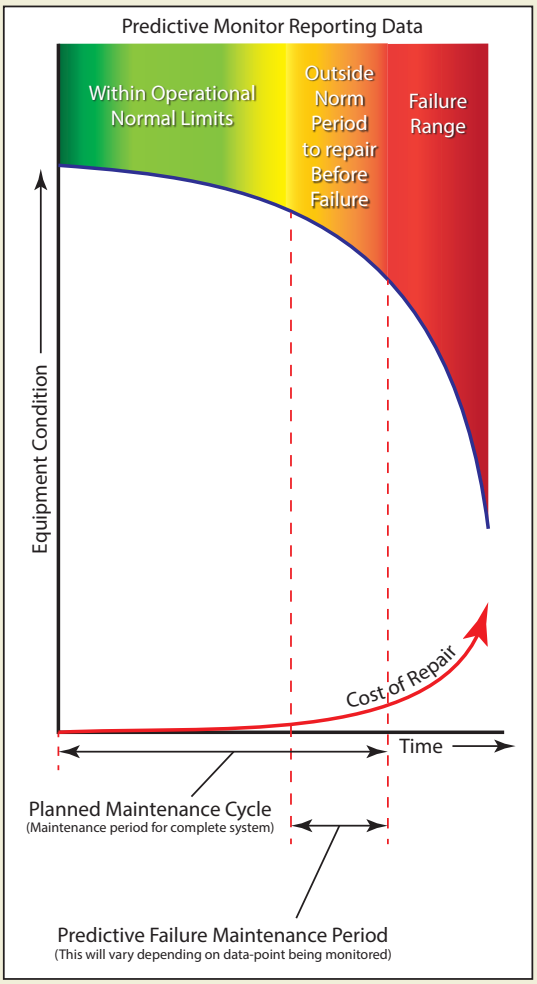
2 - Battery amperes and voltage

3 - Generator Controls:
- Battery charger
- Run status
- Alternator frequency & voltage parameters

4 - ATS (Automatic Transfer Switch) data

5 - Data Collector Transmitter
(Located in/adjacent to the generator)
Data collector will monitor variations from normal programmed in for each data-point being monitored, such as fuel level, battery ampere, or oil pressure

Monitor Tracks Rate of Change in Preprogrammed Limits to Predict when Limits will be Exceeded



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2.0 The distinction between reporting failures versus predicting them:

Annunciation controls signal when and why conditions such as low fuel, overheating, dead batteries or a failure to start have caused systems to fail. This gives service providers data they need to bring the right tools and parts to rectify any issue. But annunciation alarm controls do not monitor system changes that might predict and help prevent failure. To achieve maximum system reliability you need monitoring tools to predict conditions that can result in an unplanned system shutdown.

3.0 The Importance of Predicting Potential System Failure:

In a backup power system, the worst case outcome is for that system to fail to start as required when the primary power to a facility goes off-line. The most common reasons that backup systems fail to start are poor battery condition or problems with fuel supply. Remote monitoring technology shows a service provider the status of batteries and fuel supplies in real time, allowing the provider to correct any issue and maintain the generator system in a state of readiness.

Generators that provide primary power to a facility also can fail for many reasons that may arise in both their mechanical and electrical systems. Again, applying technology to monitor all parameters will give the service provider detailed information about components and settings that are trending out of normal limits before the system fails and primary power to the facility is lost.

4.0 Advantages and Examples of System Components that Can be Monitored:

In most cases, system failure is a result of gradual deterioration to below or above normal limits. Unless there is an unusual dramatic failure, a reduction in oil pressure will be gradual. When a remote monitor is configured to track real-time oil pressure and detects a 2 psi/hour reduction from a normal operational reading of 65 psi, this deterioration in oil pressure will be transmitted before the critical 15psi shutdown is reached. Predictability modules on the generator are programmed to track real time data and the rate of change from predetermined normal values.

5.0 Key Benefits of Monitors Programs to Predict Performance Trends:

Monitors that can be programmed to track deviations from norm and predict failure are the next generation of remote monitors that only reported generator status and reasons for shutdown. The new monitors also allow operators to use actual status data to customize planned maintenance programs for generator systems, as opposed to checking and maintaining system components on a predetermined schedule.

Key benefits predictability monitors are:

- Optimization of maintenance planning
- Change of focus from time-based to actual reported condition-based maintenance
- Tracking deterioration issues that can shorten engine, generator and control lifetimes
- Improved maintenance decision making with plans around when to run and replacement of components
- Predictability that reduces the risk of failure and unplanned downtime
- 24/7 monitoring has shown to eliminate 95% of all Fail-to-Start situations
- Greater input for life cycle cost estimates, and optimized cost of ownership
- Decreased replacement costs

6.0 How Predictably Monitors Operate:

A monitor will be fitted to the generator set. Monitor manufacturers have customized their units to a wide range of generator manufacturers' systems, avoiding the necessity to reconfigure the generator system as supplied.

Built-in administrative functions enable the system operator to organize and set up the generator and sensors to be managed. The system monitors 24/7 all critical generator parameters to inform maintenance staff of operating conditions and predictive failure information. Normal limits and shutdown parameters of all sensors are entered into each monitor's individual program. Digital filter algorithms within the monitoring device use inbound data from various sensors to analyze numerous generator system components.

Common consumables attributable to generator failure monitored are (but not limited to):

- Battery voltage condition and battery charger
- Diesel fuel level (diesel generators)
- Gas supply pressure supply (gaseous generators)
- Low oil pressure
- Low coolant level
- Blocked cooling radiator
- Fuel, air and oil filter blockages

Data gathered can be transmitted by cellular connection and satellite up-link (in remote areas), or hard-wired through cable systems (*see diagram on front-page*). Usually software is provided for system operators to customize according to how they wish to receive and analyze the data transmitted by the monitors.