



Earth Fault Resistance Monitoring of Brushless Exciter Generators/ Motors

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(insulation resistance of field winding to rotor ground)
to prevent rotor damage

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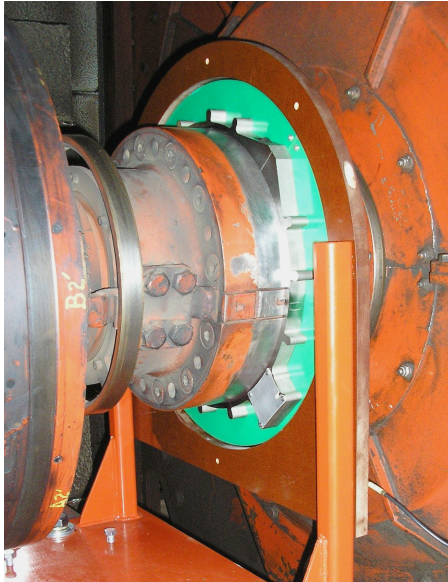
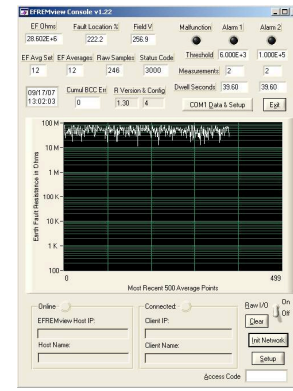
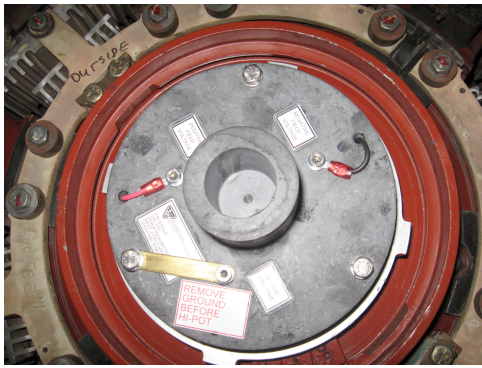
Industry: Power

Product: EFREM (Earth Fault Resistance Monitor)

Parameters measured: Ground Fault Resistance, Field Voltage, Fault Location

Accumetrics is supplying the EFREM system to major manufacturers of power generation equipment to enable the active, continuous monitoring of field winding fault resistance (insulation resistance) to rotor ground. For brushless exciter based equipment, the field winding is normally not accessible without the use of troublesome slip rings, which in many cases are only infrequently applied for momentary measurements (for instance, one touchdown of brushes every 24 hours). Early detection of faults can lead to timely repairs before rotor damage occurs from a second fault arising. Trending of the fault data allows understanding of the effects of humidity, noise, and normal resistance parameter variation. The EFREM, through an induction powered digital design, allows wireless connection to obtain precise and dependable rotating measurement of fault resistance at a rate of about 1.5 seconds per measurement. In measuring fault resistance, the EFREM is also able to report the actual field voltage, as well as the fault location (if the system is unfortunate enough to have developed a fault). The digital data used by the EFREM allows robust communication without interference from EMI, which is a common problem with some telemetry and slip ring measurements.

The system is an improvement on the popular GDS (Ground Detection System), a digital telemetry system that has been supplied by Accumetrics for generator protection for years. The GDS uses a fixed current leakage threshold as an alarm/no-alarm indication of generator safe operation. Since this current will vary depending on the magnitude of the field voltage at the wire fault, the GDS' alarm is more sensitive to faults near the positive terminal of the field winding. Alternatively, the EFREM shows trending of the actual fault/ insulation resistance; this data can be charted and used for statistical process control condition monitoring. Multiple user-settable alarms are included. As added benefits contrasted with the GDS, field voltage is reported, and an indication of the location of a fault is computed by the EFREM, which is output as the fault's percentage of its distance from the negative field terminal to the positive field terminal.



The picture above left shows an end-of-shaft mounted rotating Transmitter for the EFREM. The above center picture shows a system ready for shipment. The above right picture is the Ethernet system control and display software, “EFREMview”, showing the Log Resistance vs. Time chart, as well as readouts of Field Voltage and Fault Location. The lower left picture shows an EFREM system mounted at a mid-shaft location. The lower right picture shows a typical NEMA style Receiver, with dual 4/20mA outputs, multiple relay contacts for ground fault threshold Alarms, and full data output via Ethernet and RS232. . The Receiver generates the induction power, allowing the system to be fully functional even when the generator is at 0 RPM.

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