ACCUMETRICS
MTS SYSTEMS CORPORATION

660 MW GENERATOR ROTOR MONITORING SYSTEM

CONTINUOUS MONITORING OF EARTH FAULT RESISTANCE AND ROTOR TEMPERATURES

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Application: 660 MW Generator Rotor Monitoring System

Continuous monitoring of earth (ground) fault resistance and rotor temperatures for maximizing power output and maintaining safe, dependable operation.

Industry: Power

Product: AT-7000 and EFREM hybrid system

Parameters measured: Temperature (32 channels- RTD), Earth Fault Resistance, Field Voltage

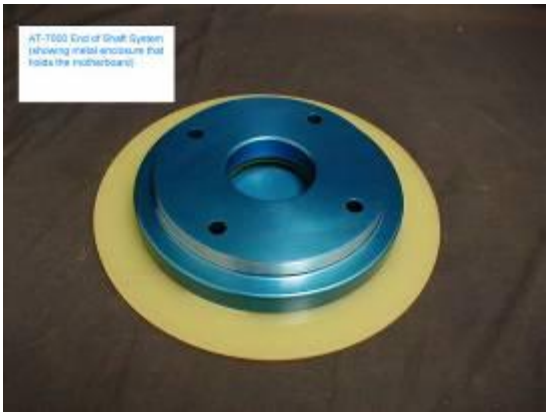
A major power producer required monitoring of their 660MW generator to provide both wireless rotor temperature monitoring and earth fault resistance measurement of the isolated (brushless exciter) field coil from the rotor. Thirty two RTD's were installed in the rotor during an outage to provide detailed temperature information during the operation of the generator. Accumetrics AT-7000 precision multichannel digital telemetry design was chosen for the RTD temperature monitoring, and the Accumetrics EFREM (Earth Fault Resistance Monitor) was chosen for the insulation resistance ground fault condition monitoring.

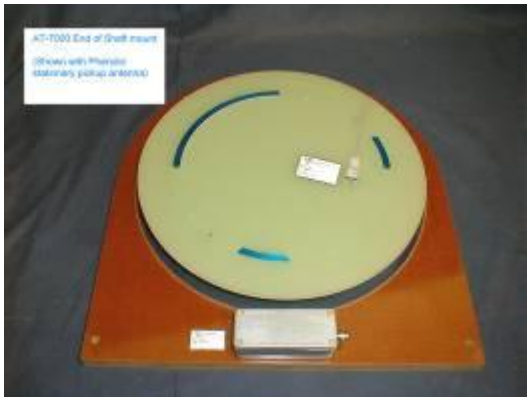
A hybrid mounting package for combining the two telemetry systems at the end of shaft (versus Accumetrics' mid-shaft clamp collar mounted systems) was custom designed for the generator. The above picture shows the hybrid transmitter assembly in the foreground, with the stationary pickup coil on the top of that assembly (see blue ring assembly for the EFREM and AT-7000 stationary induction power/data pickup. The NEMA boxes in the background provide the digital to analog conversion for analog RTD and EFREM outputs and associated Ethernet data outputs.

Benefits of the solution:

- Monitoring of system for maximum safe power output and prevention of catastrophic damage

- Reliable, and early, ground fault detection to protect the rotor from damage
- Highly accurate, dependable, and noise-free temperature data:
    - Precision instrumentation amplifiers are used before digitizing on the rotating shaft
    - High speed sampling of RTD's provides non-aliased data ---that is very immune to EMI
- Wireless access (instead of troublesome slip rings) to rotor sensor data.
- Continuous trending of actual resistance of the ground faults is provided—not just go/no-go alarms, but useful charting information allowing timely re-prioritization of service!
- User-settable alarm thresholds
- Ethernet communication of data, as well as analog signal output





End of Shaft AT-7000 system for monitoring 16 Strain Gages and 24 thermocouples (on a different generator) The AT-7000 multichannel system can measure RTD's, Thermocouples, Strain Gages, Pressure transducers, as well as differential Voltages (and Current shunts).

The EFREM Earth Fault Resistance Monitor system can measure and trend ground fault resistance (isolated field winding to rotor ground), field voltage, and alarm if thresholds are exceeded. Contact us to request information on this system, or look further at our Products section.

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Accumetrics, Inc. provides digital telemetry systems used in a variety of applications such as aerospace, marine, defense, agriculture, transportation, milling operations, energy, and power generation. Systems transmit sensor data from rotating structures using wireless techniques, preserving the integrity of the data even in environments with high levels of electromagnetic interference. Measurement solutions range from single channel products, such as strain gage torque measurements, to advanced custom multichannel systems. Accumetrics, Inc. is a subsidiary of PCB Piezotronics, Inc., and PCB® is a wholly owned subsidiary of MTS Systems Corporations.

MD-0413 revNR 0719

MTS SENSORS

MTS Sensors, a division of MTS Systems Corporation (NASDAQ: MTSC), vastly expanded its range of products and solutions after MTS acquired PCB Piezotronics, Inc. in July, 2016. PCB Piezotronics, Inc. is a wholly owned subsidiary of MTS Systems Corp.; IMI Sensors and Larson Davis are divisions of PCB Piezotronics, Inc.; Accumetrics, Inc. and The Modal Shop, Inc. are subsidiaries of PCB Piezotronics, Inc.