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WIND TURBINE MONITORING SYSTEM

CONTINUOUS MONITORING OF WIND TURBINE STRAIN GAGES AT NREL, THE NATIONAL RENEWABLE ENERGY LABORATORY

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Application: Wind Turbine Monitoring System

Continuous monitoring of wind turbine strain gages at NREL, the National Renewable Energy Laboratory.

Industry: Power

Product: AT-7000

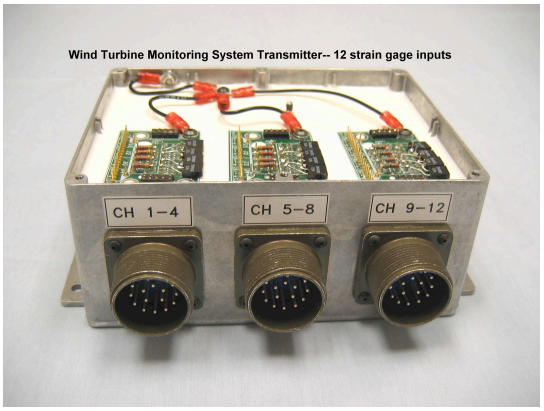
Parameters measured: Strain (Eight ¼ bridge strain gages)

The National Renewable Energy Laboratory needed to monitor eight quarter bridge strain gages, and chose Accumetrics' AT-7000 digital telemetry system. The system provided excitation for the sensors, as well as on-rotor amplification, anti-alias filtering, and digitizing of the signals. The on-shaft digitizing aided in a low susceptibility to EMI, and a robust way of transferring data to the remote receiver as a serial high speed data stream. Given the size of the rotor and the relatively low RPM, the transmitter circuitry was housed in a simple but rugged rectangular box. A series of insulated standoffs provided the mounting for a circular wire construction rotating induction coil, while the stationary pickup coil was constructed from segments of copper tubing. Each of the eight channels was provided with on-the-fly shunt calibration capability, allowing a known bridge imbalance to be applied to verify signal levels.

The system sampled each strain gage input at 5800 samples per second.

Benefits of the solution:

- Dependable high bandwidth digital telemetry—no interference from EMI, no data drop-outs.
- Induction powered for continuous use.
- Highly accurate, dependable, and noise-free strain gage data:
- Precision instrumentation amplifiers are used before digitizing on the rotating shaft
- High speed sampling provided to ensure reconstruction of full spectrum of desired bandwidth
- Wireless access (instead of troublesome slip rings) to rotor sensor data.
- Single digital data stream transmission of multiple channels (eliminating the need for multiple transmitter/receiver electronics and tuning)



AT-7000 system for monitoring 12 Strain Gages (for a different wind turbine generator application)

The above left picture shows a relatively small transmitter assembly, with three Amphenol input connectors for a 12 channel system. On the reverse side of the enclosure is located a coaxial connector for an RG-58 connection to the rotating stand-off wire transmitter coil. The above right picture shows the pickup induction power/data coil. A NEMA style Receiver is also shown.

The AT-7000 multichannel system can measure RTD's, Thermocouples, Strain Gages, Pressure transducers, as well as differential Voltages (and Current shunts).

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