

## Application Note

### Wind Turbine Gearbox Testing

Wind turbines are large investments which require thorough testing of the individual components to minimize expensive downtime and repair during operation. The gearbox, one of the most vital components of a wind turbine, is often regarded as the weak link therefore high quality and reliability of the gearbox is paramount in design and manufacture.



Wind turbine gearbox testing at Doosan Corporation Mottroll, South Korea

Doosan Corporation Mottroll is leader in the Korean hydraulic system industry and develops gearboxes for wind turbines. For R&D development of the gearboxes at its facility in Changwon, South Korea, Doosan Corporation Mottroll selected m+p international's SO Analyzer. The versatile analyzer determines vibration and acoustical characteristics as well as verifying that the torque and temperatures are within specifications.

SO Analyzer is operated with eight channels using NI 9234s, in a CompactDAQ acquisition chassis from National Instruments, for noise and vibration measurements and general data acquisition. This compact and rugged device is ideal for applications in the field and in the lab. For temperature logging alongside dynamic measurements SO Analyzer supports the National Instruments 4-channel 9217 RTD module.



NI 9234



NI 9217

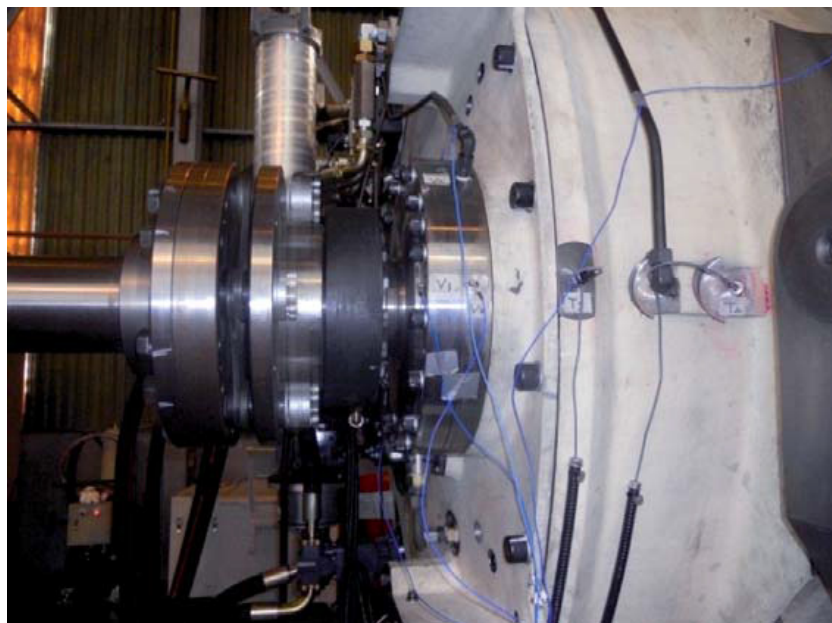
SO Analyzer supports NI CompactDAQ acquisition modules

The flexibility of SO Analyzer is used to perform multiple measurements on the wind turbine gearbox at different operating powers:

### 1. Vibration (according to ISO-10816-1)

Measurements are made over 30 s to 60 s at each specified RPM including:

- Vibration measurement using accelerometers at the specified locations
- Overall RMS velocity (mm/sec) using the integration function and narrowband spectrum analysis for detecting the dominant frequency (from 2 Hz to 1,000 Hz)



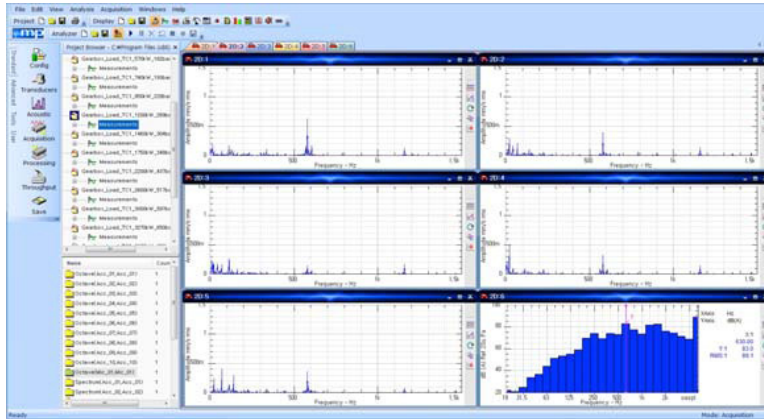
Acceleration and temperature sensors

### 2. Sound Pressure Level

Measurements are made over 30 s to 60 s at each specified RPM. Using the same method as precision sound level meters SO Analyzer measures overall A-weighted Sound Pressure Level (reference:  $20 \times 10^{-6}$  Pa) (ISO 1996) and 1/3 octave spectra analysis.

### 3. Sound Power

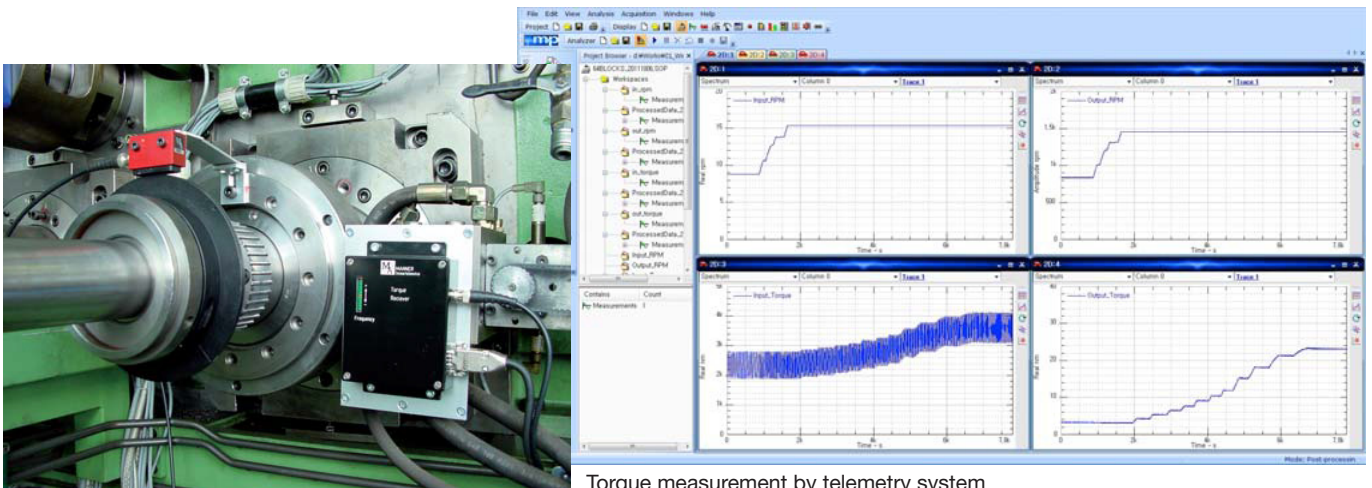
Sound power measurement and analysis using a Sound Intensity Probe is also performed and results are calculated from each scanning surface area according to ISO 9614-2.



Sound power measurement

### 4. Torque and Temperature

Torques are measured using a telemetry system for calculating each input and output drive motor power.



Torque measurement by telemetry system

Measurement of oil temperature in the sump as well as before and after the oil cooling system is also integrated using the Temperature Logging module with NI-9217 hardware. The lower sampling rates of the NI-9217 RTD input module are automatically handled by SO Analyzer and the data is combined with the dynamic results so that they can be easily compared for event or other analysis.

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70860/06-12