Not Always A Touchy Subject …

A test rig built at Centa Transmissions allows the company to guarantee that the gearboxes it supplies don't fail prematurely.

Despite its critical role, the rig is essentially quite simple in that a motor drives the test unit against a load created by one of Centa's own industrial disc brakes. The test runs initially for three hours at the full working load and then is increased to 300 percent load for another hour. At the heart of the rig is a non-contact sensor that constantly monitors the torque in the gearbox, generating a performance profile that can be compared with the ideal performance standard.

The sensor is a TorqSense unit, as developed and made by Sensor Technology of Oxfordshire, UK. Because it is non-contact, the TorqSense does not create a dynamic load, which has to be accounted for in the analysis of the output signal.

"The output reading we get is a true reflection of the performance of the gearbox; we don't even have to allow for a constant offset," says Michael Sykes, MD of Centa Transmissions. "This means our calculations, which we share with the client, inspectorate, etc. are very simple and easily understood even by non-technical people."

The gearboxes are destined to function in an environment in which reliability has to be 100 percent. Used in completely automated scoop mechanisms, these gearboxes collect small amounts of high-activity liquor from the reactor cooling system, which is sealed into thick-walled ceramic flasks for long-term storage until the radioactivity has decayed to safe levels.

"This is at the very core of the nuclear plant in which a component or system breakdown would mean shutting down all operations for months, automated/unmanned removal of faulty parts, sealing them into a secure flask and automated installation of a replacement. The cost would be millions of pounds—at the very least. To avoid this, everything has to be lifetime-guaranteed to demanding criteria."

Instead of making physical contact with the output shaft of the gearbox, TorqSense uses a radio frequency link. This picks up signals from two piezo-ceramic combs glued onto the shaft, which vary as the combs deflect under the effects of rotation. As the torque increases, the combs change their electrical resistance proportionally to the change in frequency of the surface acoustic waves caused by the rotating shaft.

"The combs function as strain gauges that measure changes in the resonant frequency of the rotating shaft," explains Sykes. "The really clever bit is that the radio frequency coupling is used to supply power to the strain gauges—being piezo-

based, they need less than one milliwatt of power, which is transmittable as a radio wave.”

Some other benefits of this TorqSense—or surface acoustic wave—technology include:

“Simplicity is a great virtue for nuclear installations,” Sykes maintains. “There is less that could go wrong; maintenance is easier; and inspections and approvals are simpler. In this respect, both our test rig and Sensor Technology’s TorqSense are ideal for the industry.”
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