

A company that designs and builds custom test equipment for the manufacturing and research sectors has developed a cost-saving sub-system that allows eight dynamometer test rigs to share a single calibration unit based on a novel non-contacting torque sensor

Economy and simplicity: eight test beds, one calibrator

The Westbury, Wiltshire based company, 1st Pass (www.1stpass.net), started out as a regional systems integrator for National Instruments' LabVIEW software. However the company quickly realised that there was a considerable need for a wider service encompassing all aspects of test rig design and build, as founder and managing director, Chris Turner, explains.

"Engineers involved in either research or quality control need test rigs, but designing them is not their forte. They tend to focus only on the immediate requirements so tend towards inflexible, mono-functional designs. Six months later when new requirements emerge, they have to build another rig.

"We saw this as a gap in the market and decided to offer them a full package whereby we would interview the engineers to establish likely future requirements, then design and build a test rig or test station that addresses all of these. This includes electrical and mechanical design, software, firmware, support systems, etc. We will also install, calibrate and maintain the rigs."

Recently, Mr Turner was invited by a major West Country based manufacturer to assess its needs for life testing electric motors. The company has a sizeable research and development function and it was decided that no less than eight separate rigs were required, each driving a test motor against a brake, with dynamic performance data being collected from around the rig and analysed via LabVIEW.

With the rigs' workload expected to be high, it was sensible to go for a solid design that would last through many years of punishing duty. However, this stretched costs beyond the budget and a different approach was needed, as Mr Turner recalls.

"We needed to be able to calibrate and recalibrate the rigs on a regular basis, and we wanted the calibration process to be as simple as possible. I was able to use a TorqSense sensor, which can monitor the torque in a rotating shaft without actually touching it. It opened up the potential for foolproof, robust yet sensitive calibration."

Developed by Sensor Technology, TorqSense measures the resonant frequency change of surface acoustic wave (SAW) devices when strain is applied to a shaft to which they are attached. The applied torque causes a deformation of the quartz substrate of the SAW device, which in turn causes a change in its resonant frequency. Essentially these devices act as 'frequency dependent' strain gauges.

The changes in resonant frequency are detected via a non-contact radio frequency rotating couple from the shaft to a fixed pick-up. It is the analysis of the difference in resonant frequencies between the two SAW devices on the shaft that gives a precise indication of the torque it is transmitting. SAW devices have a high immunity to magnetic fields allowing their use inside, or close to motors, where other analogue technologies are unsuitable due to EMC issues.

The transducer is able to sense torque bi-directionally,

with fast mechanical and electrical responses, and as the method is non-contacting, it is also free of brushes and complex electronics, which are often found in traditional torque measurement systems.

Shared calibration

Initially it was assumed that the eight test rigs would each have their own on-board calibration unit. However, as these were only used at the beginning of each test run and would

“Initially it was assumed that the eight test rigs would each have their own on-board calibration unit. However, as these were only used at the beginning of each test run and would actually be idle for most of the time, Mr Turner hit upon the idea of developing a single de-mountable unit that could be shared by all the rigs”

actually be idle for most of the time, Mr Turner hit upon the idea of developing a single de-mountable unit that could be shared by all the rigs.

TorqSense's non-contact operation and lack of flying leads make de-mountable installations an attractive proposition, so the next problem was to come up with a simple method for positioning the transducer. Following discussions with Sensor Technology, it was decided that sliding the unit up against the rig's end stops would provide the best solution. This, in turn, required a method of moving the brake away from the motor to allow room for the calibrator to slip into place. It was finally decided to mount the brake on a slide too, resulting in a simple arrangement that required little re-design beyond 1st Pass's original concept.

i More info - Enter 450 at www.dpaonthenet.net/enquiries



Sensor Technology's TorqSense torque sensor