

## Sensor Technology helps to keep sheep shorn!

The speed with which sheep shearers can have an animal shorn is a marvel, made possible by ever-developing technology.

TorqSense transducers from Sensor Technology are playing an important role in new product development at Gloucestershire-based Lister Shearing, the oldest and one of the most successful suppliers of animal shearing and dipping equipment in the world. The sensors, which are based on SAW (surface acoustic wave) technology, are being used by the company as an aid to evaluating the performance of miniature electric motors.

Able to trace its roots as an agricultural equipment manufacturer back as far as 1860, Lister Shearing produced its first sheep-shearing machine in 1909 in response to the growing demand from the Australian farmers of the day. Today, the company holds a Royal Warrant for the supply of animal care equipment and its products are sold in more than 60 countries around the world. In all of these markets, the products have established an enviable reputation for efficiency, durability and quality.

To maintain and enhance this reputation, Lister Shearing invests heavily in product development. As part of the development process, it sends engineers to work with leading grooms and shearers around the world to learn about common problems and to devise innovative solutions. These solutions are translated into practical products at the company's development facility at its Gloucestershire headquarters.

An issue commonly encountered with powered hand tools, which form a significant part of the Lister Shearing product range, is sourcing motors that will combine high efficiency and high torque output with smooth operation and long life. This situation is complicated still further by the high operating speed required from the motors – up to 20,000 rpm in some applications.

To address these motor selection issues and in particular, to assist in the development of a new type of handheld sheep shear, Lister Shearing decided to

set up a motor test rig that would allow the performance of motors from various suppliers to be compared quickly and easily.

A key requirement for this rig was that it should be able to accurately determine the torque produced by each motor and its speed under a wide range of operating conditions. Initially, it seemed that this requirement would be hard to satisfy, as most available torque sensors were either unable to cope with the high motor speeds involved, or required wired connections that would have been inconvenient or impossible to provide in this application.

Fortunately, one of the development engineers at Lister Shearing saw mentioned in a magazine the novel TorqSense sensors produced by Sensor Technology and quickly realised that these would offer an attractive solution.

TorqSense sensors depend for their operation on surface acoustic wave transducers. These transducers comprise of two thin metal electrodes, in the form of interlocking "fingers", on a piezoelectric substrate such as quartz. When an RF signal of the correct frequency is applied to the transducer, surface acoustic waves are set up and the transducer behaves as a resonant circuit.

The essential feature, however, is that if the substrate is deformed, the resonant frequency changes.

When the transducer is attached to a motor drive shaft, the deformation of the substrate and hence the change in resonant frequency is related to the torque applied to the shaft. In other words, the transducer, in effect, becomes a frequency-dependent strain gauge.

Since the transducers operate at radio frequencies, it is easy to couple signals to them wirelessly. Hence, TorqSense sensors that incorporate the SAW transducer technology can be used on rotating shafts, and can provide data continuously without the need for the inherently unreliable brushes and slip rings that are

often found in traditional torque measurement systems.

TorqSense sensors are available in versions that can be used at shaft speeds well in excess of 20,000 rpm and thus easily meet Lister Shearing's requirements in this area. In addition, they have a high overload margin, they operate equally well clockwise and anticlockwise and they feature integral temperature monitoring. Also, in addition to measuring torque, the sensors provide accurate data about speed and power. Taken together, these features meant that a TorqSense sensor offered a convenient and cost-effective all-in-one solution for the Lister Shearing motor test rig.

In this application, the sensor was complemented by Sensor Technology's TorqView software package that runs on a PC and that combines data acquisition with a real-time display of torque, motor shaft speed, power and temperature. TorqView also stores the data it captures, and offers powerful tools for its subsequent analysis.

"The team from Sensor Technology provided really excellent support in helping us to choose the right sensor and set it up so that it would provide the best results," said Robin Howell, Chief Development Engineer at Lister Shearing. "As a result, we were able to acquire useful data right from the outset. The data is interesting and even, in some cases, rather surprising."

"After using the rig for some time, I have no doubt at all that it will help us to produce equipment that will set new standards for performance in sheep shearing. Thanks at least in part to Sensor Technology, sheep around the world will soon be shorn more swiftly!"

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Enquiry No. 23