

design engineering

»»SENSORS

Passing with flying colours

Torqsense has been used for testing on-board generators

The process of servicing aircraft at MEL Aviation has been improved by the introduction of Torqsense non-contact torque sensors

“When an aircraft isn’t flying it isn’t making money. But, an unsafe aircraft is a liability to everyone”

what’s new sensors

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»» LEVEL-HEADED

Gill Sensors has developed a heavy-duty transmission oil level sensor, which has been ATEX approved for use in hazardous area mining applications. The sensor has been custom designed for installation into the gearbox of the ranging arm on a large continuous mining coal shearing machine. The sensor uses proven capacitive measurement technology as used in other Gill liquid level sensors, giving a continuous output over the full depth of the transmission oil reservoir in real time, giving the operator full vision of the level remaining. With full stainless-steel construction and a heavy-duty construction, the sensor was designed to offer reliable operation in the harsh, dusty, high vibration environments encountered in this type of operation.

www.gillsensors.co.uk

»»continues

Non-contact torque sensors developed by Banbury-based Sensor Technology are helping to speed up the servicing time for a range of military and civil aircraft.

The Torqsense non-contact torque sensors are a key element in a new fully automatic generator testing station developed by MEL Aviation in Sudbury, Suffolk.

According to Sensor Technology, the innovative sensors can be deployed instantly for high-performance acceleration and deceleration tests of aircraft generators. By contrast, conventional sensors would require the fitting and aligning of fiddly slip rings, an expensive process when considering the down-time costs of an airliner or military jet.

MEL Aviation is a foremost full service and repair provider for the overhaul of aircraft systems and components. It also designs, manufactures and supports military aircraft systems and military ground-support equipment (GSE). Civil airline customers include British Airways, Virgin Atlantic, Monarch, BMI and Saudi Arabian airlines. On the military side it works with the UK MoD and BAE Systems, on the Eurofighter and Nimrod programmes, and has

manufactured oxygen masks for use in military aircraft.

Gary Parker, one of the company’s leading engineers explained that its 24-hour service is supported by sophisticated customer care and quality assurance cultures, one-stop-shop capabilities and a passion for excellence.

‘For the most part we work with specifically designed technology and purpose-built test equipment. This breeds a culture of total responsibility for total reliability.’

Parker continued: ‘When a civil aircraft isn’t flying, it isn’t making money. When a military aircraft is on the ground, defences are weakened. But an unsafe aircraft in the air is a liability to everyone, so they are constantly rotating through ground-servicing schedules to ensure their ongoing air and battle worthiness.’

Every modern aircraft has at least one on-board generator to produce electrical power (most have two or more in a redundancy configuration for utmost reliability). These need to be ground tested regularly, typically every 500 to 1,000 flying hours, hence the need for MEL’s test station.

‘Our GTR station is in essence very simple,’ explained Parker. »

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» TAPE MEASURE

ASM Sensors has expanded its Positape line of tape-actuated position sensors with the introduction of the WB12 series. The Positape sensor line was especially developed to extend sensor life in applications that require pulleys. The new WB12 sensor provides a measuring range of 118in. The industrial-grade position sensor WB12 is constructed with a custom-designed stainless steel tape that is coiled on a precision drum. With its high degree of flexibility, the measuring tape yields an extended life of the sensor. It is perfectly suited in applications that require pulleys due to the tight locations where the sensor must be installed.

www.asm-sensor.com

» TOUGH CUSTOMER

Gems Sensors & Controls has introduced the low-cost, miniature 950M Electro Optic Level Sensor (ELS) for a wide range of applications and industries. The ELS-950M expands on the existing ELS-950 product line with a brass housing to perform in harsh environments, maintain integrity in temperatures ranging from -40°F to 230°F and pressures to 250psi. The ELS-950M has an over-moulded electronics insert, TPE insulated wires, and a fluoro-carbon O-ring seal to create a watertight, environmentally resistant assembly. The ELS-950M is UL and CE approved to EMI standards and shock and vibration tested to MIL standards, IP66/67 and RoHS compliant. These robust sensors are available in 5 or 12Vdc models with mounting options of ¼ in NPT, ½ in - 20UNF-2B or M12x1-8.

www.gemssensors.com

» PINPOINT PRECISION

The WFS Fork Sensor launched by Sick (UK) is claimed to bring precision to label printing for packaging and other production operations. Designed specifically to be mounted at the outlet of the label dispenser, it accurately detects label location and interval on the substrate, allowing rapid adjustment to different label runs with exceptional repeat accuracy. The sensor's compact design provides edge detection of non-transparent labels on different web materials, and also double sheet fed incidents. The 50µs response time ensures rapid reaction at high web speeds, and fast response to adjustments.

www.sick.com

» ROUND THE BEND

Variohm Eurosensor has introduced a low-cost angle displacement sensor from Spectra Symbol that registers a resistance change depending on the amount of bend radius induced in the sensor. Currently used in applications as far reaching as finger location for gaming gloves to displacement sensing in fitness equipment, the single-piece Flex Sensor provides a cost competitive, compact and elegant position sensing solution where a bending motion is applied to a device. At less than 0.5mm thick and with footprint dimensions of 74 x 6.35mm, the standard Flex Sensor has an active length of 55mm and a nominal 25kΩ resistance when in a flat position. Normally fixed by an integral self-adhesive backing to allow the sensor to bend freely through a typical angle of 90°, the sensor's bend resistance increases in correlation to the bend angle to an upper value between 45kΩ and 125kΩ with excellent repeatability.

www.variohm.com

‘It uses a great big electric motor to turn the generator, rapidly accelerating and decelerating it up to 10,000rpm or more to simulate extreme flight conditions, such as in ground hugging for radar evasion or an emergency descent of an airliner.’

Various sets of instruments measure the electrical output, bearing performance and so on.

The innovation of the GTR is that it is fully automatic, the test steps being controlled and monitored by a PLC system requiring the very minimum of human intervention i.e. selecting what type of test is to be performed from a menu and pressing the start button. The software language for the GTR is a proprietary SCADA package using Proficy iFix with dynamic communication links to a Telemecanique PL7 ladder logic embedded in a TSX premium programmable logic controller. All necessary functions are embedded in the Proficy iFix core construction architecture. The dynamic link is written in visual basic.

“Torqsense imparts no extra load onto the shaft, so calculations are simple. It is ideal for the work we do”

GARY PARKER, MEL AVIATION

‘Torqsense has the pivotal role of measuring the rotational speed — as a torque value — of the input shaft, which defines the simulated speed profile,’ explained Parker. ‘It is the primary parameter of the test; if it is not monitored with 100 per cent accuracy throughout the whole test all data is invalid and precious time is wasted.’

Torqsense is a surface acoustic wave (SAW) based device. In a Torqsense transducer, surface acoustic waves are produced by passing an alternating voltage across the terminals of two interleaved comb-shaped arrays, laid onto one end of a piezoelectric substrate. A receiving array at the other end of the transducer converts the wave into an electric signal.

The frequency is dependent

design essentials

The key facts to take away from this article

» **An aircraft's on-board generators need to be ground tested regularly**

» **Torqsense measures the rotational speed of a generator's input shaft**

» **It does not place extra load on the shaft, making calculations are simpler**

» **The transducers are expected to work for the GTR's 30-year lifespan**

upon the spacing of the teeth in the array and as the direction of wave propagation is at right angles to the teeth, any change in its length alters the spacing of the teeth and hence the operating frequency. Tension in the transducer reduces the operating frequency while compression increases it. To measure the torque in a rotating shaft, two SAW sensors are bonded to a shaft at 45° to the axis of rotation. When the shaft is subjected to torque, a signal is produced that is transmitted to a stationary pick-up via a capacitive couple comprising two discs, one of which rotates with the shaft, the other being static.

‘It imparts no extra load onto the shaft, so calculations are simple, added Parker, ‘In short it is simple, robust, reliable and — dare I say it — idiot-proof. As such it is ideal for the sort of demanding work we do.’

MEL expects each test station to have a working life of at least 30 years and for the Torqsense transducers to perform for all this time. In both military and commercial flight operations, this is a typical expectation, with all investments being planned with long-term amortisation and reliability never compromised.

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