A Revolutionary Technology for Strain Measurements

Fiber Optic Sensors vs Resistive Strain Gages

For over eight decades the resistive strain gage (RSG) has been the benchmark for measuring structural deformation. RSG applications are well known and their limitations have long been established. Optical based sensing technology allows users to improve accuracy and address various known RSG limitations while opening up yet unrealized possibilities to better design, test, and field products and applications. These improvements will result in safer, better performing, and more cost-effective products and services.

Fiber Optic Sensing (FOS) technology is based on the use of 80m glass fiber that has been continuously inscribed with Fiber Bragg Gratings (FBG). FBGs are the unique optical sensing element that turns ordinary telecom grade optical fiber into a powerful and robust sensing tool. These sensors act as embedded mirrors inside the fiber that reflect a specific wavelength. When an FBG fiber is bonded to a material and interrogated with light, the FBGs will reflect different wavelengths as the fiber is strained. FOS has significant advantages over legacy resistive strain gages for many different applications.

Key Benefits

- FOS is less expensive, less complex and consumes less space than RSG.
- FOS provides the best solution for long term, lifecycle, and fatigue tests.
- FOS can be applied in a fraction of the time required for RSG, allowing for quicker determination of material performance. This saves system integration time and labor, lowers cost, and improves time to market.
- Switching to FOS from RSG comes at no risk since accuracy and precision are better and result in the highest possible data

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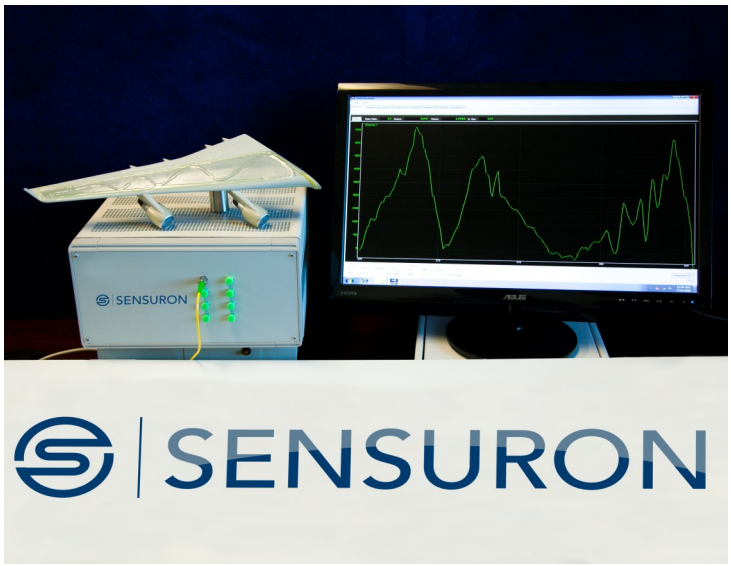

RTS150 displaying a strain field.

Sensing and Measurement Advantages

- FOS correlates well with RSG data.
- FOS achieves greater resolution at the micro strain level.
- FOS can see down to changes less than 2 με, which is an order of magnitude better than RSG. A typical RSG installation measures changes from 15-20 με.
- FOS allows for dense sensor arrays and higher spatial resolution on sensors.
- FOS allows for software selectable sensor size and spacing.
- FOS can also provide temperature data from the same FBG optical fiber without a need for RTDs, thermocouples, or their bulky wiring.
- FOS can calculate displacement and shape data, while RSG cannot.

Physical Advantages

Instrumentation:

- FOS offers a dramatically simplified signal collection hook-up over RSG.
- FOS instrumentation has a small footprint compared to RSG.
- FOS instrumentation can be portable and ruggedized.
- FOS has an Ethernet data output versus the cabinet of signal conditioners and chest of multiplexers are required for RSG.
- FOS requires no regulated power supply and uses less electricity than RSG.

Fiber:

- The weight and size of cabling used by FOS is several orders of magnitude less than that required by RSG.
- FOS has negligible mass, offering more than 100 times the sensors at less than 1% of total weight of RSG.
- FOS is immune to the EMI, RFI and crosstalk problems often associated with RSG.
- FOS is inert and can be used in explosive (ATEX) and chemically toxic applications where RSG cannot.
- Unlike RSG, FOS does not suffer from power heating, glue line creep or work hardening of gage filaments.
- RSGs fail early in high-cycle testing, whereas FOS never fails.

RTS125 fully ruggedized FOS system