PHILTEC - Application Highlight

May '97

Fiber Optic Sensors Spur Advanced Flywheel Development

Philtec's Reflectance Compensated (RC) Fiber Optic Displacement Sensors are playing a key role in the development of high-performance composite flywheel rotors.

Advanced flywheel energy storage systems are being developed to improve telecommunication industry power back-up, where the conventional battery back-up power is costly, short-lived, and environmentally problematic to dispose of. Flywheel "battery" systems also hold promise for making low-pollution, high-mileage hybrid electric cars, trucks and trains a reality.

At the core of these advanced systems are fiber/epoxy composite rotors spinning anywhere from 30,000 to more than 100,000 rpm. Safety has the highest priority in flywheel design, testing and production. Despite extremely high reliability, any flywheel must have a containment system demonstrated to contain the worst credible failure. In recognition of the need for the development of safe containment systems, as part of an ongoing Electric Hybrid Vehicle Program, the Defense Advanced Systems Research Projects Agency (DARPA) established the multi-million dollar Flywheel Safety Project in 1995.

Leading flywheel developers such as the Center for Electromechanics (CEM) of the University of Texas at Austin, and at International Energy Systems (IES) of South Wirral, England have chosen Philtec's RC sensors for monitoring rotor growth during high speed spin/failure testing.

The RC Fiberoptic sensor is ideally suited for these measurements. It provides high-sensitivity non-contact displacement measurements with high bandwidth in a small intrinsically safe package. The principle of operation is the precise detection of reflected light intensity variations

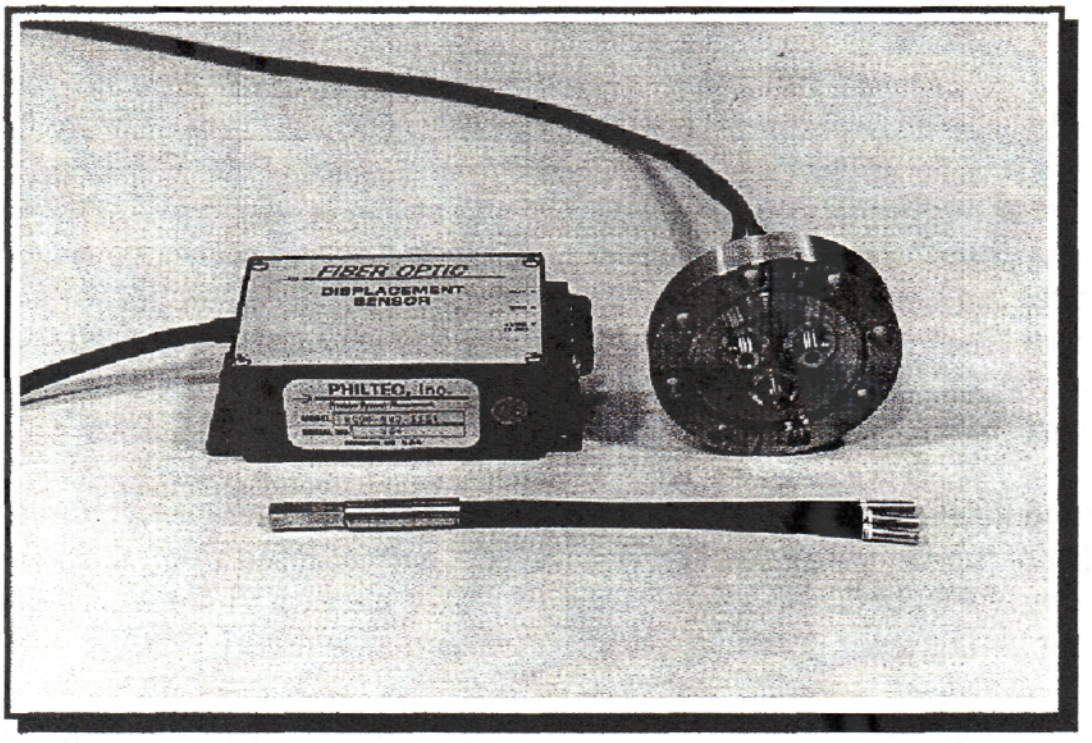
associated with target motions. They have been successfully applied to glossy as well as dull finish fiber/epoxy surfaces of various colors.

Typical sensor performance features include resolution to 100 microinches or better, bandwidths to 20 KHz, target spot size of .09 x 0.18 inch or smaller, and a linear operating range of 0.1 inch at a mean distance of 0.15 inch.

Researchers at IES have reported excellent test results using the Philtec sensors. They've found them to so accurately detect rotor growth that they not only can detect the impending failures but actually predict when the rotors will fail.

For operation in vacuum, Philtec sensors are configured as a three part system comprising:

- A light guide with sensor tip for mounting inside the vacuum chamber
- A vacuum flange for mounting to the chamber bulkhead
- An optoelectronic amplifier with fiberoptic light guide



All of Philtec's fiber optic sensors can be provided with this configuration.

PHILTEC, Inc. • POB 359 • Arnold, MD 21012 • 800-453-6242 • Fax 410-757-8138