

## VIBRATION SENSOR CROSSES THE BRIDGE TO STRUCTURAL APPLICATIONS

Along with heavy traffic and bad weather conditions, infrequent maintenance takes its toll on America's highway bridges. According to the Federal Highway Administration, one-third of the Nation's bridges are structurally unsound or otherwise deficient, and the monetary backlog for repairs—from deck replacements to complete reconstruction—hovers at about \$78 billion.<sup>1</sup>

Squeezed by decreasing Federal funds for bridge maintenance, states and localities sorely need innovative technology that lowers costs and streamlines maintenance and repair of structural problems. With BMDO funding, ERG Systems, Inc. (St. James, NY), has developed a rugged, reliable, low-cost vibration sensor that may advance the technology for monitoring the safety of bridges, a time-consuming and costly job.

The sensor, a fiber-optic light-emitting diode (FO/LED), can measure the vibration of a free-standing structure or of a structure in which it is embedded. Detecting movement photoelectrically through light reflected from a curved or flat surface would allow the sensor to detect problems before severe hazards develop. Continuous monitoring using the sensor and a system to alert transportation officials to schedule preventive maintenance could reduce future repair costs. The extremely compact, lightweight FO/LED can withstand harsh environments—such as the one found on New York City's heavily traveled George Washington Bridge—better than other laser-based vibrometers.

The FO/LED can monitor the structural integrity of aircraft, commercial machinery, building construction, and other types of heavy industry. It also can measure microdisplacements such as those found in engine camshafts of automobiles. In this automotive application, the device could help reduce component wear and improve fuel efficiency.

ERG Systems actually reduced the BMDO SBIR funding it originally requested, thanks to private sector capital and New York State funds. The company's cost-effective sensor, if manufactured in volume, could sell for \$40 per unit. Optical Research Associates, a leading distributor for optical equipment and accessories, now provides marketing and sales support for the FO/LED.

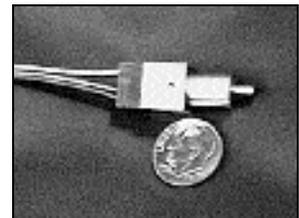
### ABOUT THE TECHNOLOGY

The FO/LED's sealed monolithic housing, with a dual fiber-optic probe, measures less than 3 cm long and less than 2 cm<sup>2</sup>. The LED fiber-optic channel produces a constant light output that the external (vibrating) surface reflects into a photodiode input channel. The amount of light the photodiode receives depends on the relative displacement of the external surface. The device senses vibrations through oscillation of the photodiode's output signal voltage.

<sup>1</sup>American Public Works Association. Transportation is America's way of life. World Wide Web at <http://www.pubworks.org/roads.html>.

. . . a vibration sensor that can help transportation authorities determine when highway bridges need maintenance.

OPTICAL RESEARCH ASSOCIATES, A LEADING DISTRIBUTOR FOR OPTICAL EQUIPMENT AND ACCESSORIES, PROVIDES MARKETING AND SALES SUPPORT FOR THE FO/LED TECHNOLOGY.



■ ERG's fiber-optic light-emitting diode, pictured above, can measure the vibration of a free-standing structure or of a structure in which it is embedded.