

IST-071
MEMS Acoustic Emission Sensor for Field Test Applications

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Abstract:

Steel bridges contain fatigue cracks and pressure vessels contain incipient cracks that are monitored by periodic inspection, and engineers must regularly determine whether the cracks are stable or whether they will worsen under continued use. Acoustic emission sensing is a preferred means of making that determination; crack tip yielding or extension releases elastic waves, termed acoustic emissions, and detection of such waves indicates active crack growth. Acoustic emission testing is regularly performed using single-channel, single-mode piezoelectric sensors, and two companies most prominent in the industry are the prospective industry participants, WavesInSolids and Physical Acoustics Corporation. In contrast to single-channel, single-mode sensing, the CMU-Lehigh research team has designed, fabricated, and tested two generations of MEMS multi-channel, multi-mode devices, which provide more information from acoustic emissions than is obtained from available commercial sensors.

Field testing of the existing CMU-Lehigh MEMS devices is presently underway with the cooperation of the industry participants.