

Distributed Brillouin Scattering Sensor for SHM of Pipelines

Pipeline integrity and disturbance are generally not monitored due to the lack of reliable and durable techniques. Unfortunately, the lack of information available on the type and location of pipeline faults has created inefficient and potentially costly situations. A distributed Brillouin fiber sensor provides an excellent opportunity for SHM of civil structures by allowing measurements to be taken along the entire length of the fiber, rather than at discrete points, by using fiber itself as the sensing medium. Currently, Dr. Bao's group at University of Ottawa [1] applied their sensor to identify several inner wall cutouts of 1-5cm sizes in an end-capped steel pipe by measuring the axial and hoop strain distributions along the outer surface of the pipe under the pressure of <550psi. The locations of structural indentations comprising 50 and 60% of the inner pipe wall are found and distinguished using strain-pressure slope. These results are quantified with fiber orientation, defect size and depth relative to unperturbed pipe sections.

[1] L. Zou, G.A. Ferrier, S. Afshar V., Q. Yu, L. Chen, and X. Bao, *Appl. Opt.* 43, 1583-1588 (2004).