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## Project DTRS56-06-T-0003

Pipeline failures from stress corrosion cracking (SCC) remain a major safety concern among pipeline operators. To manage the safety threat from SCC, the operators require key information to assist in identifying the potential and the location(s) on the pipeline system for this threat, assess and characterize the threat, and determine the appropriate mitigation measures.

In spite of many efforts at developing reliable sizing techniques for stress corrosion cracks, current methods are either very expensive and time consuming or unreliable. The development of a reliable nondestructive technique would be very desirable.

The objective of this project is to apply the proven technologies of laser ultrasonics and finite difference modeling to the important problem of depth measurement of stress corrosion cracks. Laser ultrasonics offers a number of significant benefits for the sizing of SCCs including small footprint on the pipe, rapid scanning and high bandwidth. Laser generation produces a rich admixture of ultrasonic waves, covering many wave types, directions and frequencies. Finite difference modeling offers a very promising pathway to harnessing these waves for effective crack depth measurement. Team members for this project are Lasson Technologies, Inc. and RTD Quality Services (QS) LLP. Cost share is provided by RTD QS through its affiliated companies, Pipeline Research Council International (PRCI) and individual pipeline companies.

In the first quarter we focused on three efforts: (1) knowledge transfer among the team members and their subcontractors, (2) development of the finite difference model for simulating the interaction of laser-generated ultrasonic waves with an isolated crack and (3) machining of test blocks consisting of narrow EDM notches with different depths, along with collection of SCC samples in the field. All the above efforts were completed. In the second quarter we will continue the finite difference simulations for more complex cracks and will begin optimizing the laser ultrasonic beam configuration, as guided by the simulation results.

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