

**Wang, B.,** Liu, B., Wang, Y.-Y., Wang, A., Rapp, S., 2020, Burst Pressure Prediction of Pipes with SCC Colonies – Evaluation of Intelligent Flaw Interaction Rules Using Full-scale Burst Test, Proceedings of the 13th International Pipeline Conference, Paper No. IPC2020-9696, September 28- October 1, 2020, Calgary, AB, Canada.

## **Abstract**

This is the second paper in a two-paper series which covers the PRCI-funded work aimed at the development of intelligent flaw interaction rules (termed PRCI/CRES SIA-1-5 rules). The first paper focused on the development of the rules using numerical analyses. This paper covers the evaluation of the rules through full-scale burst tests and accompanying small-scale material tests.

The full-scale burst tests were conducted on the four test sections cut from the 20” and 18” OD pipe segments. The SCC colonies on the test sections were inspected using MPI, PAUT, ECA, and IWEX. The small-scale material tests were conducted to measure pipe tensile strength and Charpy impact energy. The four test sections were pressurized until they burst. The burst tests were recorded using multiple regular video cameras to capture the global behavior and detailed crack opening process at the burst locations. With the videos and the post-test metallurgical examination of the failure surfaces, the full-scale burst tests provide not only the burst pressure but also information for validation of the fundamental principles of the new interaction rules.

The modified Ln-sec method was used to predict the burst pressure using the equivalent crack size from different flaw interaction rules and the measured pipe material properties. The PRCI/CRES SIA-1-5 rules were found to provide the most accurate and precise burst pressure predictions.

### **Keywords**

Stress-corrosion cracking, flaw interaction rules, burst pressure prediction, crack cluster, burst tests