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## **Abstract**

Integrity assessment of girth welds in in-service vintage pipelines is sometimes necessary, including regulatory requirements, changes in service or pipe support conditions which may cause additional stress on the girth welds, or “indications” being reported in in-line inspection (ILI). Material properties and flaw characteristics are essential in such assessment, but very little data are available in most cases.

In a PRCI-funded effort, material properties and flaw characteristics of vintage girth welds are generated and analyzed to fill the critical gaps. The output of this effort is being used as the inputs to a vintage girth weld assessment procedure being developed in a separate and parallel effort. The outcome of these efforts collectively allows for the assessment of vintage girth welds, which is a part of an overall integrity management program.

The basic material property data being generated include (i) pipe tensile properties in both hoop and longitudinal directions, (ii) weld metal tensile properties, (iii) macrohardness traverse, and (iv) Charpy impact transition curves with notches in the heat affected zone (HAZ) and deposited weld metal. These data provide essential information on tensile strength, weld strength mismatch, and toughness. In addition, tensile tests were conducted on crossweld specimens with natural flaws and artificially machined planar flaws. These cross-weld tests provide an indication of the welds’ stress capacity in the presence of flaws. They also provide the apparent toughness which is essential in assessing welds’ tensile strain capacity. All tested girth welds were inspected using radiography and phased array UT. Thus, this work provides a coherent picture of the material properties, flaw characteristics, and stress and strain capacities of the tested vintage girth welds.

## **Keywords**

Vintage pipeline, Girth weld, Non-destructive testing, Weld flaw, Material properties, Apparent toughness, CTOD<sub>A</sub>