

Wang, Y.-Y., Liu, M., Chen, Y., and Horsley, D., Effects of Geometry, Temperature, and Test Procedure on Reported Failure Strains from Simulated Wide Plate Tests, Proceedings of 6th International Pipeline Conference, Calgary, Alberta, Canada, September 25- 29, 2006, Paper no. IPC2006-10497

Abstract

Wide plate test is a valuable tool in the assessment of pipeline girth weld integrity. It has been used for welding procedure qualification and for the validation of theoretically based defect assessment procedures. Although the general form of the test has remained largely unchanged over the years, the size of the test specimen, strain measurement, and test procedure, has had some variations. The influence of these variables has not been adequately examined. While this might be acceptable for tests targeted for stress-based design in which a general pass/no-pass answer is desired, the requirements for data accuracy and consistency for strain-based design are much higher. Understanding the variability of the test data is critical for high strain applications.

This paper examines the effects of test geometry, mainly the length to width ratio, on the reported failure strains, assuming material's failure process remains the same. The influence of different strain measurement procedures, such as the location and gage length of LVDTs (Linear Variable Displacement Transducer), is assessed for different materials and weld strength mismatch levels. The other consideration is the influence of temperature fields on the cold test data. The postulated cold tests use either local cooling at the location of the weld defect or uniform cooling. In the case of local cooling, the gage length of the LVDTs covers materials of different temperatures. Consequently the reported failure strains are affected by the distribution of the temperature fields. The effects of the temperature fields on the reported tensile failure strains are examined.

Keywords

Pipeline, Strain-based design, Tensile strain limit, Wide plate test, Test procedure, Cold test