Wang, Y.-Y., Liu, M., Weeks, T., Richards, M., McColskey, D., and Horsley, D., Broad Perspectives of Girth Weld Tensile Strain Response, Proceedings of the 8th International Pipeline Conference, September 27-October 1, 2010, Calgary, Alberta, Canada, Paper no. IPC 2010-31369

Abstract

Tensile strain capacity (TSC) is a critical component of the strain-based design of pipelines. TSC is affected by a number of material parameters, such as the strain hardening rate, weld strength mismatch, and toughness. Girth weld high-low misalignment, internal pressure, and flaw size are additional influential parameters. The impact of those parameters can be rationalized by fracture mechanics principles and is supported by an increasingly large library of experimental test data. A number of predictive TSC models are under development. One of the most significant challenges in the development of these models is the scatter of experimental test data. As more test data are collected with specially arranged precision instrumentation, it is become apparent that the scatter of test data is a matter of true material response. It is, therefore, critical to see beyond the scatter and understand the overall material behavior in the development and validation of TSC models. This paper highlights the material behavior observed in a large number of large-scale experimental tests. The material response is then classified into different categories to assist the understanding of the experimental data scatter and rationalize the trends expected from test data.

Keywords

Pipeline, Strain-based design, Tensile strain capacity, Girth weld