

Wang, Y.-Y., Liu, M., Horsley, D., Apparent Fracture Toughness from Constraint Considerations and Direct Testing, Proceedings of the 17th International Offshore and Polar Engineering Conference, 2007, Lisbon, Portugal

Abstract

One of the methodologies proposed for the strain-based design of pipelines uses the “apparent toughness” in setting the postulated failure condition. The apparent toughness is the toughness corresponding to the loading condition and flaw geometry of pipeline girth welds. However, determining the apparent toughness has been an outstanding issue as most toughness tests are still being performed using the standardized bend tests. This paper examines ways the apparent toughness may be estimated from standard toughness tests on the basis of constraint-sensitive fracture mechanics and experimental test data. Toughness conversion factors are proposed. These conversion factors enable the estimation of the apparent toughness of pipeline girth welds from the toughness obtained from standardized test specimens. Some of the limitations of the toughness conversion methodology in applying to the strain-based design of pipelines are highlighted.

Keywords

Fitness-for-service, constraint, ECA, Pipeline, Ductile fracture, Fracture mechanics, Strain-based design