Zhang, Z., Yu, Z., **Liu, M., Kotian, K., and Zhang, F.**, Application of compressive strain capacity models to multiple grades of pipelines, Proceedings of the 10th International Pipeline Conference, 2014, Calgary, Alberta, Canada, Paper no. IPC2014-33680

Abstract

Local buckling due to excessive compressive strain generated by bending and/or longitudinal compression is one of the main threats to pipeline integrity. Strain-based design and assessment (SBDA) methods have been developed for designing and maintaining pipelines under high longitudinal strain. In SBDA, the resistance to local buckling is often measured by compressive strain capacity.

Extensive work has been performed on the compressive strain capacity of pipes through both experimental and numerical modeling. Models for calculating the compressive strain capacity have been developed over many decades. Some earlier models were developed using experimental test data of low strength linepipes. High strength linepipes are being increasingly used for the construction of new pipelines. The applicability of the existing models to modern high strength pipelines needs to be evaluated.

In this paper, selected compressive strain capacity models were reviewed and evaluated. An experimental database of 61 experimental tests from public-domain publications was created. Approximately 34% of the testing data are from high strength pipes (primarily X80). The calculated compressive strain capacity from the selected models was compared with the test results. The performance of the selected models was evaluated and the applicability of the models to the linepipes of different strengths was discussed.

Keywords

Pipeline, Strain-based design, SBD, Compressive strain capacity, Compressive strain limit, Buckling, Wrinkle