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Abstract

Strain-based design and assessment (SBDA) focuses on potential failures driven by high longitudinal strains. Pipeline failures driven by longitudinal stresses or strains are relatively rare events in comparison to failure driven by hoop stresses. Longitudinal strains are often associated with ground settlement/movement or other unusual upsetting events. Failure modes are assessed by comparing strain demand with strain capacity. In current practice, strain demand and capacity are evaluated separately. Strain capacity is usually obtained from models supported by experimental testing. To date most of the models and experimental data have focused on nominally straight segments of pipelines with nominally the same pipe properties, wall thickness, diameters, geometric and material properties and mechanized GMAW girth welds.

There are gaps between the present approach to SBDA and field conditions under which SBDA is applied. For instance, linepipes are delivered with a range of tensile properties. Welds are produced by a variety of processes with a range of tensile and toughness properties. Pipe dimensions, mechanical properties, and soil conditions affect both strain demand and strain capacity.

In this paper, some of the high-level gaps between model assumptions and field conditions are highlighted. Potential approaches are suggested in the hope that future work be purposefully planned to fill those gaps, thus making the technology more robust to use under real-world conditions.

Keywords

Pipeline, Strain-based design and assessment