

Wang, Y.-Y., Liu, M., Horsley, D., Strain-Based Design of Pipelines, Proceedings of EPRG-PRCI-APIA 17th Joint Technical Meeting on Pipeline Research, 2007

Abstract

Strain-based design (SBD) encompasses both strain demand (applied strain) and strain capacity (strain limit). At least two limit states are associated with SBD: tensile rupture and compressive buckling. SBD can be cost-effective and sometimes necessary when displacement-controlled loading is expected. Such loading may arise from seismic activity, slope instability, frost heave, and mine subsidence for onshore pipelines. For offshore pipelines, displacement-controlled loading can occur during pipe laying and in service. This paper covers strain capacity of pipelines, with focus on tensile strain capacity. An overview of SBD is presented first. The second part of the paper summarizes the recent experimental and analytical work aimed at refining tensile strain capacity prediction for pipeline girth welds. The effects of anisotropy on tensile and compressive strain capacity are examined under both uniaxial and bi-axial loading conditions. The paper concludes with the highlights of current gaps and future research needs.

Keywords

Strain-based design, Tensile strain capacity, Compressive strain capacity, ECA, High strength steel, Anisotropy, Pipeline