Buried pipeline analysis subjected to strike-slip fault

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Abstract

The paper examines the mechanical behavior of a buried steel pipeline crossing an active strike-slip fault. The fault is normal to the direction of the pipeline, moving in the horizontal direction, causing stresses, strains and deflection in the pipeline. The pipe-soil interaction (PSI) system is modeled using 2D finite elements PSI and JOINTC simulating the strike-slip fault using commercial finite element software Abaqus. Steel pipeline API-5L of grade X65 is used. The finite element analysis is conducted for fixed diameter-to-thickness ratio of 48 for different fault offsets (200mm, 400mm, 600mm, 800mm and 1000mm) using different sand (Loose, Medium and Dense) types. The paper focuses on the effects of various sand types and fault offsets on the structural response of the pipeline with particular emphasis on identifying deformation, bending strain and axial stress. The deflection, bending strain and axial stress are analyzed using PSI element. The results are then verified numerically using JOINT-C element. The results from the present investigation are useful for pipeline design purposes.

Keywords: Buried pipelines, Strike-slip fault, Fault offset, PSI element, and JOINTC element.