Article Abstract

Title:	Non-axisymmetric dynamic response of imperfectly bonded buried liquid-filled orthotropic thin cylindrical shell due to incident shear wave (SH wave)
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Abstract:	The main aim of this paper is to assess the effects of the liquid presence and the bond imperfection while evaluating the non-axisymmetric dynamic response of an imperfectly bonded liquid filled buried orthotropic thin cylindrical pipeline excited by shear horizontal wave (SH-wave) due to seismic excitation. Using thin shell theory, the effect of shear deformation and rotary inertia is not considered. The pipeline is modeled as an infinite thin cylindrical shell imperfectly bonded to surrounding. A thin layer is assumed between the shell and the surrounding medium (soil) such that this layer possesses the properties of stiffness and damping both. The degree of imperfection of the bond is varied by changing the stiffness and the damping parameters of this layer. For the wave propagation in the liquid inside the pipe, linear acoustic equation is used. The effects of the liquid presence on the shell displacement are studied for different soil condition and at various angles of incidence of the shear wave. The effect of the bond imperfection on the shell response is compared with the effects realized due to the presence of liquid inside the pipeline. It is found that magnitude of the response of liquid filled pipeline can become even more than that of an empty pipeline, and hence, it cannot be assumed that a liquid filled pipeline will always furnish safe and conservative response. Numerical results are presented for the case of an incident plane shear horizontal wave (SH- wave) only. Such studies are critical for design considerations for providing utility services through underground pipelines made of orthotropic material in seismic zones.
Keywords:	Buried Pipelines, Non-axisymmetric, Imperfect Bond, Seismic Wave, Thin Shell and Shear Wave.