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ABSTRACT TITLE

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ABSTRACT

Investigation of the structural response of cylindrical shells to internal dynamic pressure is a challenging topic for experimental, analytical and numerical researchers. The study of unstable cracks in pressurized tubes are of paramount importance in oil industry with potential environmental hazard complications. Therefore, a comprehensive study of failure/fracture of tubes remains a major field of engineering research. Due to complexity of global and local responses, analytical studies are almost impossible to derive and experiments are very costly and dangerous, so the numerical methods are usually preferred. The extended finite element methodology for simulation of arbitrary inclined crack propagation, induced by inner gaseous detonation in a cylindrical shell is introduced. XFEM is utilized for accurate approximation of the discontinuous displacement field around the crack. The Mindlin shell theory is applied in a degenerated-solid shell formulation and the pressure history of detonation is approximated by the Taylor-Zeldovich model. The crack in shell is assumed to be across the whole thickness and the potential crack propagation path is not restricted to any predefined direction. The detonation loading is prescribed in the form of pressure history and the influence of moving pressure velocity is examined. The results of the developed XFEM code are well compatible with available experimental results, and are competitive with other numerical methods.

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