APPLICATIONS OF LIMIT LOAD ANALYSES TO ASSESS THE STRUCTURAL INTEGRITY OF PRESSURE VESSELS

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ABSTRACT

With advances in computational modeling techniques, limit load methods are gaining wider acceptance as a tool for determining the structural integrity of pressure vessels. The objective of a limit load analysis is to size a vessel or structure considering nonlinear methods such as elastic-plastic material properties and non-linear strain-displacement relations. Case studies are presented in this paper that feature external pressures, gravity, and wind loads. The technique applies an appropriate initial magnitude for each load type and uses the analysis model to increase the load until a lower bound is calculated. The lower bound value is determined by incrementally increasing the load until convergence is not possible then the results are extracted.

This paper presents how limit load techniques were used to address the structural integrity of four engineered systems including the structural stability of a corroded tower under wind and vacuum loads, determining the pressure capacity of a pressure vessel, analysis of a subsea vessel under high external pressures, and the remaining buckling resistance of a dented subsea flowline. The paper highlights the application of limit load techniques using criteria detailed in WRC 464.

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