عنوان مقاله:

Non-Axisymmetric Time-Dependent Creep Analysis in a Thick-Walled Cylinder Due to the Thermo-mechanical loading

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خلاصه مقاله:

In this study, the non-linear creep behaviour of a thick-walled cylinder made of stainless steel 316 is investigated using a semi-analytical method. The thick-walled cylinder is under a uniform internal pressure and a non-axisymmetric thermal field as a function of the radial and circumferential coordinates. For the high temperature and stress levels, creep phenomena play a major role in stress redistributions across the cylinder thickness. The Bailey-Norton creep constitutive equation is used to model the uniaxial creep behaviour of the material. Creep strain increments are accumulated incrementally during the life of the vessel. Creep strain increments are related to the current stresses and the material uniaxial creep model by the well-known Prandtl-Reuss relations. Considering the mentioned non-axisymmetric boundary conditions, the heat conduction equation and the Navier partial differential equations has been solved using the separation of variables and the complex Fourier series methods. The corresponding displacement, strain and stress functions are obtained. Considering the non-axisymmetric loadings, the distribution of the radial, circumferential and shear stresses are studied. Furthermore, the effects of internal pressure and external temperature distribution on the effective stress history are investigated. It has been found that the non-axisymmetric thermal loading has a significant effect on stress redistributions.

کلمات کلیدی:

Time-dependent creep, Thick-walled cylinder, Stainless Steel 316, Thermal and mechanical loads, Non-axisymmetric loading