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Modelling of Creep in a Thick-Walled Cylindrical Vessel Subjected to Internal Pressure

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Abstract : The present study focussed on carrying out the creep analysis in an isotropic thick-walled composite cylindrical pressure vessel composed of aluminium matrix reinforced with silicon-carbide in particulate form. The creep behaviour of the composite material has been described by the threshold stress based creep law. The value of stress exponent appearing in the creep law was selected as 3, 5 and 8. The constitutive equations were developed using well known von-Mises yield criteria. Models were developed to find out the distributions of creep stresses and strain rate in thick-walled composite cylindrical pressure vessels under internal pressure. In order to obtain the stress distributions in the cylinder, the equilibrium equation of the continuum mechanics and the constitutive equations are solved together. It was observed that the radial stress, tangential stress and axial stress increases along with the radial distance. The cross-over was also obtained almost at the middle region of cylindrical vessel for tangential and axial stress for different values of stress exponent. The strain rates were also decreasing in nature along the entire radius.

Keywords : creep, composite, cylindrical vessel, internal pressure
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