Thermo-Visco-Plasticity and Creep Analysis of Thick-Walled Pressure Vessels made of Functionally Graded Materials

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Abstract

In this study, a solution procedure for finite element thermo-visco-plasticity and creep analysis in a functionally graded materials (FGMs) thick-walled pressure vessel subjected to thermal and internal pressure was studied. The structure is replaced by a system of discrete rectangular cross-section ring elements interconnected along circumferential nodal circles. The property of FGMs is assumed to be continuous function of volume fraction of material composition. The thermo-visco-plasticity and creep behavior of the structures are obtained by the use of an incremental approach. The obtained results show that the material composition significantly affects the stress as a function of time at the inside and outside surface of thick-walled pressure vessel. The use of FGMs can adjust the stress distribution in the structure.

**Keywords:** Thermo-visco-plasticity analysis, Creep analysis, Pressure vessel, FGMs