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Creep damage simulation of thick-walled tubes using the Î~ projection concept

A. Loghman ... M.A. Wahab

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Abstract

This paper describes a numerical model developed for the computation of creep damages in a thick-walled tube subjected to an internal pressure and a thermal gradient. The model predicts the changes in the creep damage rates during the life of the tube due to variation in stresses with time and through-thickness variations. The creep damage fraction is based on the Robinson's linear life fraction damage rule which has been incorporated in a non-linear time-dependent stress analysis. Following the stress histories the damages are calculated and summed during the life of the tube. Furthermore, from the effective stress histories a reference time has been found when the effective stress distribution becomes uniform throughout the tube wall. Effect of internal pressure on this reference time is also investigated and reported in this paper. The material long-term creep properties up to rupture and the creep rupture data are defined by the Î~ projection concept.[1â€“3] The accuracy of the results has been examined

by comparing the Î˜ predicted creep curves and the numerically followed curves. Deviation of the followed paths from the Î˜ predicted paths are very small.

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