The Analysis of Creep Fracture about the Pressure Vessel of Axisymmetry

吳俊財、劉勝安

E-mail: 8515814@mail.dyu.edu.tw

ABSTRACT

This proposal use the Continuum Damange Mechanics and the Finite Element Method to study the creep fracture behavior about the elliptic pressure vessel in the high temperature and high pressure environments. This study derives the constitutive relations of creep first. Additionally,a strain- controlled creep damange law is derived from a more complex strain-dependent creep damange law. This law indicates that creep strain is the only factor controlling creep damange. Based on this one-dimensional creep damange law,a multi-dimensional creep damange law is then postulated,using the maximum principle tensile strain criterion or the maximum principle stress criterion or the maximum octahedral shear stress criterion. To include nonlinear time-dependent creep behavior using the finite element method,the suitable way is reduced to a set of consecutive steps,where each step is linearized. The moving boundary-value problem solution obtained at each step is used as the initial condition for the subsequent step,thus the damange value is obtained. When the damange value of the element reach critical, the entire element is removed from the overall structural model. The associated traction and displacement boundary condition ,along with the overall structural siffness matrix,are then reformulated. Once the boundary-value problem is reformulated, the time continues propagation. The time propagation is continued until the whole structural member comes to complete collapse. This method models the real fracture behavior essentially.

Keywords : 英文關鍵詞: creep ; creep damage ; creep rupture ; crack

Table of Contents