各種板件在受遷界應力下之潛變及潛變損壞分析

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摘 要

本研究主要利用連體損壞力學配合有限單元法之應用，來探討板件在承受高溫下受邊界應力作用之潛變及潛變破裂行為。首先以有限單元法對板件作一適當分割並依據初始之外力與位移邊界條件計算各單元之應力、應變，然後選定時間階段再依據暫穩態假設、時間硬化假設或應變硬化假設計算潛應變增量，進而累積總潛應變量，並求得潛變殘餘力，重新整合外力向量而再次計算各單元之應力、應變並依據最大主張應變法則、最大主張應力法則、最大剪應力法則或混合法則計算各單元之潛變累積損壞量，並對每一單元進行判斷，當板件中某一單元之累積損壞量達到破裂臨界值時，則須將此單元之剛性從整體結構中移去，並重新修正外力與位移邊界條件，如此不斷重覆計算，破裂壽命與破裂路徑即可求得。

關鍵詞 : 潛變 ; 潛變損壞 ; 連體損壞力學 ; 有限單元法 ; 應力 ; 應變 ; 破裂壽命 ; 破裂路徑

目錄

參考文獻

[1] Da Costa Andrade, E.N., On the Viscous Flow in Metals and Allied Phenomena, Proc. R. Soc.,A84,pp.1,1910.

[2] Norton, F.H., The Creep of Steel at High Temperature, New york, McGraw-Hill,1929.

[3] Graham, A., Processes of Creep and Fatigue in Metal, Oliver and Boyd, pp.154,1962.

[4] Johnson, A.E., Proc. Inst. Mech. Engrs., London,164,pp. 432,1951.

[5] Odqvist,F.K.G.,Mathematical Theory of creep and Creep Rupture,2nd Edition,Oxford,Clarendon press,1974.

[6] Robinson, E.L., Effect of Temperature Varation on the Creep Strength of Steels, Trans. A.S.M.E, 60, pp.253, 1938.

[7] Hoff,N.J.,The Necking and the Rupture of Rods Subjected to Constant Tensile Loads,J.Appl. Mech.,20,pp.105, 1953.

[8] Dorn, J.E. and Tietz, T.E., Creep and stress-Rupture Investigations on Some Alunium Alloy Sheet Metal, Proc. A.S.T.M.,49,pp.815,1949.

[9] Kachnov, L.M., Rupture Time Under Creep Condition, problems of Continuum Mechanics, pp.202, S.I.A.M., philadelphia,1961.

[10] Leckie, F.A. and Hayhurst, D.A.,Constitutive Equations for creep Rupture, Acta Mertal.,25,pp1059,1977.

[11] Hayhurst, D.R., Dimmer, P.R. and Morrison, C.J., Development of Continuum Damage in the Rupture of Notched Bars, Phil. Trans. R. Soc. London, A311, pp.103,1984.

[12] Woodford, D.A., Density Change During creep in Nikel, Met. Sci. J.,3, pp.234,1969.

[13] Belloni,G.,Bernaconi,C.and piatti,G.,Damage and Rupture, in AISI 310 Austenistic Steel,Meccanica, 12,pp.84,1977.

[14] Belloni,G.,Bernasconi,G.and piatti,G.,Creep Damage Models,Creep in Engineering Material and Structures (Edited by G.Bernasconi and piatti),pp.195,Applied Science,London,1980.

[15] Rabotnov, Yu.M., Creep Problem in Structual Members (English Translation Edited by F.A. Leckie), Chap.6, North Holland, Ams-terdam,1969.

[16] Shames,I.H.and Cozzarelli,F.A.,Elastic and Inelastic Stress Analysis,in press.

[17] Lemaitre, J. and Dufailly, J., Damage Measurements, Eng.Frac.Mech.,28,pp.643,1987.

[18] Penny, R.K. and Mariott, D.L., Design for Creep, McGraw-Hill, Lon-don,1971.
[19] Kachanov, L.M., Introdution to Continuum Damage Mechanics, Martinus Nijhoff Publishers, Dordrecht, Holland,1986.
[20] Cozzarelli, F.A. and Bernasconi, G., Nonlinear Creep Damage Under One-Dimensional Variable Tensile Stress, Int. J. Nonlinear Mech.,16, pp.27,1984.
[21] Armen, H.,Assumptions, Model and Computational Methods for Plsticity, Comp.Struc.,10, pp161,1978.
[22] Zienkiewicz, O.C. and Cormeau, I.C., Viscoplasticity- Plasticity and Creep in Elastic Sloids-A Unified Numerical Solution Approach, Int. J. Numer. Methods in Eng.,8, pp.821,1974.
[23] Zienkiewicz, O.C., The Finite Element Method, 3rd Edition, McGraw-Hill,1977.
[24] Hayhurst, D.R., Dimmer, P.R. and Morrison, C.J., Development of Continuum Damage in the Rupture of Notched Bars, Phil. Trans. R. Soc. London, A311, pp.103,1984.
[25] Saanouni K., Chaboche, J.L. and Bathias, C., On the Creep Crack Growth Prediction by a Local Approach, Eng. Frac. Mech.,25, pp.677,1986.
[25] Saanouni K., Chaboche, J.L. and Bathias, C., On the Creep Crack Growth Prediction by a Local Approach, Eng. Frac. Mech.,25, pp.677,1986.
[25] Saanouni K., Chaboche, J.L. and Bathias, C., On the Creep Crack Growth Prediction by a Local Approach, Eng. Frac. Mech.,25, pp.677,1986.