The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

TOPICS IN MECHANICAL ENGINEERING
THE FRANK W. OTTO DISTINGUISHED LECTURE SERIES

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Lecture Title: Computational Models of Ductile Fracture

Friday, February 26, 2010, 2:30 PM, Room 301 Engineering

Abstract

Several recent fundamental experiments on the ductility of tough structural alloys reveal that a measure of stress state in addition to triaxiality must be taken into account. A discussion of these experiments will be the starting point of the seminar. A recent extension of the Gurson constitutive model of damage and failure of ductile alloys has introduced an additional measure and the extension is now able to account for localization and crack formation under shearing as well as tension. When properly calibrated against a basic set of experiments, this model has the potential to predict the emergence and propagation of cracks over a complete range of stress states. The talk will also address procedures for calibrating the damage parameters of the extended constitutive model. Procedures are demonstrated for DH36 steel using data from three tests: (i) tension of a round bar, (ii) mode I cracking in a compact tension specimen, and (iii) shear localization and mode II cracking in a shear-off specimen. The computational model is then used to study the emergence of the cup-cone fracture mode in the neck of a round tensile bar. Ductility of a notched round bar provides additional validation.

Biography

Dr. Hutchinson is the Abbott and James Lawrence Professor of Engineering, School of Engineering and Applied Sciences, Harvard University. Professor Hutchinson's interests span the Mechanics of Materials and Structures (micro and macro-mechanics: elasticity, plasticity, stability) from structures as large as aerospace structures and ships through the microscopic scales relevant to the deformation, fracture and processing of engineering materials. He joined the faculty at Harvard in 1964. His current research includes activities on the extension of plasticity theory to micron scales, the mechanics of thin films, ductile fracture and lattice materials. He works closely with colleagues at Harvard and at other universities and industrial labs. Awards and Honors: Irwin Medal of ASTM (1982,) Prager Medal of SES (1991), Nadai Award of ASME (1991), Timoshenko Medal of ASME (2002), Honorary Doctoral Degrees from the Royal Institute of Technology, Stockholm, Technical University of Denmark, University of Illinois, Lehigh University and Northwestern University. National Academy of Engineering, National Academy of Sciences.

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