

Charles W. Jewett, P.E.
Senior Engineer

Professional Profile

Mr. Charles W. Jewett is a Senior Engineer in Exponent's Materials and Corrosion Engineering practice. He has over 30 years of experience in mechanical testing and test instrumentation. Mr. Jewett performs mechanical testing and failure analysis of mechanical components, including bicycles, recreational equipment, and medical devices. He determines mechanical properties of materials from small sample punch tests. He has expertise in fatigue and fracture mechanics testing as well as stress corrosion cracking and corrosion fatigue testing and analysis. He has designed test systems and products for crack growth monitoring by electrical potential measurements. Mr. Jewett has particular experience with test system design, operation, and development of software for computerized data acquisition and reduction. He addresses issues related to instrumentation for test data acquisition, residual stress measurements, strain gauging and determination of mechanical properties of materials.

Prior to joining Exponent, Mr. Jewett was employed as a Senior Engineer, Nuclear Energy Business Operation, for General Electric Company.

Academic Credentials and Professional Honors

M.S., Mechanical Engineering, University of California, Berkeley, 1977
B.S., Mechanical Engineering, University of Washington, 1974

Tau Beta Pi; Outstanding Student Award, American Society for Testing and Materials

Licenses and Certifications

Registered Professional Mechanical Engineer, California, #M018698

Patents

Patent 6,267,011: Method and Apparatus for Determining the True Stress and True Strain Behavior of a Ductile Polymer, issued July 31, 2001 (with S.M. Kurtz and J.R. Foulds).

Publications

Miniature Specimen Shear Punch Test for UHMWPE used in Total Joint Replacements,” *Biomaterials*, Vol. 23, pp. 1907–1919, 2002 (with S.M. Kurtz, J.S. Bergstrom, J.R. Foulds, and A.A. Edidin).

“A Small Punch Test Technique for Characterizing the Elastic Modulus and Fracture Behavior of PMMA Bone Cement Used in Total Joint Replacement,” *Biomaterials*, Vol. 22, pp 1875–1881, 2001 (with V.L. Giddings, S.M. Kurtz, J.R. Foulds, and A.A. Edidin).

“The Relationship Between the Clinical Performance and Large Deformation Mechanical Behavior of Retrieved UHMWPE Tibial Inserts,” *Biomaterials*, Vol. 21, No. 3, pp. 283–91, 2000 (with S.M. Kurtz, C.M. Rimnac, L. Pruitt, V. Goldberg, and A.A. Edidin).

“Degradation of Mechanical Behavior in UHMWPE after Natural and Accelerated Aging,” *Biomaterials*, Vol. 21, No. 4, pp. 1451–1460, 2000 (with S.M. Kurtz, A.A. Edidin, K. Kwarteng, and A. Kalinowski).

“Radiation and Chemical Crosslinking Promote Strain Hardening Behavior and Molecular Alignment in UHMWPE During Multiaxial Loading Conditions,” *Biomaterials*, Vol. 20, No. 16, pp. 1449–1462, 1999 (with S.M. Kurtz, L. Pruitt, J.R. Foulds, and A.A. Edidin.).

“A Miniature Specimen Mechanical Testing Technique Scaled to the Articulating Surface of Polyethylene Components for Total Joint Arthroplasty,” *Journal of Biomedical Materials Research (Applied Biomaterials)*, Vol. 48, pp. 75–81, 1999 (with S.M. Kurtz, J.R. Foulds, and A.A. Edidin).

“Plasticity Induced Damage Layer is Precursor to Wear in Radiation Crosslinked Acetabular Components,” *Journal of Arthroplasty*, Vol. 14, No. 5, pp. 616–627, 1999 (with S.M. Kurtz, A.A. Edidin, L. Pruitt, D.J. Crane, and D. Roberts).

“The Yielding, Plastic Flow, and Fracture Behavior of Ultra-High Molecular Weight Polyethylene used in Total Joint Replacements,” *Biomaterials*, Vol. 19, pp. 1989–2003, 1998 (with S.M. Kurtz, L. Pruitt, R.P. Crawford, D.J. Crane, and A.A. Edidin).

“Validation of a Small Punch Testing Technique to Characterize the Mechanical Behavior of Ultra-High Molecular Weight Polyethylene,” *Biomaterials*, Vol. 18, No. 24, pp. 1659–1663, 1997 (with S.M. Kurtz, J.R. Foulds, S. Srivastav and A.A. Edidin).

“An Elastic-Plastic Material Model for the True Stress-Strain Behavior of Ultra-High Molecular Weight Polyethylene in Tension and Compression,” *1997 Advances in Bioengineering*, ASME, BED-Vol. 36, pp. 311–312, 1997 (with S.M. Kurtz, J.R. Foulds, J.E. Moalli, and A.A. Edidin).

“Fracture Toughness by Small Punch Testing,” *Journal of Testing and Evaluation, JTEVA*, Vol. 23, No. 1, pp. 3–10, January 1995 (with J.R. Foulds, P.J. Woytowicz, and T.K. Parnell).

“Miniature Specimen Test Technique for FATT,” Proceedings, American Society of Mechanical Engineers International Joint Power Generation Conference, San Diego, CA, October 1991 (with J.R. Foulds and R. Viswanathan).

“The Benefit of Hydrogen Addition to the Boiling Water Reactor Environment on Stress Corrosion Crack Initiation and Growth in Austenitic Stainless Steel,” *Journal of Engineering Materials and Technology*, Vol. 108, January 1986 (with A. E. Pickett).

“Fatigue Crack Growth Behavior of Four Structural Alloys in High Temperature High Priority Oxygenated Water,” *Journal of Engineering Materials and Technology*, Vol. 101, June 1979 (with J.N. Kass and D.A. Hale).

Published Reports

“Joint EPRI-CEA Research on Small Punch Testing for Nuclear Application,” Electric Power Research Institute, 1003075, Palo Alto, CA, December 2001 (with J.R. Foulds, W-M. Chi, and M. Wu).

“Small Punch Testing of 3-3.5NiCrMoV Turbine Disk Steel for Toughness,” Electric Power Research Institute, TR-113646, Palo Alto, CA, October 1999 (with J.R. Foulds and M. Wu).

“Small Punch Testing for Nuclear Reactor Embrittlement Assessment,” Electric Power Research Institute, TR-111116, Palo Alto, CA, December 1998 (with J.F. Williams et al.).

“Small Punch Testing for Irradiation Embrittlement – Experimental Requirements and Vision Enhancement System,” Electric Power Research Institute, TR-106638, Palo Alto, CA, December 1996 (with J.R. Foulds et al.).

“Small Punch Testing for Fracture Toughness Measurement,” Electric Power Research Institute, TR-105130, Palo Alto, CA, August 1995 (with J.R. Foulds et al.).

“Miniature Specimen Test Technique for Estimating Toughness,” Failure Analysis Associates, Inc., Final Report to Electric Power Research Institute, EPRI GS-7526, Project RP1957-10, 1991 (with J.R. Foulds).

“The Growth and Stability of Stress Corrosion Cracks in Large Diameter BWR Piping,” Electric Power Research Institute Final Report, NP-2472, Vol. 2, Project T118-1, June 1982 (with R.M. Horn et al.).

Conference Papers and Abstracts

“Shear Punch Testing for Virgin and Degraded UHMWPE in Orthopaedic Implants,” *Transactions of the Society for Biomaterials*, Vol. 24, p. 42, 2001 (with S.M. Kurtz, J.R. Foulds and A.A. Edidin).

“Shear Resistance of Virgin and Crosslinked UHMWPE for TJR,” *Transactions of the Society for Biomaterials*, Vol. 24, p. 398, 2001 (with S.M. Kurtz, and A.A. Edidin).

“A Small Punch Test Technique for Characterizing PMMA Used in Total Joint Replacement,” *Transactions of the Orthopaedic Research Society*, Vol. 25, p. 509, 2000 (with V.L. Giddings, S.M. Kurtz, J.R. Foulds, and A.A. Edidin).

“Temperature and Formulation Dependence of Elastic and Fracture Behavior During Small Punch Testing of Bone Cements,” *Transactions of the 6th World Biomaterials Congress*, p. 412, 2000 (with S.M. Kurtz, V.L. Giddings, J.R. Foulds, and A.A. Edidin).

“The Mechanical Performance of Conventional vs. Hylamer-M Retrieved Tibial Inserts,” *Transactions of the Society for Biomaterials*, Vol. 22, p. 4, 1999 (with S.M. Kurtz et al.).

“Effect of Peroxide and Radiation Crosslinking on the Strain Hardening Behavior and Molecular Alignment of UHMWPE,” *Transactions of the Society for Biomaterials*, Vol. 22, p. 516, 1999 (with S.M. Kurtz, D. Crane, L. Pruitt, J.R. Foulds, and A.A. Edidin).

“Direct Correlation of Abrasive Wear for Irradiation-Crosslinked UHMWPE with Large-Deformation Mechanical Behavior Determined at the Articulating Surface,” *Transactions of the Orthopaedic Research Society*, Vol. 24, p. 101, 1999 (with S.M. Kurtz, A.A. Edidin, and J.R. Foulds).

“Mechanical Degradation of Retrieved UHMWPE Tibial Components Characterized by the Small Punch Test,” *1999 Advances in Bioengineering*, ASME, BED-Vol. 43, pp. 151–152, 1999 (with S.M. Kurtz, A. Kalinowski, C.M. Rinnac, and A.A. Edidin).

“Through-Thickness Degradation of UHMWPE is More Severe Than Previously Estimated Using Indirect Techniques,” *Transactions of the Society for Biomaterials*, Vol. 22, p. 7, 1999 (with S.M. Kurtz, A.A. Edidin, K. Kwarteng, A. Kalinowski, M. Kester).

“Radiation and Chemical Crosslinking Promotes Strain Hardening Behavior and Molecular Alignment in UHMWPE Under Multiaxial Loading Conditions,” *Transactions of the Orthopaedic Research Society*, Vol. 24, p. 842, 1999 (with S.M. Kurtz, D. Crane, L. Pruitt, J. R. Foulds, A.A. Edidin).

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“Ultimate Properties and Crystalline Morphology of Ultra-High Molecular Weight Polyethylene During Uniaxial and Biaxial Tension,” *Transactions of the Society for Biomaterials*, Vol. 21, p. 125, 1998 (with S.M. Kurtz, D. Crane, L. Pruitt, J.R. Foulds, and A.A. Edidin).

“Direct Correlation of Abrasive Wear Resistance of Irradiation-Crosslinked UHMWPE Cups with Large-Deformation Mechanical Behavior Determined at the Articulating Surface,” *Transactions of the Society for Biomaterials*, Vol. 21, p. 220, 1998 (with S.M. Kurtz, J.R. Foulds, and A.A. Edidin).

“Effect of Crosslinking on Abrasive Wear Resistance, Crystalline Morphology, and the Large Deformation Mechanical Behavior at the Articulating Surface,” *Transactions of the Third World Congress of Biomechanics*, p. 349a, 1998 (with S.M. Kurtz et al.).

“Small Punch Test for Characterization of Aged UHMWPE After Gamma Sterilization in Air and Nitrogen,” *Transactions of the Orthopaedic Research Society*, Vol. 23, p. 361, 1998 (with S.M. Kurtz, J.R. Foulds, and A.A. Edidin).

“Mechanical Characterization of Ultra-High Molecular Weight Polyethylene Using the Small Punch Test after Gamma Sterilization and Aging,” *Transactions of the Society for Biomaterials*, Vol. 21, p. 500, 1998 (with S.M. Kurtz, J.R. Foulds, M. Manley, and A.A. Edidin).

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“The True Ultimate Stresses and Fracture Morphology of Ultra-High Molecular Weight Polyethylene Upon Tensile Failure,” *1997 Bioengineering Conference*, ASME, BED-Vol. 35, pp. 57–58, 1997 (with S.M. Kurtz, J.E. Moalli, R.M. Vogt and A.A. Edidin).

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“Miniature Sample Removal and Small Punch Testing for In-Service Component FATT,” *Clean Steels Technology: Proceedings of the Robert I. Jaffee Memorial Symposium*, pp. 101-109. R. Viswanathan (ed.), ASM International, OH, 1992 (with J.R. Foulds et al.).

“In-Service Steam Turbine Rotor Material Evaluation by Small Punch Testing,” *Proceedings, International Joint Power Generation Conference*, Atlanta, GA; and In: *Steam Turbine-Generator Developments for the Power Generation Industry*, PWR-Vol. 18, pp. 151–157, W.G. Steltz (ed.). American Society of Mechanical Engineers, 1992 (with J.R. Foulds et al.).

“Mitigation of Stress Corrosion Cracking Through Suppression of Radiolytic Oxygen,” *Proceedings, National Association of Corrosion Engineers Conference on Environmental*

Degradation of Materials in Nuclear Power Systems, Myrtle Beach, SC, August 1983 (with B.M. Gordon, R.L. Cowan, and A.E. Pickett).

“Corrosion Resistance Improvement of Ferritic Steels Through Hydrogen Addition,”
Presentation, American Institute of Metallurgical Engineers Conference, Snowbird, UT, June 1983 (with B.M. Gordon, A.E. Pickett, and M.E. Indig).