

Mr. Edwards is a polymer materials scientist with over 40 years of experience in the plastic and composites industry. He is a co-author of the book *Fractography in Failure Analysis of Polymers*, first published in 2015 with a second edition released in 2024.

His experience includes testing and analysis of plastic, rubber, and composite materials, as well as consulting and laboratory management. He has special expertise in failure analysis, fractography, and testing of plastics, including plastic pipe and fitting materials and stress rupture testing for design.

Additional areas of expertise include failure analysis, creep and stress rupture, fracture, mechanical testing, analytical testing, environmental effects, and lifetime prediction. Mr. Edwards has managed the Bodycote Broutman polymer test laboratory, which included hydrostatic pipe testing and mechanical and analytical testing of polymers and composite materials.

Mr. Edwards has taught courses on failure analysis, fracture of plastics, and testing of plastic materials. He has provided expert testimony regarding product failures in both state and federal courts.

Education

BS, Chemical Engineering. University of Illinois. 1978

Graduate Courses in Materials Engineering. Illinois Institute of Technology. 1981–1982

Licenses & Certifications

- State of Arkansas P.E. License 18187
- State of Illinois P.E. License 062-041364

Positions Held

Engineering Systems Inc., Aurora, Illinois

- Senior Managing Consultant, 2010 – Present
- Senior Consultant, 2007–2010

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Areas of Specialization

- Failure Analysis & Plastics Testing
- Environmental Effects & Lifetime Prediction
- Creep & Stress Rupture
- Fracture
- Mechanical Testing
- Material Testing
- Material Selection
- Stress Rupture Testing for Design

Bodycote Polymer Broutman Laboratory, Chicago, Illinois

- Senior Consultant, 2004–2007
- Vice President, Technical, 2000–2004

Bodycote Broutman, Inc. (formerly L.J. Broutman & Associated, Ltd.), Chicago, Illinois

- Vice President, Plastics Technology, 1995–2000
- Manager, Piping Products Laboratory, 1990–1995
- Research Engineer, 1982–1990

International Harvester Company, Chicago, Illinois

- Research Associate, 1979–1982

Continuing Education

- **Fall Protection Safety for the Competent Person** – Construction Safety Council, 2020
- **Infrared Microscopy Course (FTIR Spectroscopy)** – Hooke College of Applied Sciences (McCrone Group), 2010
- **Strategy of Experimentation** – DuPont Specialty Servies Course, 1987

Professional Affiliations/Honors

Society of Plastics Engineers

- Senior Member, 1980 - Present
- Technical Program Chair, FAPSIG, 2010–2011
- Chairman, FAPSIG, 2011–2012
- Dr. Myer Ezrin Best Paper Award, ANTEC, 2011
- Member, Board of Directors, Medical Plastics Division, 2007–2010

American Society for Testing and Materials

- Member, Committee F-17 on Plastic Piping Systems Journal of Pipeline Systems, 1989 - Present

Journal of Pipeline Systems

- Peer Reviewer, 2016 – Present
- Member, International Relations Committee, 2016 – Present
- Co-chair, Non-metallics Session at Failure Analysis Symposium at MS&T, 2016

Book Contributions

“Fractography in Failure Analysis of Polymers: 2nd Edition,” **D.B. Edwards**, A.R. Shah, and M.D. Hayes, Elsevier, ISBN 978-0-443-29149-4, 2024.

“Fractography in Failure Analysis of Polymer,” M.D. Hayes, **D.B. Edwards**, and A.R. Shah, Elsevier 978-0-323-24272-1, 2015.

Publications

“Service Lifetime Assessment of Polymeric Material Products,” **D.B. Edwards** and A.R. Shah, ASM Handbook, Vol. 11, 2020.

“Failure Analysis and Prevention,” **D.B. Edwards** and A.R. Shah, Fracture of Plastics, ASM Handbook, Vol. 11, 2019.

“Assessment of Polybutylene Plumbing Installations After Long-Term Service,” **D.B. Edwards** and D.E. Duvall, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2018.

“Failure Analysis of a Plastic Toy Helicopter,” **D.B. Edwards**, D.B. Brickman, C.A. Fox, and R.A. Brewster, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2016.

“Identifying ESC Failures in Polymers Using Fractography,” **D.B. Edwards**, Microscopy and Microanalysis, Vol. 22, No. S3, pp. 1850-1851, 2016.

“Determining the Processing Quality of PVC Pipe by DSC – How Precise?” **D.B. Edwards**, D.E. Duvall, and A.R. Shah, Proceedings of the 17th Plastic Pipes Conference, 2014.

“Assessment of Polybutylene Plumbing Installation after 18 Years of Service,” **D.B. Edwards** and D.E. Duvall, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2013.

“Polybutylene Water Service Pipe: The Other Side of the Story,” **D.B. Edwards** and D.E. Duvall, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2012.

“Determination of Environmental Stress Cracking Failure Mode in Investigation of CPVC Fire-Suppression Sprinkler Pipe Failures,” **D.B. Edwards** and A.R. Shah, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2012.

“Failure Analysis of Plastic Crimp Fitting Assemblies,” **D.B. Edwards**, D.E. Duvall, and A.R. Shah, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2011.

“Field Failure Mechanisms in HDPE Potable Water Pipe,” **D.B. Edwards** and D.E. Duvall, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2011.

“Challenges in Investigating Chlorinated Polyvinyl Chloride Pipe Failures,” **D.B. Edwards**, M.D. Hayes, M.L. Hanks, F.E. Hagan, and D.E. Duvall, Journal of ASTM International, Vol. 8, No. 1, pp. 01–12, 2011.

“Forensic Analysis of Oxidation Embrittlement in Failed HDPE Potable Water Pipes,” **D.B. Edwards** and D.E. Duvall, Proceedings of the ASCE Pipeline Division Specialty Congress – Pipelines 2010, pp. 648–662, 2010.

“Evaluation of Fractures Created in Plastic Pipes by Freezing of Water Inside of the Pipes,” **D.B. Edwards**, D.E. Duvall, and J.F. Grzetic, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2010.

“Analysis and Testing of Freezing Phenomena in Plastic Piping Systems,” **D.B. Edwards**, K.M. Smith, D.E. Duvall, and J.F. Grzetic, Proceedings of the ASME Congress, 2009.

“Fracture Toughness Testing (KIC) of PE 4710 Pipe Material,” **D.B. Edwards**, H. Svetlik, and A. Shabeer, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2008.

“Failure Investigation of XLPE Chemical Storage Tanks,” **D.B. Edwards** and D.E. Duvall, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2008.

“Failure Analysis of a Large Diameter Heat-Fusible PVC Pipe in a Horizontal Directional Drilling Installation,” **D.B. Edwards** and D.E. Duvall, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2008.

“Lessons from Failure,” **D.B. Edwards**, B.J. Gedeon, and A.I. Kasner, Appliance Design, pp. 19–21, 2007.

“Failure Analysis of Polypropylene Used in a Hot Water Environment: Effects of Different Stabilizer Systems,” **D.B. Edwards**, L.J. Broutman, and A.I. Kasner, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2007.

“Phosphate Esters as Stress Crack Agents: Case Studies in Failure Analysis,” **D.B. Edwards** and A.I. Kasner, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2007.

“Failure Prevention: Lessons from the Failure Analysis Investigations of Polymer Parts in Appliances,” **D.B. Edwards**, A.I. Kasner, and B.J. Gedeon, 57th Annual Conference of the International Appliance Technical Conference, 2006.

“Failure Analysis of a PEX Pipe Crimping System,” **D.B. Edwards** and T.P. Jeka, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2005.

“Steel Wire Reinforced Plastic Composite Pipe,” **D.B. Edwards**, B.D. Agarwal, and L.J. Broutman, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2004.

“The Effects of High Stress and Material Constraint on the Fracture Appearance of a Polyethylene Liner Pipe,” **D.B. Edwards** and R. Miller, Proceedings of the Society of Plastics Engineers Annual Technical Conference, 2004.

“Complex Yield Behavior of PE100 Resin on Plane Strain Tensile Specimens,” **D.B. Edwards**, L.J. Broutman, S.W. Choi, S. Lee, G. Palermo, K. Cho, M. Choi, and T. Park, Proceedings of the International Plastic Pipe Symposium, 2001.

“An Alternative Method for Determining the Hydrostatic Design Basis for Plastic Pipe Materials,” **D.B. Edwards**, L.J. Broutman, and S.W. Choi, Proceedings of the International Plastic Pipe Symposium, 2001.

“Failure Analysis Models for Polyacetal Molded Fittings in Plumbing Systems,” **D.B. Edwards**, L.J. Broutman, and P.K. So, Proceedings of the Society of Plastics Engineers 57th Annual Technical Conference, 1999.

"An Alternative Method for Determining the Hydrostatic Design Basis for Plastic Pipe Materials," **D.B. Edwards**, L.J. Broutman, E.F. Palermo, and A.R. Shah, Proceedings of the International Plastic Pipe Symposium, 1998.

"Failure Analysis of Thermoplastic Camper Tops," **D.B. Edwards**, L.J. Broutman, L.R. Nylander, and P.K. So, Proceedings of the Society of Plastics Engineers 56th Annual Technical Conference, 1998.

"A Case Study of Polyethylene Pipe in a Paper Mill Application," **D.B. Edwards** and D.E. Duvall, Proceedings TAPPI Engineering Conference, 1996.

"Creep and Stress Rupture Testing of Polyethylene Sheet under Equal Biaxial Tensile Stresses," **D.B. Edwards** and D.E. Duvall, Journal of Reinforced Plastics and Composites, Vol. 12, No. 3, pp. 285–295, 1993.

"Fatigue Testing of PVC Pipe Fittings," **D.B. Edwards**, B. Lehman, and R. Cohen, Journal of Vinyl Technology, Vol. 14, No. 2, pp. 69–73, 1992.

"Aging of Plastic Pipe Used for Natural Gas Distribution," **D.B. Edwards**, L.J. Broutman, L.R. Nylander, et al., Final Report to the Gas Research Institute, GRI Report No. 88/0285, 1988.

"Analysis of Polyethylene Gas Pipe Field Failure at Clear Lake, Iowa," **D.B. Edwards** and L.J. Broutman, National Transportation Safety Board, NTSB Accident No. DCA-83-AP-022, 1983.

"Environmental Testing of High Strength Molding Compounds," **D.B. Edwards** and N. Sridharan, Polymer Composites, Vol. 3, pp. 1-5, 1982.

Presentations

"Plastics Fracture Analysis Workshop," A.R. Shah, **D.B. Edwards**, P.E. Umberger, ESi, Aurora, IL, 2015, 2018, 2023.

"Quantifying Oxidative Degradation in Polyolefin Pipe by IR Spectroscopy," **D.B. Edwards** and D.E. Duvall, Society of Plastic Engineers Annual Conference, Orlando, FL, 2018.

"Plastics Failure Analysis/Prevention and Testing Seminar," **D.B. Edwards**, Society of Plastics Engineers and Bodycote Broutman, 1995–2001, 2007–2008.

"Plastics Fracture Analysis Workshop," **D.B. Edwards**, Society of Plastics Engineers and Bodycote Broutman, 2001–2008

"Identifying ESC Failures in Polymers Using Fractography," **D.B. Edwards**, Microscopy Society of America, Columbus, OH, July 28, 2016.

"Manufacturing Processes for Composite Materials," **D.B. Edwards**, Lewis University, Romeoville, Illinois, December 17, 2011.

"Failure Analysis of Plastic Materials: A Tool for Prevention," **D.B. Edwards**, Design & Manufacturing Midwest, Rosemont, IL, September 2010.

"Failure Analysis of Plastic Materials for Medical Devices: A Tool for Prevention," **D.B. Edwards**, MEDTEC, Stuttgart, Germany, March 2006.

"Failure Analysis of Plastic Materials for Medical Devices: A Tool for Prevention," **D.B. Edwards**, MDM Midwest, Minneapolis, MN, October 2004.

"Failure Analysis of Plastic Materials for Medical Devices: A Tool for Prevention," **D.B. Edwards**, MDM East, New York, NY, June 2004.

"The Effects of High Stress and Material Constraint on the Fracture Appearance of a Polyethylene Liner Pipe," **D.B. Edwards** and R. Miller, International Plastic Pipe Symposium, Milan, Italy, April 19–22, 2004.

"Failure Analysis of Plastic Materials for Medical Devices: A Tool for Prevention," **D.B. Edwards**, MDM West, Anaheim, CA, January 2004.

"Mechanical Properties of Polymers and Service Life Predictions," **D.B. Edwards**, Society of Plastics Engineers and Bodycote Broutman, 1995–1999.

"Fatigue Testing of PVC Pipe Fittings," **D.B. Edwards**, B. Lehman, and R. Cohen, Proceedings of the Society of Plastics Engineers 50th Annual Technical Conference, 1992.

"Environmental Testing of High Strength Molding Compounds," **D.B. Edwards** and N. Sridharan, Press Molders Committee Meeting of the Society of the Plastics Industry, Columbus, OH, 1981.