



DALE B. EDWARDS, P.E.
SENIOR MANAGING CONSULTANT

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Mr. Edwards is a polymer materials scientist with over 35 years of experience in the plastics and composites industry. He is a co-author of the book, **Fractography in Failure Analysis of Polymers** that was published in 2015. His experience includes testing and analysis of plastic, rubber and composite materials, 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 expertise includes failure analysis, creep and stress rupture, fracture, mechanical testing, analytical testing, environmental effects and lifetime prediction. Mr. Edwards has managed a polymer test laboratory (Bodycote Broutman) that included hydrostatic pipe testing, 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 and has provided expert testimony regarding product failures in both state and federal courts.

Areas of Specialization

Failure analysis and testing of plastics, including plastic pipe and fitting materials
Stress rupture testing for design
Failure analysis
Creep and stress rupture
Fracture
Mechanical testing
Material Selection
Environmental effects and lifetime prediction

Education

B.S. Chemical Engineering - University of Illinois, 1978
Graduate Courses in Materials Engineering - IL Inst. of Technology, 1981-1982

Licensed Professional Engineer (P.E.)

State of Arkansas License No. 062-041364
State of Illinois License No. 18187

August 2018

Professional Affiliations/Honors

Society of Plastics Engineers (SPE) – Senior Member

Technical Program Chair – Failure Analysis and Prevention Special Interest Group
(FAPSIG), 2010-2011
Chairman – FAPSIG, 2011, 2012
Dr. Myer Ezrin Best Paper Award – ANTEC 2011
Member of the Board of Directors of the Medical Plastics Division of SPE (2007 through
2010)

American Society for Testing and Materials

Member of Committee F-17 on Plastic Piping Systems

Peer reviewer for the **Journal of Pipeline Systems**

Positions Held

Engineering Systems, Inc., Aurora, Illinois

Senior Managing Consultant, 2010 to Present
Senior Consultant, 2007 to 2010

Bodycote Polymer-Broutman Laboratory, Chicago, Illinois

Senior Consultant, Bodycote Polymer, 2004-2007
Vice President, Technical, Bodycote Polymer, 2000-2004

Bodycote Broutman, Inc., (f.k.a. L.J. Broutman & Associates, Ltd.)

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

International Harvester Company

Research Associate, 1979-1982

Teaching

Mr. Edwards has taught seminars in the Plastic Failure Analysis Series that were co-sponsored by The Society for Plastics Engineers (SPE):

"Plastics Failure Analysis/Prevention and Testing Seminar" (1995-2001, 2007, 2008), Failure Analysis Seminar Series sponsored by Bodycote Broutman, Inc. and the Society of Plastics Engineers. This seminar has also been presented by Mr. Edwards and his colleagues at ESi, in 2015 and 2018.

"Mechanical Properties of Polymers and Service Life Predictions" (1995-1999) Mechanical Behavior of Plastics Seminar Series sponsored by Bodycote Broutman, Inc. and the Society of Plastics Engineers

"Plastics Fracture Analysis Workshop" (2001-2008) Failure Analysis Seminar Series sponsored by Bodycote Polymer – Broutman Laboratory and the Society of Plastics Engineers. This seminar has also been presented by Mr. Edwards and his colleagues at ESi, in 2015 and 2018.

Mr. Edwards has taught seminars on failure analysis of plastics for medical devices, co-sponsored by the Medical Plastics Division of SPE:

"Failure Analysis of Plastic Materials for Medical Devices: A Tool for Prevention"
The Medical Design and Manufacturing Conference, MDM West, Anaheim, California, January 2004
MDM East, New York, June 2004
MDM Midwest, Minneapolis, Minnesota, October 2004
MEDTEC, Stuttgart, Germany, March 2006

"Failure Analysis of Plastic Materials – A Tool for Prevention", presented at Design & Manufacturing Midwest 2010 Conference, Rosemont, Illinois, September 29, 2010

Mr. Edwards has also taught a seminar as an adjunct instructor at Lewis University titled "Manufacturing Processes for Composite Materials," December 17, 2011

Additional Training

Infrared Microscopy Course (FTIR spectroscopy), Hooke College of Applied Sciences (McCrone Group), April 20-22, 2010

Strategy of Experimentation – DuPont Specialty Services Course, June 1987

Book Contribution

Fractography in Failure Analysis of Polymers, M. D. Hayes, D. B. Edwards, A. R. Shah, Elsevier Inc., Oxford, UK, 2015

Publications

"Assessment of Polybutylene Plumbing Installations after Long-term Service" Proceedings of the Society of Plastics Engineers Annual Technical Conference (ANTEC), Orlando, Florida, May 7, 2018, with D. E. Duvall

"Identifying ESC Failures in Polymers Using Fractography", Microsc. Microanal. 22 (suppl 3), Microscopy Society of America, Columbus, Ohio, July 28, 2016

"Failure Analysis of a Plastic Toy Helicopter" Proceedings of the Society of Plastics Engineers Annual Technical Conference (ANTEC), Indianapolis, Indiana, May 23, 2016, with D.B. Brickman, C.A. Fox and R.A. Brewster

"Determining the Processing Quality of PVC Pipe by DSC – How Precise?" Proceedings of the 17th Plastic Pipes Conference, PPXVII, Chicago, Illinois, September 22-24, 2014, with D. E. Duvall and A. R. Shah

"Assessment of Polybutylene Plumbing Installation after 18 Years of Service," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Cincinnati, Ohio, April 22-24, 2013, with D. E. Duvall

"Polybutylene Water Service Pipe: The Other Side of the Story," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Orlando, Florida, April 1-4, 2012, with D. E. Duvall

"Determination of Environmental Stress Cracking Failure Mode in Investigation of CPVC Fire-Suppression Sprinkler Pipe Failures," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Orlando, Florida, April 1-4, 2012, with A. R. Shah

"Failure Analysis of Plastic Crimp Fitting Assemblies," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Boston, Massachusetts, May 1-5, 2011, with D. E. Duvall and A. R. Shah

"Field Failure Mechanisms in HDPE Potable Water Pipe," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Boston, Massachusetts, May 1-5, 2011, with D. E. Duvall

"Challenges in Investigating Chlorinated Polyvinyl Chloride Pipe Failures," Journal of ASTM International, 8(1), 2011, with M. D. Hayes, M. L. Hanks, F. E. Hagan and D. E. Duvall

"Forensic Analysis of Oxidation Embrittlement in Failed HDPE Potable Water Pipes," Proceedings of the 2010 ASCE Pipeline Division Specialty Congress – Pipelines 2010, pp. 648-662, with D.E. Duvall

"Evaluation of Fractures Created in Plastic Pipes by Freezing of Water Inside of the Pipes," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Orlando, Florida, May 16-19, 2010, with D. E. Duvall and J. F. Grzetic

"Analysis and Testing of Freezing Phenomena in Plastic Piping Systems," Proceedings of the ASME Congress, Orlando, Florida, November 13-18, 2009, with K. M. Smith, D. E. Duvall and J. F. Grzetic

"Fracture Toughness Testing (K_{Ic}) of PE 4710 Pipe Material," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Milwaukee, Wisconsin, May 4-7, 2008, with H. Svetlik and A. Shabeer

- "Failure Investigation of XLPE Chemical Storage Tanks," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Milwaukee, Wisconsin, May 4-7, 2008, with D. E. Duvall
- "Failure Analysis of a Large Diameter Heat-Fusible PVC Pipe in a Horizontal Directional Drilling Installation," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Milwaukee, Wisconsin, May 4-7, 2008, with D. E. Duvall
- "Lessons from Failure," Appliance Design, pp. 19-21, May 2007, with B. J. Gedeon and A. I. Kasner
- "Failure Analysis of Polypropylene Used in a Hot Water Environment – Effects of Different Stabilizer Systems," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Cincinnati, Ohio, May 6-10, 2007, with L. J. Broutman and A. I. Kasner
- "Phosphate Esters as Stress Crack Agents – Case Studies in Failure Analysis," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Cincinnati, Ohio, May 6-10, 2007, with A. I. Kasner
- "Failure Prevention – Lessons from the Failure Analysis Investigations of Polymer Parts in Appliances," 57th Annual Conference of the International Appliance Technical Conference, Rosemont, Illinois, March 27-29, 2006, with A. I. Kasner and B. J. Gedeon
- "Failure Analysis of a PEX Pipe Crimping System," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Boston, Massachusetts, May 1-5, 2005, with T. P. Jeka
- "Steel Wire Reinforced Plastic Composite Pipe," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Chicago, Illinois, May 16-20, 2004, with B. D. Agarwal and L. J. Broutman
- "The Effects of High Stress and Material Constraint on the Fracture Appearance of a Polyethylene Liner Pipe," Proceedings of the Society of Plastics Engineers Annual Technical Conference, Chicago, Illinois, May 16-20, 2004, with R. Miller); also presented at the International Plastic Pipe Symposium, PPXII, Milan, Italy, April 19-22, 2004
- "Complex Yield Behavior of PE100 Resin on Plane Strain Tensile Specimens," Proceedings of the International Plastic Pipe Symposium, Munich, Germany, September 3-6, 2001, with L. J. Broutman, S. W. Choi, S. Lee, G. Palermo, K. Cho, M. Choi and T. Park
- "An Alternative Method for Determining the Hydrostatic Design Basis for Plastic Pipe Materials," Proceedings of the International Plastic Pipe Symposium, Munich, Germany, September 3-6, 2001, with L. J. Broutman, and S. W. Choi
- "Failure Analysis Models for Polyacetal Molded Fittings in Plumbing Systems," Proceedings of the Society of Plastics Engineers 57th Annual Technical Conference, 1999, with L. J. Broutman and P. K. So
- "An Alternative Method for Determining the Hydrostatic Design Basis for Plastic Pipe Materials," Proceedings of the International Plastic Pipe Symposium, Goteburg, Sweden, September 14-17, 1998, with L. J. Broutman, E. F. Palermo and A. R. Shah
- "Failure Analysis of Thermoplastic Camper Tops," Proceedings of the Society of Plastics Engineers 56th Annual Technical Conference, 1998, with L. J. Broutman, L. R. Nylander and P. K. So
- "A Case Study of Polyethylene Pipe in a Paper Mill Application," Proceedings TAPPI Engineering Conference, 111, September 16-19, 1996, with D. E. Duvall

"Creep and Stress Rupture Testing of Polyethylene Sheet under Equal Biaxial Tensile Stresses," Journal of Reinforced Plastics and Composites, 12(3), March 1993, with D. E. Duvall

"Fatigue Testing of PVC Pipe Fittings," Journal of Vinyl Technology, June 1992, 14(2), with B. Lehman and R. Cohen; also presented at the Proceedings of the Society of Plastics Engineers 50th Annual Technical Conference, 38, 276-279, 1992

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

"Analysis of Polyethylene Gas Pipe Field Failure at Clear Lake, Iowa," for National Transportation Safety Board, NTSB Accident No. DCA-83-AP-022, July 12, 1983, with L. J. Broutman

"Environmental Testing of High Strength Molding Compounds," Polymer Composites, 3(1), January 1982, with N. Sridharan; also presented at the Press Molders Committee Meeting of the Society of the Plastics Industry, Columbus, Ohio, 1981

Presentations

"Quantifying Oxidative Degradation in Polyolefin Pipe by IR Spectroscopy" ANTEC Conference, Orlando, Florida Society of Plastic Engineers Annual Conference, with D. E. Duvall, 2018