



**DONALD E. DUVALL, Ph.D., P.E.**  
**SENIOR MANAGING CONSULTANT**

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Dr. Duvall is a polymer materials scientist with more than 50 years experience in the plastics industry. He specializes in engineering, testing and failure analysis of products manufactured from polymeric materials, especially those intended for long-term, load bearing applications. Prior to joining ESi, Dr. Duvall was a project manager and Vice President of Plastics Technology for L. J. Broutman & Associates (LJBA), a consulting, contract research and testing organization located in Chicago, which specialized in work on polymeric materials and products made from them. He was responsible for managing projects involved with thermoplastic polymer materials, including plastic piping and geosynthetics. He also was in charge of setting up the plastic piping products testing laboratory at LJBA. Before joining Broutman & Associates, he was Technical Service Manager for the Plexco Division of Amsted Industries. There he was responsible for providing technical assistance to the company's sales and production staff and to customers of their line of polyethylene pipe and fittings and pipeline corrosion coating system. Prior to Plexco, he was employed by Gould Incorporated in their Nickel/Zinc – Electric Vehicle project. Previous to that time, he was a research chemist for The Richardson Company, a manufacturer of thermoplastic molding and extrusion compounds.

Dr. Duvall has also been active in teaching in the fields of polymer science and failure analysis. He was an adjunct instructor in the Metallurgical & Materials Engineering Department and the Mechanical, Materials & Aerospace Engineering Department at Illinois Institute of Technology in Chicago. He was one of the creators of the L. J. Broutman & Associates/Bodycote-Broutman Failure Analysis Seminar series presented in conjunction with the Society of Plastics Engineers. He was a member of the associate staff of the US DOT Transportation Safety Institute from 1987 - 2016, lecturing on plastic gas distribution piping system failure analysis.

**Areas of Specialization**

Plastic, composite & rubber products for long-term, load bearing applications  
Failure analysis of products manufactured from polymeric materials  
Physical, mechanical and environmental testing of polymeric materials  
Structure and properties of thermoplastic polymers, polymer alloys and blends  
Synthesis of thermoplastic polymers and polymer compound formulation  
Plastics processing methods  
Analytical chemistry of organic chemical compounds

*April 2023*

## Education

Ph.D., Metallurgical and Materials Engineering. Illinois Institute of Technology. 1993  
M.S., Materials Science and Engineering. Northwestern University. 1981  
B.S., Chemistry. Illinois Institute of Technology. 1971

## Licensed Professional Engineer (P.E.)

State of Illinois ..... License No. 062-050452

## Professional Affiliations/Honors

### National Council of Examiners for Engineering and Surveying (NCEES)

Fundamentals of Engineering Exam Development Committee, 2023 - Present

### Society of Plastics Engineers (SPE) – Honored Service Member

Engineering Properties & Structure Division Board of Directors, 1998 – 2004  
Engineering Properties & Structure Division Chair-Elect, 2001 – 2002, Chair 2002 – 2003. Past  
Chair 2003 – 2004  
Failure Analysis & Prevention Special Interest Group Technical Program Chair, 2004 – 2005,  
Chair 2005 – 2007, Past Chair 2007 – 2009, Board of Directors 2009 – Present  
Plastic Pipe & Fittings Special Interest Group Chair 2004 – 2006, 2012 – 2017, Technical  
Program Chair, 2010  
Named an Honored Service Member of SPE, May 2017

### American Society of Testing and Materials (ASTM)

Member of Committees D20 on Plastics, D35 on Geosynthetics, G03 on Durability of Nonmetallic  
Materials, and F17 on Plastic Piping Systems, Chairman of Subcommittee F17.26 on  
Polyolefin Pipe (1986 – 1989)

### American Water Works Association (AWWA)

Member, Polyolefin Pressure Pipe Standards Committee, 1994 – Present  
Chairman, Subcommittee to Revise AWWA Standard C901, 1994 – 2000

Listed in Who's Who in Plastic & Polymers, Technomic Publishing Co., 2000

Listed in Marquis' Who's Who in Science and Engineering: Premier Edition, 1992 – 1993

Dr. Myer Ezrin Best Paper Award – Society of Plastics Engineers Annual Technical Conference, Failure  
Analysis and Prevention Special Interest Group, May 2011 (with Dale B. Edwards)

Dow Chemical Company Best Paper Award – Case Studies Category, Society of Plastics Engineers Annual  
Technical Conference, Failure Analysis and Prevention Special Interest Group, May 2002

Recognized for "Continued Superior Performance" by the U.S. Department of Transportation's  
Transportation Safety Institute (1989 and 1992)

Peer reviewer for technical journals Geotechnical Testing Journal (ASTM), Polymer Engineering & Science (SPE), Journal of Materials Science, and Journal of Failure Analysis and Prevention

### **Continued Education**

"Rheology of Polymers, Its Relation to Processing and Properties"

Short Course sponsored by the Plastics Institute of America at Northwestern University,  
November 6-9, 1979

"Microencapsulation"

Short course presented by the Center for Professional Advancement, June 23-25, 1980

"Managing Technical Service"

Short course presented by the American Management Association, August 17-19, 1981

"Adhesion Principles & Practice for Coatings & Polymer Scientists"

Short course presented at the Rheology & Coatings Laboratory, Department of Chemistry, Kent State University, June 7-11, 1982

"Fundamentals of Lubricating Greases – Advanced Course"

Short course presented by the National Lubricating Grease Institute, Asheville, North Carolina,  
October 30-31, 2000

### **Positions Held**

#### **Engineering Systems Inc., Aurora, Illinois**

Senior Managing Consultant, 2010 – Present  
Senior Consultant, 1995 – 2010

#### **Illinois Institute of Technology, Chicago, Illinois**

Lecturer, MMAE Department, 2003 – 2013  
Adjunct Associate Professor, MMAE Department, 1998 – 2003  
Part-time Instructor, MMAE Department, 1996 – 1998  
Part-time Instructor, METM Department, 1988 – 1996

#### **L.J. Broutman & Associates, Chicago, Illinois**

Vice President, Plastics Technology, 1990 – 1995  
Manager, Piping Products Section, 1984 – 1990

#### **Plexco Division, Amsted Industries, Franklin Park, Illinois**

Manager, Technical Services, 1981 – 1983

#### **Gould Incorporated, Rolling Meadows, Illinois**

Research Scientist, 1978 – 1981

## **The Richardson Company, Melrose Park, Illinois**

Research Chemist, 1973 – 1978

### **Selected 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. B. Edwards
- "Oxidation Resistance of Polypropylene Random Copolymer Pipe to Chlorinated Water," Journal of Failure Analysis and Prevention **14**(3), 336-342 (2014).
- "Thermal Degradation and Ignition Characteristics of Clothes Dryer Lint," Journal of Failure Analysis and Prevention, **12**(4), 341-347 (2012), with Thomas J. Bajzek and Ronald Pape
- "Challenges in Investigating Chlorinated Polyvinyl Chloride Pipe Failures," Journal of ASTM International, **8**(1), 1-12 (2011), with Michael D. Hayes, Michael L. Hanks, Frank E. Hagan, and Dale B. Edwards
- "Failure Analysis of Cross-linked Polyethylene Chemical Storage Tanks," ANTEC 2008 – Proceedings of the Society of Plastics Engineers 66<sup>th</sup> Annual Technical Conference, pp. 1758-1762, May 2008, with Dale B. Edwards
- "Analysis of Heating by Friction in Plastic Clothes Dryer Components," Journal of Failure Analysis & Prevention **7**(6), pp. 400-406, 2007, with Thomas J. Bajzek and Richard N. Koopman
- "Effect of Environment on Plastics Performance," ASM Handbook, Volume 11: Failure Analysis & Prevention, pp. 796-799, ASM International, Materials Park, Ohio (2002)
- "Insight into the Mechanisms Controlling Creep Deformation of Polyethylene," Proceedings of the Society of Plastics Engineers 53rd Annual Technical Conference, **41**, 1939 (1995)
- "Environmental Degradation of PET and Its Potential Effect on Long Term Mechanical Properties of Oriented PET Products," Polymer Plastics: Technology and Engineering, **34**(2), 227 (1995)
- "Impact of Product Structure on the Stability and Durability of Coated Poly(ethylene terephthalate) Geogrids," Geotextiles and Geomembranes, **13**(3), 133 (1994)
- "Experimental Analysis of Stresses in Interference Fit Assemblies," Proceedings of the Society of Plastics Engineers 51st Annual Technical Conference, **39**, 2367 (1993), with S. W. Choi, P. K. So and L. J. Broutman
- "Estimates of the Dependence of Crack Velocity on the Molecular Weight of Polyethylene Pipe Material," Proceedings of the Society of Plastics Engineers 51st Annual Technical Conference, **39**, 2000 (1993) with G. W. Kamykowski
- "Creep of Polyethylene Sheet under Equal Biaxial Tensile Stresses," Journal of Reinforced Plastics and Composites, **12**(3), 285 (1993).
- "Effect of Molecular Weight on Slow Crack Growth in HDPE," Proceedings of the Society of Plastics Engineers 50th Annual Technical Conference, **38**, 140 (1992), with P. K. So and L. J. Broutman
- "Evaluation of Creep Rupture Properties of Geosynthetics," Proceedings of the 4th International Conference of Geotextiles and Geomembranes, Volume II, 678 (1990), with P. D. Egan

## **Selected Technical Presentations**

"Quantifying Oxidative Degradation in Polyolefin Pipe by IR Spectroscopy" ANTEC Conference, Orlando, Florida Society of Plastic Engineers Annual Conference, May 7, 2018, with D. B. Edwards and A. R. Shah

"Plastics Failure Analysis Seminars", presented by Engineering Systems, Inc., June 8-12, 2015 & August 13-17, 2018.

"Oxidative Degradation of High-Density Polyethylene Pipes from Exposure to Drinking Water Disinfectants," California/Nevada Section, American Water Works Association Spring Conference, March 31, 2010

"Creep, Stress Rupture & Stress Relaxation in Design & Failure Analysis" Society of Plastics Engineers Webinar presented June 11, 2009

"Water Water Everywhere – Failure Analysis of Plastic Toilet Valves" ASM Materials Solutions 2003 Conference, Columbus, Ohio, 2003

"Failure Analysis of Plastic Gas Piping" U.S. Department of Transportation, Transportation Safety Institute/PHMSA Seminars on Pipeline Failure Investigation Techniques, 1987-2016

"Failure Analysis Techniques for Polymeric Materials" ASM International Failure Prevention through Education: Getting to the Root Cause program, May 22, 2000

"Betting the Company on 5¢ Worth of Plastic" Failure Analysis/Medical Plastics Division Panel Discussion. Society of Plastics Engineering Annual Technical Conference, May 1996

"Plastics Failure Analysis" Seminars co-sponsored by L. J. Broutman & Associates and the Society of Plastics Engineers, 1986-1995

"Application-Induced Structural Changes in a Polymeric Battery Separator Membrane" Symposium on Polymer Science in Energy Applications, 8th Rocky Mountain Regional ACS Meeting, Denver, Colorado, June 11, 1986