

Dr. Donald Duvall is a polymer materials scientist with more than 40 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 in Chicago. He was responsible for managing projects involved with thermoplastic polymer materials, including plastic piping and geosynthetics, and was in charge of setting up the plastic piping products testing laboratory.

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 staffs 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 been active in teaching polymer science and failure analysis. He was an adjunct instructor in the Metallurgical & Materials Engineering Department and the Mechanical, Materials & Aerospace Engineering Department at the 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 in 1987–2016, lecturing on plastic gas distribution piping system failure analysis.

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## Education

PhD, Metallurgical and Materials Engineering. Illinois Institute of Technology. 1993

MS, Materials Science and Engineering. Northwestern University. 1981

BS, Chemistry. Illinois Institute of Technology. 1971

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## ESi Aurora

4215 Campus Drive  
Aurora, IL 60504

## Areas of Specialization

- Plastic, Composite & Rubber Products for Long-Term, Load-Bearing Applications
- Failure Analysis of Products Manufactured from Polymeric Materials
- Physical, Mechanical & Environmental Testing of Polymeric Materials
- Structure/Properties of Thermoplastic Polymers, Polymer Alloys & Blends
- Synthesis of Thermoplastic Polymers & Polymer Compound Formulation
- Plastics Processing Methods
- Analytical Chemistry of Organic Chemical Compounds

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## 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

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## Continuing Education

- **Fundamentals of Lubricating Greases: Advanced Course** – National Lubricating Grease Institute, 2000
- **Adhesion Principles & Practice for Coatings & Polymer Scientists** – Rheology & Coatings Laboratory, Kent State University, 1982
- **Managing Technical Service** – American Management Association, 1981
- **Microencapsulation** – Center for Professional Advancement, 1980
- **Rheology of Polymers, Its Relation to Processing and Properties** – Plastics Institute of America, Northwestern University, 1979

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## Professional Affiliations/Honors

### Society of Plastics Engineers

- Named Honored Service Member, May 2017

- Special Interest Group Chair, Plastic Pipe & Fittings, 2004–2006, 2012–2017
- Aerospace Session, Failure Analysis Symposium at MS&T, 2015
- Co-winner, Dr. Myer Ezrin Best Paper Award, Annual Technical Conference, FAPSWIG, May 2011
- Technical Program Chair, Plastic Pipe & Fittings, 2010
- Past Chair, Failure Analysis and Prevention Special Interest Group (FAPSWIG), 2007–2009
- Chair, FAPSWIG, 2005–2007
- Technical Program Chair, FAPSWIG, 2004–2005
- Chair-Elect, Engineering Properties & Structure Division, 2001–2002, Chair 2002–2003, Past Chair 2003–2004
- Board of Directors, Engineering Properties & Structure Division, 1998–2004
- Winner, Dow Chemical Company Best Paper Award, Case Studies Category, Annual Technical Conference, FAPSWIG, May 2002

#### **American Society of Testing and Materials**

- Member, Committee D20 on Plastics, 1986–1989
- Member, Committee D35 on Geosynthetics, 1986–1989
- Member, Committee G03 on Durability of Non-metallic Materials, 1986–1989
- Member, Committee F17 on Plastic Piping Systems, 1986–1989
- Chairman, Subcommittee F17.26, Polyolefin Pipe, 1986–1989

#### **American Water Works Association**

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

#### **Plastic & Polymers, Technomic Publishing Co.**

- Named in “Who’s Who,” 2000

#### **Marquis**

- Named in “Who’s Who in Science and Engineering: Premier Edition,” 1992–1993

#### **Transportation Safety Institute, U.S. Department of Transportation**

- Recognized for Continued Superior Performance, 1989 & 1992

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### **Publications**

“Oxidation Resistance of Polypropylene Random Copolymer Pipe to Chlorinated Water,” **D.E. Duvall**, Journal of Failure Analysis and Prevention, Vol. 14, No. 3, pp. 336–342, 2014.

- “Thermal Degradation and Ignition Characteristics of Clothes Dryer Lint,” **D.E. Duvall**, T.J. Bajzek, and R. Pape, *Journal of Failure Analysis and Prevention*, Vol. 12, No. 4, pp. 341–347, 2012.
- “Challenges in Investigating Chlorinated Polyvinyl Chloride Pipe Failures,” **D.E. Duvall**, M.D. Hayes, M.L. Hanks, F.E. Hagan, and D.B. Edwards, *Journal of ASTM International*, Vol. 8, No. 1, pp. 1–12, 2011.
- “Failure Analysis of Cross-Linked Polyethylene Chemical Storage Tanks,” **D.E. Duvall** and D.B. Edwards, *Proceedings of the Society of Plastics Engineers 66th Annual Technical Conference*, pp. 1758–1762, May 2008.
- “Analysis of Heating by Friction in Plastic Clothes Dryer Components,” **D.E. Duvall**, T.J. Bajzek, and R.N. Koopman, *Journal of Failure Analysis & Prevention*, Vol. 7, No. 6, pp. 400–406, 2007.
- “Effect of Environment on Plastics Performance,” **D.E. Duvall**, *ASM Handbook*, Vol. 11: Failure Analysis & Prevention, pp. 796–799, 2002.
- “Insight into the Mechanisms Controlling Creep Deformation of Polyethylene,” **D.E. Duvall**, *Proceedings of the Society of Plastics Engineers 53rd Annual Technical Conference*, Vol. 41, pp. 1939, 1995.
- “Environmental Degradation of PET and Its Potential Effect on Long Term Mechanical Properties of Oriented PET Products,” **D.E. Duvall**, *Polymer Plastics: Technology and Engineering*, Vol. 34, No. 2, pp. 227, 1995.
- “Impact of Product Structure on the Stability and Durability of Coated Poly(ethylene terephthalate) Geogrids,” **D.E. Duvall**, *Geotextiles and Geomembranes*, Vol. 13, No. 3, pp. 133, 1994.
- “Experimental Analysis of Stresses in Interference Fit Assemblies,” **D.E. Duvall**, S.W. Choi, P.K. So, and L.J. Broutman, *Proceedings of the Society of Plastics Engineers 51st Annual Technical Conference*, Vol. 39, pp. 2367, 1993.
- “Estimates of the Dependence of Crack Velocity on the Molecular Weight of Polyethylene Pipe Material,” **D.E. Duvall** and G.W. Kamykowski, *Proceedings of the Society of Plastics Engineers 51st Annual Technical Conference*, Vol. 39, pp. 2000, 1993.
- “Creep of Polyethylene Sheet under Equal Biaxial Tensile Stresses,” **D.E. Duvall**, *Journal of Reinforced Plastics and Composites*, Vol. 12, No. 3, pp. 285, 1993.
- “Effect of Molecular Weight on Slow Crack Growth in HDPE,” **D.E. Duvall**, P.K. So, and L.J. Broutman, *Proceedings of the Society of Plastics Engineers 50th Annual Technical Conference*, Vol. 38, pp. 140, 1992.
- “Evaluation of Creep Rupture Properties of Geosynthetics,” **D.E. Duvall** and P.D. Egan, *Proceedings of the 4th International Conference of Geotextiles and Geomembranes*, Vol. 2, pp. 678, 1990.

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## Presentations

- “Plastics Failure Analysis Seminars,” **D.E. Duvall**, Engineering Systems, Inc., Aurora, IL, August 13–17, 2018, June 8–12, 2015
- “Assessment of Polybutylene Plumbing Installations After Long-Term Service,” **D.E. Duvall** and D.B. Edwards, *Society of Plastics Engineers Annual Technical Conference*, Orlando, FL, May 7, 2018.

“Quantifying Oxidative Degradation in Polyolefin Pipe by IR Spectroscopy,” **D.E. Duvall**, D.B. Edwards, and A.R. Shah, Plastic Engineers Annual Technical Conference, Orlando, FL, May 7, 2018.

“Oxidative Degradation of High-Density Polyethylene Pipes from Exposure to Drinking Water Disinfectants,” **D.E. Duvall**, California/Nevada Section, American Water Works Association Spring Conference, Long Beach, CA, March 31, 2010.

“Creep, Stress Rupture & Stress Relaxation in Design & Failure Analysis,” **D.E. Duvall**, Society of Plastics Engineers, Virtual, June 11, 2009.

“Water-Water Everywhere: Failure Analysis of Plastic Toilet Valves,” **D.E. Duvall**, ASM Materials Solutions Conference, Columbus, OH, 2003.

“Failure Analysis of Plastic Gas Piping,” **D.E. Duvall**, U.S. Department of Transportation, Transportation Safety Institute/PHMSA Seminars on Pipeline Failure Investigation Techniques, Washington D.C., 1987–2016.

“Failure Analysis Techniques for Polymeric Materials,” **D.E. Duvall**, ASM International Failure Prevention through Education: Getting to the Root Cause, Cleveland, Ohio, May 22, 2000.

“Betting the Company on 5¢ Worth of Plastic,” **D.E. Duvall**, Society of Plastics Engineering Annual Technical Conference, Indianapolis, Indiana, May 1996.

“Application-Induced Structural Changes in a Polymeric Battery Separator Membrane,” **D.E. Duvall**, Symposium on Polymer Science in Energy Applications, 8th Rocky Mountain Regional ACS Meeting, Denver, CO, June 11, 1986.