Richard P. Baron

Ph.D., P.E.

Principal, Director of Materials

Dr. Baron is a Principal and Director for ESi. His forensic engineering consulting career started at Materials Analysis, a respected engineering consulting firm that joined ESi in 2012. He has a total of over 28 years of experience in the preparation, characterization, and root cause failure analysis of metallic, polymeric, and ceramic materials, composites, and coatings. His work experience spans multiple industries, including aviation, oil and gas, HVAC, automotive, construction, water distribution, commercial products, and electronic components. He has led multidisciplinary failure investigations on many projects involving complex mechanical assemblies, high-temperature turbine components, piston engines, heat exchangers, welded structures, commercial plastic components, petrochemical transmission, and recreational and fitness equipment.

Dr. Baron earned his bachelor's and master's Degrees at Lehigh University and his Doctorate at the University of Virginia. All his degrees are in Materials Science and Engineering, and he is a licensed Professional Engineer (P.E.) in Texas and Oklahoma. He serves as a technical reviewer for ASM International's Journal of Failure Analysis and Prevention and routinely presents failure analysis investigations at technical forums. He has testified as a qualified professional engineering expert in both state and federal courts.

Education

PhD, Materials Science & Engineering. University of Virginia. 1998

MS, Materials Science & Engineering. Lehigh University. 1994

BS, Materials Science & Engineering. Lehigh University. 1993

Licenses & Certifications

- State of Texas P.E. License 92534
- State of Oklahoma P.E. License 27062
- SuperAlloys for Heavy-Duty and Aircraft-Type Gas Turbines, Certificate of Completion, University of Florida, 2018

Contact Information

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ESi Dallas

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Areas of Specialization

- Engineering Failure Analysis
- Railroad & Transit
- Non-Metallic Materials
- Turbine Components
- Electrical Components
- Corrosion Engineering
- Welding Metallurgy
- Testing & Examinations
- Piston Engines

- Technical Committee for Excellence, Certificate of Participation, Houston Fire Dept., 2001
- Engineer-in-Training Certification, 1993

Positions Held

Engineering Systems Inc., Dallas, Texas

- Director, Materials Practice, 2021 – Present
- Principal, 2019 – Present
- Manager of Dallas Operations, 2015 – 2020
- Senior Managing Consultant, 2015 – 2018
- Senior Consultant, 2011 – 2015

Materials Analysis Inc., Dallas, Texas

- Staff Engineer, 2003 – 2011
- Graduate Engineer, 1998 – 2003

University of Virginia, Charlottesville, Virginia

- Graduate Research Assistant, 1994 – 1998
- Graduate Teaching Assistant, 1997

Advanced Material Development Center, Saginaw, Michigan

- Summer Research Intern, 1995

Energy Research Center, Bethlehem, Pennsylvania

- Graduate Research Assistant, 1993 - 1994

Continuing Education

- **Gas Turbine Engine Accident Investigation** – USC, April, 2025
- **SuperAlloys for Heavy-Duty & Aircraft-Type Gas Turbines** – Certificate of Completion, University of Florida, 2018
- **Model 250 Series IV (C40/C47) Engine Maintenance Training Course** – Rolls Royce, 2008
- **Basic Gas Turbine Engine Technology** – International Gas Turbine Institute, American Society of Mechanical Engineers, 2000

Professional Affiliations/Honors

The Minerals, Metals and Materials

- Member since 2003

American Society of Metals and Materials

- Member since 1991

American Welding Society

- Member since 2006

ASTM International

- Member since 2012

Engineer-in-Training Certification

- Certification 1993

Bachelor of Science with High Honors

- Lehigh University

John Cyril Osburn Award

- Lehigh University

Phi Eta Sigma

- Honor Society

Tau Beta Pi

- Honor Society

Alpha Sigma Mu

- Honor Society

Project Experience

Aviation – Engine Failure

- A small general aviation plane crashed shortly after takeoff, allegedly due to engine power loss from a defective turbine shaft. The project included engine teardown, component inspection, fractographic characterization, and material property testing. Through the results of the metallurgical investigation, it was concluded that the engine was producing power at impact and the turbine shaft failed during the crash sequence.

Gas Transmission – Natural Gas Leak

- A fatality occurred as a result of an explosion caused by a natural gas leak in a main line. Metallurgical investigation was conducted to determine pipe integrity and cause of the leak. It was concluded that gas main pipe, though over 50 years old, was sound and failure resulted from abnormal geological loading.

Consumer Product – Golf Club

- A preteen boy was fatally injured when he was pierced with the failed end of a golf club. The project involved comprehensive characterization of the subject club, unique exemplar golf club testing, and critique of the alleged material defect claims. The metallurgical investigation revealed no defects, and failure occurred through misuse of the golf club.

Consumer Product – Gas Absorption Refrigerators

- Fires occurred in which gas absorption refrigerator leaks were alleged to have been the cause. Metallurgical characterization and product testing of subject and exemplar systems were conducted to determine the propensity of these refrigerators to result in a fire in the manner alleged.

Consumer Product – Mattress

- A project involved personal injury resulting from allegedly defective springs used in the construction of a commercial mattress. Multiple metallurgical inspections of the subject mattress and exemplar mattress testing revealed that springs were not defective. Instead, misuse of the subject mattress resulted in the personal injury.

Construction Products – Coated Metallic Roof Panels

- Multiple projects have involved the condition of coated metallic roof panels following alleged hailstone impacts. Detailed metallurgical examination was performed to roof panel samples to characterize the effect, if any, on the corrosion protection system and the long-term performance of the roof. It has been concluded that the integrity of the coating system has not been appreciably diminished, and the alleged hailstone impact resulted in cosmetic damage.

Chemical Storage – Heat Exchanger Failure

- A heat exchanger system within a storage tank failed resulting in loss of product and significant remediation costs. Improperly constructed weld joints used to fabricate the heat exchanger coils allegedly caused system failure through leaking and subsequent corrosion attack. Metallurgical examination of recovered coil sections revealed no evidence of weld failures and instead, corrosion resulting from system control abnormalities.

Residential Plumbing – Plastic Component Failures

- Multiple projects have involved the failure of plastic pipes, fittings, and/or components that resulted in significant remediation costs from water damage. Such projects typically include visual, stereoscopic, and radiographic examination, fractography, and material property characterization. Potential causes of failure include manufacturing defects, improper installation, and environmental degradation.

Petrochemical Industry – Construction Defect Arbitration

- A newly constructed pipeline was allegedly determined to be not fit for service due to product purity issues. Metallurgical testing and review of inline inspection (ILI) results and production documents were used to refute the claims against the pipeline construction firm. Instead, inadequacies in product purity transportation resulted from improper care and maintenance provided by the end user.

Publications

"Visual Examination and Photography in Failure Analysis," ASM Handbook, Vol. 11B, October 2021.

"Creep and Stress-Rupture Failures," ASM Handbook, Vol. 11, October 2020.

"Failure of Recreational Products: Case Studies," R.P. Baron, A.E. Richards, M.J. Mulherin, MS&T Invited Speaker, Salt Lake City, UT, October 2016

"Failure Analysis of a Titanium Golf Club Head," Journal of Failure Analysis and Prevention, Vol. 10, Issue 6, December 2010.

"Failure Analysis of Some Uncommon Welds," American Welding Society – North Texas Section, October 2007.

"Failure Analysis of First Stage Turbine Air Seal Assembly," MS&T Fundamentals and Characterization, Vol. 1, October 2006.

"The Process and Characterization of Sintered Metal Reinforced Aluminium Matrix Composites, Ph.D. Dissertation, August 1998.

"Mechanical Properties of Aluminium Matrix Composites Reinforced with Sintered Ferrous Compacts," Materials Science and Engineering, 1998.

""Relationship Between Fractional Porosity and Tensile Strength for High-Porosity Sintered Ferrous Powder Components," Scripta Materialia, 1998.

"The Processing and Characterization of Sintered Metal Reinforced Aluminium Matrix Composites," Journal of Materials Science, 1997.

"Oxidation and Erosion Resistance of Amorphous Bright Chromium Electroplated Coatings," Advances in Surface Engineering, Vol. 2, Process Technology, 1997

"The Diffusion and Properties of an Amorphous Bright Chromium Deposit on an Iron-Carbon Substrate," M.S. Thesis, 1994

Presentations

““The Little Plane that Could: Failure Analysis of a Robust Turbine Engine,” E. Wright, G. Novak, **R. Baron**, D. Ahearn, D.E. Alexander, presented at 2019 MS&T Technical Meeting, Portland, OR, October 2019.

“Investigation of a Compressor Turbine Blade Failure Involving the Fir Tree Attachment Condition,” E. Wright, G. Novak, **R. Baron**, D. Ahearn, D.E. Alexander, presented at 2018 MS&T Technical Meeting, Columbus, OH, October 2018.