



Dennis Turriff

PhD PEng

Principal, Senior Engineer

contact

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expertise

Failure Analysis

areas of specialization

Metallurgy and Mechanical Engineering

Product liability and transportation defects

Industrial Equipment and medical device failures

Plumbing and HVAC system failures

Material processing issues: soldering, brazing, welding, heat treating and powder metallurgy

Fractography of metallic and plastic parts

Stress analysis and load testing

Dr. Dennis Turriff is a senior engineer, and leads MEA Forensic's Failure Analysis group in Toronto. His background in both materials science and mechanical engineering help him isolate the root cause of failure in a wide variety of incidents involving vehicles, industrial equipment, consumer products, plumbing, and medical devices.

Dennis has a Bachelor's degree and a Doctorate in Mechanical Engineering, with a specialization in Materials Science, from the University of Waterloo. His PhD work focused on novel soldering processes and brazing of steel and aluminum automotive alloys. He continues to use the same tools in his case work and to investigate failures of metallic and plastic components.

Identifying the cause of a failure often starts with a close examination of the physical evidence. Dennis uses optical, digital, and scanning electron microscopes to observe minute features on fracture surfaces that can identify overload failures versus progressive failure modes like fatigue and corrosion. Metallurgical analysis and fractography are used regularly to find materials defects. Dennis also relies on his mechanical engineering background if mechanical testing or analysis of forces, stresses, and strains is required for a complete understanding of the circumstances leading to a failure. The end goal of the analysis is to isolate root causes related to use, maintenance, installation, manufacture, or design.

Dennis is registered as a Professional Engineer in Ontario and is a certified fire and explosion investigator. He has testified as an expert in court. "My job is to take a range of complex technical information, analyze it in an objective manner, and be able to distill

it down to clear, logical conclusions that the court can understand," he says.

education

Doctor of Philosophy, Mechanical Engineering, Specializing in Materials Science, University of Waterloo, 2007.

Bachelor of Applied Science, Mechanical Engineering, Co-op, with distinction, University of Waterloo, 2002.

Diplôme d'Études Collégiales, Pure and Applied Sciences, subsidized by Royal Military College of Canada, 1997

professional status

Registered Professional Engineer, Professional Engineers of Ontario (PEO), License No. 100139442.

Certified Fire and Explosion Investigator (CFEI), National Association of Fire Investigators, 2010.

professional associations

American Welding Society (AWS)

National Association of Fire Investigators (NAFI)

Canadian Association of Fire Investigators (CAFI)

professional experience

MEA Forensic Engineers & Scientists

Principal, Senior Engineer, 2009 to present

Registered professional engineer specializing in mechanical and material failures related to product, property, transportation, and equipment losses including water escapes, fuel oil escapes, fires, and explosions. Employing scientific failure analysis tools to isolate root and contributing causes related to defective use, maintenance, inspections, manufacture, or design. Engineering work includes evidence and site examinations, non-destructive and destructive testing, metallurgical analysis, as well as materials characterization and identification for metallic and plastic components. Experiments are routinely conducted to test hypotheses of failure modes and failure sequences for components, products, and machinery relative to reported conditions or applicable standards and codes.

Ongoing research involves metallography and fractographic analysis (scanning electron microscopy, SEM/EDS), thermal analysis and spectroscopy (DSC, TGA, dilatometry, FTIR), statics and stress analysis, sequence of events testing. Qualified as an Expert Witness in the Ontario Superior Courts of Justice.

University of Waterloo

Instructor and Research Engineer, Mechanical and Mechatronics Engineering Department, 2007 to 2009

Instructor for a core undergraduate engineering course – ME230: Control of properties of materials. Executed various research projects (Al automotive brazing; CVD catheter tube development, Ni, Ti, Cu sintering studies; Cu-steel brazing, heat treating and mechanical testing, Cu/Ni plating). Designed and implemented new lab instruments for improved gas purity, delivery, temperature measurement, and IT control systems. Helped train and supervise graduate students and delivered safety and WHMIS training to engineering students.

Variable Melting Point Technologies Inc.

Contract Materials Researcher/Consultant, 2006 to 2009

Consulting on product developed of new powder-based lead-free solders aimed at micro-electronic SMT soldering applications.

University of Waterloo

Research Assistant: Mechanical Engineering Department, 2002 to 2007

Research and development of novel variable melting point (VMP) Ni-Cu braze alloys by incorporating commercial powder metallurgy techniques and transient liquid phase sintering (TLPS) technology into modern furnace brazing processes.

Teaching Assistant: Mechanical Engineering Department, 2004 to 2006

Designed, implemented, and directed new lab experiments and projects in graduate and undergraduate level courses (Control of Properties of Materials, Experimental Methods in Materials Engineering). Lectured and set assignments and exams for a graduate level course. Developed new report writing guidelines now applied for co-op education program.

Toyota Motor Mfg. Canada, Cambridge, ON

Engineering Specialist, 2000

Applied concepts of the lean Toyota Production System (i.e., JIT, Kaizen, Kanban, etc.) to assess and improve automotive manufacturing processes in the welding and plastic molding plants. Managed concurrent projects aimed at cost reductions safety, quality, process workflow, and ergonomic improvements for manual and automated robotic processes. Performed root-cause failure investigations, life-cycle experiments, and cost reduction analysis of new Ti-coated resistance spot welding tips. Performed destructive and non-destructive testing of welds and automotive parts. Designed and tested a successful robotic back-up process for a critical, automated body welding/framing station.

Aluminerie Alouette, Sept-Îles, QC

Project Engineer, May to September 1999

Designed a coke-unloading system for ships delivering raw materials for aluminum casting production. Secondary projects included: noise and vibration analysis of large hydraulic pump systems, CAD design of a lifting hook, and reverse engineering of aluminum melt extraction crane arms for significant cost savings.

Husky Injection Molding Systems, Bolton, ON

Mechanical Designer, January to December 1998

2D/3D CAD design and drafting of new injection molding machine components. In-field testing of new clamping system tie-bar lubricants for improved cycle time and durability.

Iron Ore Company of Canada (IOC)

Track Maintenance Team, Summer 1996 and 1997

Repair and preventative maintenance of iron ore mining company railway and equipment.

Canadian Armed Forces

Royal Military College (RMC) Officer Cadet, May 1995 to May 1996

Regular Officer Training Program (ROTP).

research activities

MEA Forensic (2011-2018)

Thermal and microstructural characterization of power metallurgy and brazing processes for automotive alloys.
Damage characterization for vehicles involved in rollover collisions.
Wheel separation mechanisms and fastener torque audit techniques.

University of Waterloo (2002-2009)

Executed various research projects (Aluminum automotive brazing; CVD catheter tube development, Ni, Ti, Cu powder metallurgy sintering studies; Cu-steel brazing, steel heat treating, and mechanical testing) and hands-on use of numerous analytical tools:

metallographic and fractographic analysis (SEM/EDS, optical, XRF)
x-ray diffraction and neutron diffraction at a nuclear reactor facility
mechanical testing (tensile, impact, hardness)
laser flash thermal diffusivity analysis (LFA)
quantitative thermal analysis (DSC, TGA, dilatometry)
diffusion-based modelling

awards

Natural Sciences & Eng. Research Council (NSERC) PhD Scholarship PGSD 3 (2004-07).

University of Waterloo President's Graduate Scholarship (2004-07).

University of Waterloo Engineering Graduate Studies Scholarship (2002-06).

Materials and Manufacturing Ontario (MMO) MAsc Scholarship (2002- 04).

Ontario Graduate Scholarship (OGS) – offer/award declined (2004).

Teaching Assistant Award (Winter 2004, Fall 2006).

1st prize ASM International undergraduate research presentation (March 2001).

Natural Sciences & Engineering Research Council (NSERC) undergraduate scholarship (May 2000).

Robert Hewitt bursary for high academic achievement from Hewitt Equipment Ltd. (1997, 2001).

Award for highest academic achievement and athletics in Cégep science program (1997).

publications

On the directionality of rollover damage and abrasions

lectures & presentations

May 10, 2017 – Speaker, TSSA Fuels Seminar – Failure Analysis Methods, Toronto, ON.

April 28, 2015 – Speaker, Health & Safety Conference, Partners in Prevention 2015, Toronto, ON.

November 2014 – Guest Panelist, Fuel Oil Escape Seminar: Recent Court Decisions, Toronto, ON.

November 2014 – Guest Lecture, Forensic Engineering and Failure Analysis Course, University of Toronto, Department of Materials Science and Engineering.

March 2014 – Guest Lecture, Forensic Engineering and Failure Analysis Course, University of Toronto, Department of Materials Science and Engineering.

training and professional development

Aug. 4, 2017 – Working at Heights: Fundamentals of Fall Prevention, Infrastructure Health and Safety Association (IHSA), Toronto, ON.

October 10-12, 2016 – Plastic Part Failure: Analysis, Design & Prevention, University of Wisconsin School of Continuing Education,

Milwaukee, WI.

July 6, 2015 – Building Code Overview, Ontario Society of Professional Engineers, Mississauga, ON.

April 21-23, 2015 – Society of Automotive Engineers (SAE) World Congress, Detroit, MI.

April 9, 2014 – Canadian Association of Fire Investigators, CAFI, Seminar, Toronto, ON, Canada.

November 17-19, 2013 – Canadian Association of Fire Investigators, CAFI, Symposium, Niagara Falls, ON, Canada.

Sept. 2013 – Flexible Connector Failure Seminar, National Association of Subrogation Professionals, NASP.

March-April 2013 – Confined Space Entry and WHMIS training course for tunnel boring construction site, Toronto, ON.

Nov. 2012 – Canadian Association of Fire Investigators, CAFI, Seminar, Mississauga, ON, Canada.

July 2012 – Electrical Arcing and Fires Seminar, National Association of Subrogation Professionals, NASP.

October 2010 – Canadian National Advanced Fire, Arson and Explosion Investigation Training Program, NAFI, Markham, ON.

April 2010 – DRI Product Liability Conference, Las Vegas, NV.

July 2009 – Struers Metallographic Workshop, Waterloo, Ontario, Canada. July, 2009.

July 25-29, 2009 – American Crystallographic Association conference (ACA 2009), Toronto, ON, Canada.

May 3-7, 2009 – International Conference on Neutron Scattering (ICNS 2009), Knoxville, TN, USA.

Nov. 16-20. 2008 – International Conference on Sintering, La Jolla, CA, USA.

Sept. 11-13, 2008 – Argonne National Labs Postdoctoral Symposium, Chicago, IL, USA.

Aug. 23-27, 2008 – Conference of Metallurgists (COM2008), Winnipeg, AB, Canada.

Nov. 11-14, 2007 – Brazing and Soldering symposium/program, FABTECH International & AWS, Chicago, IL, USA.

Aug. 2007 – Netzsch Laser Flash Thermal Diffusivity training workshop, Waterloo, ON, Canada.

June 2007 – 19th Canadian Materials Science Conference (CMSC), Hamilton, ON, Canada.

April 23-26, 2006 – International Brazing & Soldering Conference (IBSC), ASM International, San Antonio, TX, USA.

June 2006 -18th Canadian Materials Science Conference (CMSC), Montreal, QC, Canada.

June 2004 – Material & Manufacturing Ontario (MMO) Partnerships meeting, Toronto, ON, Canada.

June 2003 – 15th Canadian Materials Science Conference (CMSC), Halifax, ON, Canada.

June 2003 – Material & Manufacturing Ontario (MMO) Partnerships meeting, ON, Canada.

2002 11th Int. Symp. of Processing and Fabrication of Advanced Materials, ASM International, Columbus, OH, USA.

June 2002 – Material & Manufacturing Ontario (MMO) Partnerships meeting, ON, Canada.