CURRICULUM VITAE

Troy J. Eggum, Ph.D., P.Eng., CIP, CFEI *(he/him)*

(403) 208-4545 | teggum@30fe.com

700 2nd Street SW, 19th Floor, Calgary, AB T2P 2W2

EXPERT SUMMARY

Dr. Troy Eggum is Practice Lead of the Energy & Power group at 30 Forensic Engineering. Prior to launching the Energy & Power practice in 2024, Dr. Eggum was a Senior Associate with the firm's Materials & Product Failure group. He holds a Doctorate in Mechanical Engineering from the Schulich School of Engineering at the University of Calgary, where he specialized in corrosion, hydrogen damage mechanisms, and material properties of pipeline steels. Troy has 30 years of industry experience including six as an Energy Adjuster, specializing in large and complex losses for Canadian, US, and Lloyd's insurance markets and international reinsurance markets. At 30 Forensic Engineering, Troy investigates product, equipment, and system failures in industrial and consumer settings, with deep experience in the oil and gas, energy, mining industries, fire protection systems, and building mechanical systems.

SPECIALIZED PROFESSIONAL COMPETENCIES

- Mechanical Failure Analysis
- Oil and Gas Pipeline Failures and Pollution Events
- Corrosion, Erosion, Microbially Influenced Corrosion, and Hydrogen Failures
- Products and Completed Operations Hazard
- Design, Construction, Maintenance, and Operation of Pipelines
- Upstream Oil and Gas Production and Compression Facilities Equipment Failures and Fires
- Upgrader and Refinery Failures in Vessels, Process Piping, Tankage
- Large Pipeline Energy Transportation Systems
- Mobile Equipment Service and Transportation-Related Failures
- Mining Equipment including Haulers and Shovels
- Agriculture Industry Mobile Machinery and Grain Handling and Processing Facilities
- Gas Compression and Separation Equipment Failures
- Fiber-Reinforced Glass and Composite Pipe Failures
- Downhole Corrosion and Material Failures
- Offshore and Onshore Wind Turbine Generators Failures – Shaft, Hub, and Blade Bearings, Gearbox, and Electrical Arcing Failures

- Effects of Climate-related Changes in Ocean Salinity and pH on Corrosion of Offshore Wind Turbine Generator Support Structures
- Offshore Marine Structures, Vessels, and Submerged Equipment Failures
- Fractography and Fracture Surface Analysis
- Metallurgical Analysis of Microstructure and Mechanical Properties of Materials
- Building and industrial Mechanical and HVAC Systems
- Fire and Explosion Investigations
- Fire Protection Systems
- Workplace Injuries associated with Equipment Failures
- Qualified Expert Witness for the Supreme Court of British Columbia, Court of King's Bench Alberta, and the Supreme Court of Yukon

ACADEMIC BACKGROUND

Doctor of Philosophy (Mechanical Engineering), University of Calgary, Calgary, AB, 2013

Master of Science (Mechanical Engineering), University of Calgary, Calgary, AB, 2007

Bachelor of Science (Mechanical Engineering), University of Calgary, Calgary, AB, 2002

Bachelor of Science (Chemistry), University of Saskatchewan, Saskatoon, SK, 1997

ADDITIONAL COURSES

NFPA 921 Certified Fire and Explosion Investigator (CFEI), 2021

Chartered Insurance Professional (CIP), 2019

Principles of Failure Analysis, ASM International, 2016

How to Organize and Run a Failure Investigation, ASM International, 2015

Basic Corrosion, NACE International, 2014

Piping Design Course, Society for Piping Engineers and Designers, 2004

Advanced Certificate in Psychology, University of Saskatchewan, 1999

PROFESSIONAL EXPERIENCE

30 Forensic Engineering

Practice Lead, Energy & Power
2024 – Present, Calgary, AB

- Lead investigations into Energy Industry failures, in oil and gas, coal mining, and power generation.

- Energy transportation and pipeline system failures leading to pollution events.
- Onshore focus but also experience with offshore environments and equipment.
- Coordinate and liaise with other specialist experts in geotechnical, construction, structural, fire & explosion, and health & safety.

Senior Associate, Materials & Product Failure
2021 – Present, Calgary, AB

- Analysis of industrial systems, operations, processes, and responsibilities in complex multiparty environments including design, construction, operation, and maintenance.
- Analysis of physical failure mechanisms including metallurgical, corrosion, materials, and fracture.
- Experience in fire & explosion, fire protection systems, building mechanical and HVAC, workplace injuries and fatalities involving equipment.
- Qualified as an expert witness in the Supreme Court of British Columbia, Court of King's Bench Alberta, and the Supreme Court of Yukon.

AqualisBraemar

Senior Loss Adjuster
2015 – 2020, Calgary, AB

- Independent Loss Adjuster for national and international insurance claims in the energy industry.
- Performing cause investigation, policy and contract interpretation, adjustment of repair and remediation expenditures, and negotiation of final settlement.
- Liability, Property Damage, and Business Interruption claims successfully resolved include pipeline release and environmental pollution, upgrader and refinery fires and explosions, well blowouts, mobile and stationary equipment, mining equipment, course of construction.

Materials, Corrosion & Forensic Engineer
2015 – 2020, Calgary, AB

- Technical Specialist in Materials and Corrosion Engineering, and Failure analysis.
- Lead investigations, develop protocols for forensic analysis, and manage third party experts for large industrial losses, including formal and informal presentation of findings to insurance markets.
- Areas of expertise include; failure of pipelines, process piping, and equipment due to corrosion, materials, and mechanical failure modes; analysis of leak detection systems, process monitoring, as well as construction, maintenance, and operation history.

Broadsword Corrosion Engineering Ltd.

Senior Corrosion Engineer
2013 – 2014, Calgary, AB

- Corrosion Engineering Assessments using proprietary Internal Corrosion Prediction Modeling (ICPM) simulation software for projects in North America, South America, and India.
- Participate in research and continuous development of software suite.
- Team Lead, project participant, technical writing, and Project Management roles on problems related to corrosion in oil and gas and other industries.

- Developed mechanistic electrochemical and erosion-corrosion models of dissolved oxygen and chlorine corrosion in seawater injection systems for client project.
- Developed work plans, Design Basis Memoranda, and cost estimates in response to requests from industries including oil and gas, industrial food production, electricity transmission.
- Secured funding ($93K/yr) from federal government agency (NRC IRAP) for a research project related to determination of microbially influenced corrosion rates (MIC).

Pipeline Engineering Centre, University of Calgary

Materials/Corrosion Engineer
2007 – 2013, Calgary, AB

- Researching hydrogen diffusion in steel, the effect of hydrogen on material properties, and hydrogen's role in a pipeline stress corrosion cracking failure.
- Participating in industry conferences: International Pipeline Conference, NEB Forum, Pipeline Integrity Management Seminar, National Association of Corrosion Engineers.

Mount Royal University, Faculty of Science and Technology, Engineering Transfer Program

Sessional Instructor
2010, 2011, 2012, Calgary, AB

- Instructor for Vector Mechanics course (Engineering Statics). Prepare and deliver lectures and tutorials to first-year engineering transfer students.
- Responsible for preparation and marking of assignments, quizzes, midterms, final exam.
- Instructor for Design Methodology, an experiential/group learning course. Responsible for preparation of lecture materials, assignments, and evaluation.

Fluor Canada

Quality Assurance Engineer
2003 – 2003, Calgary, AB

- Quality assurance and database management of Construction Work Packages at industry leading engineering design firm.

Pipe Stress Engineer
2001, 2002, Calgary, AB

- Stress analysis of refinery piping using manual calculations and AutoPipe software to meet ASME B31.3 and Section VIII codes, considering thermal expansion, dead & live weight, upset conditions, nozzle loads.
- Liaising with Piping Designers, Rotating Equipment Engineers, Vessels Engineers.
- Syncrude Upgrader Expansion One (UE-1), 2002.
- Shell Athabasca Oil Sands Development Project, 2001.

Polytech Products, Inc.

Design Technician
2000 – 2000, Calgary, AB

- Perform heat loss analysis, prepare material list and quote, design heating system.
- Used AutoCAD to prepare in-floor piping layout for mechanical contractors.
- Redesign product technical and specifications manual and draw brass fittings using AutoCAD to prepare technical manual.

Maxxam Analytics

Lab Technician
1999 – 1999, Calgary, AB

- Environmental Division, May 1999 – December 1999 – Trace organics, metals, and nitrogen analysis in a contract environmental lab.
- Petrel Coretech Division, January 1999 – April 1999 – Supervise crew of six technicians performing constituent analyses on oil sands samples.

Weyerhaeuser Canada, Prince Albert Pulp and Paper

Paper Technician
2003 – 2003, Prince Albert, SK

- Calibrate on-line testing equipment, effluent analysis, QA/QC.

Saskatchewan Oil and Gas Company

Battery Operator
1992 – 1992, Estevan District, SK

- Field Operations. Monitor and maintain liquids production equipment and output.

PanCanadian Petroleum Limited

Plant Operator
1991 – 1991, Weyburn Field, SK

- Plant Operations at an Enhanced Oil Recovery and Waterflood Facility.

PROFESSIONAL SOCIETIES AND ASSOCIATIONS

- Association of Professional Engineers and Geoscientists of Alberta (APEGA)
- APEGA Practice Standards Subcommittee, updating the Guideline for Professional Members as Expert Witnesses, 2023-2024
- Association of Professional Engineers and Geoscientists of Saskatchewan (APEGS)
- Engineers and Geoscientists of British Columbia (EGBC)
- Southern Alberta Risk and Insurance Management Society (SARIMS)
- National Association of Corrosion Engineers (NACE International)

- American Society for Metals (ASM International)
- National Association of Fire Investigators (NAFI)

AWARDS AND ACHIEVEMENTS

- Ron Curle Scholarship in Pipeline Engineering, University of Calgary, 2013
- Graduate Travel Award – Research Services, University of Calgary, 2012
- Queen Elizabeth II Graduate Scholarship, University of Calgary, 2010
- Queen Elizabeth II Graduate Scholarship, University of Calgary, 2009
- Mechanical and Manufacturing Engineering Graduate Scholarship, University of Calgary, 2009
- Alberta Graduate Citizenship Award, University of Calgary, 2009
- Queen Elizabeth II Graduate Scholarship, University of Calgary, 2008
- Graduate Travel Award – Research Services, University of Calgary, 2006
- Undergraduate Scholarship, Faculty of Engineering, University of Calgary, 2001
- NSERC Undergraduate Award, National Science and Engineering Research Council grant for research in Material Engineering (declined), 2001
- Pearson Memorial Award, Faculty of Engineering, University of Calgary, 2000

PUBLICATIONS

- Eggum, T., Tajallipour, N., Arumugam, S., Teevens, P., “Comprehensive Approach to Oxygen Corrosion Analysis of Water Injection Systems,” NACE CORROION 2015. Dallas, USA. March 15-19, 2015.
- Arumugam, S., Tajallipour, N., Eggum, T., Teevens, P., “Application of a Thermodynamic Model to Predict the Solubility of CO_2 in Pure H_2O and in Salt Solutions and Corrosion Prediction of Carbon Steel Under Supercritical Conditions,” NACE CORROSION 2015. Dallas, USA, March 15-19, 2015.
- Eggum, T. J., 2013, “Hydrogen in Low Carbon Steel: Diffusion, Effect on Material Properties, and an Examination of Hydrogen’s Role in the Initiation of Stress Corrosion Cracking in a Failed Pipeline,” Ph. D. Thesis, University of Calgary, Calgary, Canada.
- Eggum, T. J. and Hunter, C. J., 2008, “Development and Validation of a System for the Growth of Cells and Tissues Under Intermittent Hydrostatic Pressure” Journal of Biomechanical Engineering, 130, 064501 (6 pages).
- Eggum, T. J., 2007, “Development and Validation of a Hydrostatic Pressure Bioreactor for Cell Culture: Applications in Intervertebral Disc and Mesenchymal Stem Cells,” Unpublished master’s thesis, University of Calgary, Calgary, Canada.
- Eggum, T. J., Hunter, C. J., 2006, “’Educated’ Cells for IVD Therapy: Differential Response of MSCS to Oxygen, Glucose, and Notochord Conditioned Medium,” 52nd Annual Meeting of the Orthopaedic Research Society, Chicago, USA.

SPEAKING ENGAGEMENTS

- Various and numerous presentations, accredited by the Alberta Insurance Council for continuing education credit in the areas of high-rise building water losses, workplace injury events, energy industry losses, the role of forensic engineers and expert witnesses. 2021 – present.
- Various and numerous presentations, accredited by the Alberta Insurance Council for continuing education credit in the areas of; pipeline losses, corrosion related failures, surface facility losses. 2015 – 2019.
- "Corrosion Demystified – An Adjuster's Perspective." Invited Lecture, Miller Insurance. London, UK. November 8, 2017.
- "Comprehensive Approach to Oxygen Corrosion Analysis of Water Injection Systems." NACE CORROSION 2015. Dallas, Texas, USA. March 18, 2015.
- "Hydrogen Concentration Profiles in Steel Using Mercury Eudiometry Technique." NACE Northern Area Western Conference 2012. Anchorage, Alaska, USA. February 7, 2012.
- "Mapping Hydrogen Diffusion in 1018 Steel by Mercury Eudiometry." NACE CORROSION 2012. Salt Lake City, USA. March 11-15, 2012. Conference paper accepted but session cancelled.
- "Spinal Tissue Engineering: Experimental Design, Engineering Design, and Validation." University of Calgary senior undergraduate design engineering students. Calgary, Canada. March 13, 2008.
- "Measurement of Hydrogen Concentration in the Plastic Zone Near a Crack Tip and Along the Fracture Surface for Low Carbon Steel." 4th Annual Schulich School of Engineering Graduate Student Research Conference. Calgary, Canada. May 1, 2007.
- "Engineering Design and Experimental Design in Tissue Engineering," Masters of Biomedical Technology Program Graduate Students. Calgary, Canada. October 18, 2006.
- "Development of a Novel Hydrostatic Pressure Bioreactor for use in Tissue Engineering Approaches to the Intervertebral Disc." 3rd Annual Schulich School of Engineering Graduate Student Research Conference. Calgary, Canada. May 5, 2006.
- "'Educated' Cells for IVD Therapy: Differential Response of MSCS to Oxygen, Glucose, and Notochordal Conditioned Medium." 6th Annual Alberta Biomedical Engineering Conference. Banff, Canada. October 20, 2005.