

Exponent®
Engineering & Scientific Consulting

Julian Hallai, Ph.D., P.E., CMarEng

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Professional Profile

Julian Hallai, Ph.D., P.E., CMarEng, is a senior managing engineer in Exponent's Mechanical Engineering practice with over 20 years of experience in pipeline and tubular mechanics, offshore structures, naval architecture, maritime systems, oilfield engineering, and structural integrity. He advises law firms, insurers, energy companies, project owners, and other clients on forensic engineering; failure investigations; design, engineering, EPC/EPCI, and construction matters; personal injury matters; technology development; intellectual property matters; and dispute resolution.

Dr. Hallai's technical experience spans onshore and offshore pipelines, risers, piping, casing and production tubing, ships and floating structures, mooring systems, offshore platforms and renewable-energy infrastructure, drilling and production systems, pressure-containing equipment, storage tanks, and industrial, commercial, residential, and municipal mechanical systems. He has particular depth in maritime and offshore engineering, pipelines and tubular systems, and other mechanical and structural systems.

His technical background spans research, design, technology development, integrity assessment, experimental and computational mechanics, and forensic investigation, providing continuity from fundamental mechanics and experimental work through real-world engineering failure investigations and disputes. He has particular experience supporting cross-border disputes and investigations, including matters involving Latin America, and can perform work in English, Spanish, and Portuguese.

Before joining Exponent, Dr. Hallai led research and technology development programs at ExxonMobil and worked as a pipelines and risers engineer for Petrobras and Intecsea. He is a Chartered Marine Engineer (CMarEng) and a Board-Certified Ocean Engineer (BC.OE) through the American Society of Civil Engineers (ASCE). He holds professional engineering licenses in California, Hawaii, Louisiana, New York, Rhode Island, Texas, and Washington. His areas of licensure include mechanical engineering, naval architecture and marine engineering, and petroleum engineering.

Maritime, Naval Architecture & Offshore Engineering

Dr. Hallai provides naval architecture, structural integrity consulting, design review, forensic engineering, and failure investigation services for ships and vessels, floating production systems, mooring systems, offshore platforms, waterfront structures, subsea cables and infrastructure, and other floating and offshore structures. His work encompasses structural analysis under operating and extreme loading conditions — including fracture, fatigue, buckling, and collapse — as well as vessel stability, marine hydrodynamics, mooring response, structural integrity, marine casualty reconstruction, and incident causation. He also advises clients on offshore wind, floating renewable-energy facilities, offshore substations, and HVDC converter platforms, applying the naval architecture, structural mechanics,

hydrodynamics, and offshore engineering principles to design review, integrity assessment, construction issues, and failure investigation of emerging energy infrastructure.

His background in mooring systems extends to graduate research on mooring-line dynamics and damping, coupled vessel-riser-mooring analysis, mooring-system design, and planning and execution of offshore model-test programs. His work has included numerical simulation and physical testing of mooring and riser systems under complex environmental and operational loading. His master's research specifically addressed mooring-line damping and dynamics of moored floating structures. His subsequent offshore R&D included mooring design, disconnection analysis, and model testing.

Dr. Hallai's analytical capabilities include nonlinear finite element analysis (FEA), structural mechanics, dynamic mooring analysis, and experimental methods ranging from standard laboratory testing to novel small-scale and full-scale structural testing. His computational work includes model development, calibration, verification and validation, sensitivity and parametric analysis, and comparison of numerical predictions with experimental and field data. He has extensive experience applying codes and standards governing offshore structural design and integrity, including API, ASME, DNV, and ISO standards applicable to offshore structures, floating systems, pipelines, risers, and mechanical integrity.

Pipelines, Risers, Piping, Casing & Tubular Systems

Dr. Hallai has extensive experience in the mechanics, analysis, design, structural integrity, and failure investigation of tubular systems. His experience began as a pipeline and risers engineer with Intecsea and Petrobras, where he worked on pipeline analysis, design, installation, and project engineering before pursuing doctoral research in pipeline mechanics. His Ph.D. research combined laboratory experiments with nonlinear finite element analysis to study the bending, material response, instability, localization, and collapse behavior of steel tubes. His subsequent work has encompassed onshore and offshore pipelines, subsea pipelines and flowlines, marine and drilling risers, midstream pipeline networks, process and facility piping, municipal waterlines, natural-gas distribution and utility lines, casing, production tubing, and other downhole tubular systems.

He performs stress and structural analysis of pipelines, risers, piping, casing, tubing, and related tubular components subjected to internal and external pressure, axial loading, bending, thermal loading, cyclic loading, external loads, soil and support interaction, and combined loading. He evaluates failure modes including fracture, fatigue, buckling, collapse, burst, leakage, connection failure, corrosion and metal loss, pressure-related failure, and loss of structural integrity.

Dr. Hallai's well-tubular experience spans casing, production tubing, and related downhole tubular systems used in oil and gas production, carbon-dioxide injection, and underground natural-gas storage. His work includes evaluation of tubing and casing stresses, burst and collapse resistance, fatigue, connection behavior, thermal and pressure loading, bending, annulus-pressure behavior, and other well-integrity issues.

His pipeline forensic experience spans energy, municipal, and utility infrastructure. He has investigated failures involving onshore and offshore oil and gas pipelines, submerged municipal waterlines, gas lines affected during horizontal directional drilling (HDD) operations, and pressurized waterlines damaged during construction. His work also includes assessment of pipeline networks and evaluation of the effects of design, materials, fabrication, installation, operation, degradation, external loading, construction activity, and third-party damage on pipeline performance. His broader pipeline and riser experience includes high-strain pipeline behavior, reeling and liner installation, residual-stress effects, pipeline walking, geotechnically induced loading, damaged-pipeline rehabilitation and return-to-service, and life-extension assessment of flexible risers.

Dr. Hallai applies analytical, numerical, and experimental methods, including nonlinear FEA, fracture and fatigue mechanics, structural mechanics, thermal-fluid analysis, and laboratory testing, together with applicable API, ASME, DNV, ISO, and other industry codes and standards.

Oilfield Accidents, Pressure-Release Incidents & Personal Injury Investigation

Dr. Hallai supports attorneys, insurers, operators, and other clients in oilfield accidents and personal injury matters involving drilling rigs, drilling and production operations, oilfield equipment, tubulars, wellhead and well-control equipment, well-servicing and tubular-handling equipment, managed-pressure-drilling operations, pressurized equipment and systems, loss-of-containment events and sudden pressure-release incidents, as well as other mechanical and structural systems.

He performs root-cause analysis and accident reconstruction to establish engineering causation — identifying whether a failure originated in mechanical design, material condition, fabrication or manufacturing quality, installation, maintenance, operational practice, overpressure, pressure containment failure, stored-energy release, external loading, or a combination of factors. Dr. Hallai has served as an expert witness in personal injury and oilfield accident litigation, providing technically rigorous, defensible opinions on engineering causation and related technical issues.

His background includes eight years leading R&D programs at ExxonMobil, where he developed and validated engineering solutions for ultra-deepwater drilling and production systems operating under high pressure, high temperature, cyclic loading, and corrosive sour-service conditions. This experience provides practical context for his investigations of drilling, production, well-control, tubular, pressure-containing, and other oilfield equipment incidents.

Engineering, EPC/EPCI & Construction Disputes, International Arbitration

Dr. Hallai serves as a technical expert in EPC (engineering, procurement, and construction), EPCI (engineering, procurement, construction, and installation), and engineering/construction disputes involving offshore, energy, marine, industrial, and other engineered facilities, including litigation and international arbitration proceedings. He evaluates technical disputes involving engineering design, procurement, fabrication, construction, installation, mechanical completion, commissioning, and operations.

His work addresses design-versus-construction issues, alleged design defects, fabrication and construction deficiencies, specification and drawing compliance, application of engineering codes and standards, interface responsibility, project execution, offshore logistics, remediation, delay-related technical issues, equipment failures, and allocation of technical responsibility among design, fabrication, installation, commissioning, and operational activities.

He has been retained in international arbitration matters and advises legal teams on the technical merits of complex offshore and energy project disputes. His work includes evaluating engineering evidence, testing technical allegations, identifying causation, and communicating complex engineering issues clearly and defensibly. These matters have proceeded before the International Chamber of Commerce (ICC), London Court of International Arbitration (LCIA), Singapore International Arbitration Center (SIAC), Asian International Arbitration Center (AIAC), and SCC Arbitration Institute, involving projects in Latin America, the North Sea, the United Kingdom, the Caspian region, and Southeast Asia.

Dr. Hallai conducts his work in English, Spanish, and Portuguese, including ICC proceedings involving Spanish-language submissions. His language capabilities allow him to work directly with clients, counsel, technical personnel, project records, and other source materials in multilingual cross-border disputes. His Latin American experience also includes prior technology-development work in Brazil, where he developed relationships with operators, universities, and suppliers and supported technical collaboration with Petrobras on offshore and riser technologies.

Mechanical Failure Analysis, Forensic Engineering, Structural Integrity & Fitness-for-Service

Dr. Hallai performs forensic engineering, mechanical failure analysis, structural integrity assessment, construction-defect evaluation, and fitness-for-service analysis across industrial, commercial, residential, municipal, and energy applications. His work involves pipes and piping systems, plumbing and fluid systems, flanges, fittings, valves, storage tanks, aboveground storage tanks (ASTs), process tanks, pressure vessels, pressure-containing equipment, pumps, supports, vertical-transportation and elevator equipment, hydraulic systems, building and facility systems, and other mechanical and structural components.

He evaluates whether failures or performance problems arise from design, materials, manufacturing or fabrication, construction and installation, maintenance, operation, external damage, loading, securement, or combinations of these factors. He investigates failures involving fracture, fatigue, corrosion-related damage, buckling, collapse, tank and vessel shell failures, burst, leakage, and pressure-release events, loss of containment, vibration-induced damage, equipment malfunction, and installation deficiencies.

His sour-service experience includes evaluation of sulfide stress cracking (SSC), hydrogen-induced cracking (HIC), and stress-oriented hydrogen-induced cracking (SOHIC), including application of NACE MR0175/ISO 15156 requirements for materials selection and qualification in hydrogen sulfide-containing oil and gas environments. This work also builds on his prior research and patent work involving technologies for protecting pipelines and tubular systems against sour-service degradation and cracking. Earlier in his career, Dr. Hallai led a multi-year sour-service research program integrating high-pressure hydrogen sulfide testing, fracture-toughness assessment, mechanics and hydrogen-diffusion modeling, and full-scale validation to support qualification and integrity assessment of carbon-steel pipelines and tubulars.

His fitness-for-service (FFS) assessments follow API 579 and related standards to evaluate whether damaged or degraded equipment can safely remain in service, including equipment that is cracked, corroded, or otherwise compromised. His experimental and computational capabilities — including FEA-based stress analysis, fatigue and fracture mechanics, material characterization, laboratory testing, and model validation — allow him to reconstruct failure sequences and provide quantitative support for engineering opinions in both consulting and litigation contexts.

Mechanical Engineering, Marine & Energy Intellectual Property, Patent & Trade Secret Disputes

Dr. Hallai advises legal teams in patent litigation, post-grant proceedings, trade secret disputes, licensed-technology matters, and other intellectual-property disputes involving mechanical engineering, naval architecture, marine and offshore systems, engineered products, industrial equipment, structural systems, fluid and pressure systems, ships and floating structures, mooring systems, drilling systems, drilling automation, downhole tools, production equipment, pipelines and tubulars, risers, casing and tubing, subsea systems, offshore technology, wellhead and frac equipment, valves and pressure-containing equipment, electric hydraulic-fracturing systems, distributed-energy systems, thermal-management technologies, and related mechanical, marine, offshore, and energy technologies.

He has been retained as a technical expert in intellectual property matters and brings experience in mechanical engineering, naval architecture, research and development, product and technology development, experimental validation, failure analysis, and engineering analysis. His prior R&D leadership at a major operator and his experience as a named inventor on patents involving drilling risers and floating offshore structures, together with patent work involving pipeline, tubular, and sour-service technologies provide practical context for evaluating the development, operation, functionality, and technical evolution of complex engineered systems.

His work includes technical analysis of infringement and validity, prior art, claim interpretation, written-description and indefiniteness issues, motivation to combine, the knowledge and capabilities of a “person of ordinary skill in the art” (POSITA), trade secret identification and derivation, and reverse engineering.

He also applies experimental and computational methods, including full-scale testing, FEA, stress and fluid-flow analysis, and signal analysis, to evaluate claimed functionality and distinguish competing technical explanations.

His membership in the Houston Intellectual Property Law Association (HIPLA) reflects his sustained engagement with the IP legal community and his understanding of how technical expert opinions function in patent and trade secret proceedings.

Academic Credentials & Professional Honors

M.B.A., Business Administration, Quantic School of Business and Technology, 2022

Ph.D., Engineering Mechanics, University of Texas, Austin, 2011

M.S.E., Engineering Mechanics, University of Texas, Austin, 2008

M.S.E., Naval Architecture and Marine Engineering, University of São Paulo, 2003

B.S.E., Naval Architecture and Marine Engineering, University of São Paulo, 2000

Advanced Skills Milestone in Pipelines and Risers, ExxonMobil, 2018

OMAE Conference Appreciation Award, ASME, 2018

Max L. Williams Endowed Graduate Fellowship in Mechanics of Solids, Structures, and Materials, 2011

Roberto Rocca Education Program Fellowship, 2007

The University of Texas at Austin Graduate School Recruitment Fellowship, 2006

Brazilian Navy Award, 2000

Brazilian Society of Naval Engineering Award, 2000

Licenses and Certifications

Professional Engineer Mechanical, Alaska, #256728

Professional Engineer Mechanical, California, #43137

Professional Engineer, Hawaii, #22018

Professional Engineer Mechanical, Louisiana, #0049834

Professional Engineer, New York, #111920

Professional Engineer Mechanical, Rhode Island, #PE.0015923

Professional Engineer Naval Architecture/Marine Engineering, Texas, #118871

Professional Engineer Mechanical, Texas, #118871

Professional Engineer Petroleum, Texas, #118871

Professional Engineer Mechanical, Washington, #26027478

Project Management Professional (PMP)

ASCE Board-Certified Ocean Engineer (BC.OE)

Academic Appointments

Lecturer of Subsea Engineering, Department of Mechanical Engineering, Cullen College of Engineering, University of Houston, since 2021

Prior Experience

R&D Program Lead, ExxonMobil, 2012-2020

Graduate Researcher & Adjunct Faculty, The University of Texas at Austin, 2006-2011

Pipelines and Risers Engineer, Petrobras, 2004-2006

Pipelines and Risers Engineer, Intecsea, 2003-2004

Undergraduate and Graduate Researcher, University of São Paulo, 1999-2003

Professional Affiliations

American Society of Mechanical Engineers (ASME)

- - Member of VVUQ 10 Subcommittee (Verification, Validation, and Uncertainty Quantification in Computational Solid Mechanics)
- - Scientific Committee Member and Organizer of the International Conference on Ocean, Offshore & Arctic Engineering (OMAE)

Society of Petroleum Engineers (SPE)

Society of Naval Architects and Marine Engineers (SNAME)

Houston Intellectual Property Law Association (HIPLA)

Languages

Hungarian

Italian

Portuguese

Spanish

Patents

US Patent 9,670,740: Drilling Riser with Distributed Buoyancy, June 2017 (with Fenz DM)

CA Patent 2977364C: Drilling Riser with Distributed Buoyancy, February 2019 (with Fenz DM)

US Patent 10,065,712: Floating Modular Protective Harbor Structure and Method of Seasonal Service Extension of Offshore Vessels in Ice-Prone Environments, September 2018 (with Krstulovic-Opara N)

CA Patent 3046622C: Floating Modular Protective Harbor Structure and Method of Seasonal Service Extension of Offshore Vessels in Ice-Prone Environments, February 2020 (with Krstulovic-Opara N)

PCT Patent Application WO2022/150241 A1: Process for protecting carbon steel pipe from sulfide stress cracking in severe sour service environments, Filed Jan 7, 2021 (with Baker DA, Gordon PA, Jun, HJ, Ozekcin, A, Srivastava, V, Thirumalai, NS)

Publications

Hilbert, LB, Hallai, JF. "Natural Gas Production in Extreme Weather," Pipeline & Gas Journal, June 2021; Vol. 248, No. 6.

Hong JK, Brongers M, Kalyanam S, Hioe Y, Wilkowski G, Zeng Y, Hallai, JF. "Flaw Design for d-c EP Monitoring of Crack Initiation and Growth During Full-Size Pipe Experiments," ASME 2020 Pressure Vessels & Piping Conference, PVP2020-21579, Minneapolis, MN, July 19-24, 2020.

Neeraj T, Srivastava V, Hallai JF, Ma N, Sarosi P, Jun H, Baker D. Hydrogen Permeation, Absorption and Trapping in Carbon Steels: A Comparison of Line Pipe and OCTG Steels. The Twenty-ninth International Ocean and Polar Engineering Conference, Honolulu, Hawaii, June 16-21, 2019.

Liu Y, Kyriakides S, Hallai JF. "Reeling of Pipe with Lüders Bands," International Journal of Solids and Structures 2015; 72: 11-25.

Srivastava V, Hallai JF, Campbell B, Kokkinis T. Dynamic Response of Submerged Buoys Disconnected at Large Vessel Offsets. Arctic Technology Conference, OTC24563, Houston, Texas, February 10-12, 2014.

Hallai JF, Kyriakides S. "Underlying Material Response for Lüders-Like Instabilities," International Journal of Plasticity 2013; 47: 1-12.

Hallai JF, Kyriakides S. On the Bending of Tubes with Lüders Bands: Influence of Geometric and Material Parameters. Proc. International Conference on Ocean, Offshore and Arctic Engineering, OMAE2012-83604, Rio de Janeiro, Brazil, July 1-6, 2012.

Hallai JF, Kyriakides S. "On the Effect of Lüders Bands on the Bending of Steel Tubes. Part I: Experiments," International Journal of Solids and Structures 2011; 48: 3275-3284.

Hallai JF, Kyriakides S. "On the Effect of Lüders Bands on the Bending of Steel Tubes. Part II: Analysis," International Journal of Solids and Structures 2011; 48: 3285-3298.

Hallai JF, Kyriakides S. Effect of Lüders Bands on the Bending Capacity of Steel Tubes. Proc. International Conference on Ocean, Offshore and Arctic Engineering, OMAE2010-20982, Shanghai, China, June 6-11, 2010.

Hallai JF, Augusto OB. Mooring Line Damping. Proc. Pan-American Congress of Naval Engineering, Maritime Transportation and Port Engineering, IPEN CT7-23, Guayaquil, Ecuador, October 24-28, 2005.

Hallai JF. Influence of Soil Properties on the Behavior of Heated On Bottom Pipelines. Proc. Rio Pipeline Conference & Exposition, IBP1071_05, Rio de Janeiro, Brazil, October 17-19, 2005.

Azevedo FB, Solano RF, Hallai JF, Bomfimsilva CT. "Final Design and Installation Constraints of Shallow

Water Oil Pipelines at the Capixaba North Terminal Offshore Brazil," Proc. International Conference on Ocean, Offshore and Arctic Engineering, OMAE2005-67400, Halkidiki, Greece, June 6-11, 2005.

Presentations

Sobotka J, Popelar C, Hickey F, Hallai JF, Zeng, Y. A New Test Specimen to Determine Environmentally-Assisted Cracking Threshold. The Minerals, Metals & Materials Society (TMS) 2022 Annual Meeting & Exhibition, Anaheim, California, February 27-March 3, 2022. (Submitted).

Hudson PJ, Hallai JF. Passing Vessels & Bank Effect: A Naval Architecture Perspective. Crescent River Port Pilots' Association, New Orleans, Louisiana, June 22-24, 2021.

Hallai JF, Kyriakides S. Determination of the Material Response for Lüders-like Instabilities. ASME 2013 International Mechanical Engineering Congress & Exposition, IMECE2013-66901, San Diego, California, November 15-21, 2013.

Hallai JF, Kyriakides S. On the Modeling of the Interaction of Lüders Bands with Structural Instabilities of Steel Tubes Under Bending. ASME Applied Mechanics and Materials Conference McMat-2011, McMat2011-4105, Chicago, Illinois, May 31-June 2, 2011.

Hallai JF, Kyriakides S. Material and Structural Instabilities in Tubes with Lüders Bands under Bending. Kyriakides-Liechti Symposium: Advances in Solid and Structural Mechanics, In celebration of the 60th Birthdays of Stelios Kyriakides and Kenneth M. Liechti, Austin, Texas, May 13-14, 2011.

Hallai JF, Kyriakides S. Inelastic Bending and Collapse of Tubes with Lüders Bands. Society of Engineering Science 47th Annual Technical Meeting, 4-8-1-2, Ames, Iowa, October 4-6, 2010.

Hallai JF, Kyriakides S. Effect of Lüders Bands on the Response and Stability of Steel Tubes under Bending. 16th U.S. National Congress of Theoretical and Applied Mechanics, USNCTAM2010-461, State College, Pennsylvania, June 27-July 2, 2010.

Kyriakides S, Hallai JF, Ok A. The Effect of Lüders Bands on Localization and Propagation of Curvature of Steel Tubes Under Pure Bending. 28th International Conference on Ocean, Offshore and Arctic Engineering, OMAE2009-79755, Honolulu, Hawaii, May 31-June 5, 2009.

Project Experience

Maritime, Naval Architecture & Offshore Engineering

- Reconstructed a marine anchor-drag incident involving subsea infrastructure, using vessel-position data, anchor-chain dynamics, seabed interaction, and numerical simulation to evaluate vessel, anchor, and pipeline behavior and assess potential damage mechanisms.
- Analyzed vessel hydrodynamic interaction and passing-ship effects in restricted waterways, quantifying surge, sway, and yaw loads on moored vessels and waterfront facilities and evaluating squat, bank effect, under-keel clearance, speed, and separation distance.
- Evaluated offshore fixed-foundation installation performance for a utility-scale offshore wind project, integrating installation records, geophysical interpretation, published research, and nonlinear finite element analysis to assess monopile-soil interaction, installation anomalies, plastic deformation, and foundation suitability for long-term service.
- Performed structural and fatigue assessments of a mobile offshore production unit, evaluating offshore structural integrity, fatigue performance, transportation loading, operational

environmental loading, inspection programs, and repair feasibility associated with cracking of a primary structural component.

- Evaluated vessel routing, metocean conditions, transit performance, and fuel-consumption impacts in a maritime commercial dispute, integrating AIS tracking data, weather conditions, vessel draft, speed, and voyage performance.
- Investigated a high-speed personal-watercraft collision resulting in catastrophic injuries, evaluating vessel operation, navigation practices, right-of-way considerations, operator actions, and accident reconstruction to assess causation and contributing factors.
- Evaluated historical vessel systems and marine-equipment installations in a maritime exposure investigation, analyzing vessel construction practices, propulsion and auxiliary systems, maintenance activities, and marine-pump applications across commercial fleets.
- Investigated the performance and failure of a large pile-supported waterfront marine structure, evaluating wave loading, pile behavior, dynamic response, resonance potential, fatigue mechanisms, metocean design assumptions, and long-term service life of a public marine facility.
- Led analysis and development of Arctic floating-drilling systems, including coupled drilling-vessel, riser, and mooring simulations; shallow-water mooring-system design; emergency and planned disconnection scenarios; and physical model-test planning and execution for buoy and riser systems.

Pipelines, Risers, Piping, Casing & Tubular Systems

- Developed and validated nonlinear finite element models of well tubular systems, incorporating wellbore geometry, installation history, pressure, temperature, gravity, buoyancy, and contact effects to evaluate stress, strain, and structural integrity under operating conditions.
- Performed fracture-mechanics and remaining-strength assessments of tubular systems, applying API 579 methodologies, material-toughness characterization, digitized crack-path reconstruction, and stress-intensity-factor calculations to evaluate fracture behavior and structural capacity.
- Evaluated corrosion damage and remaining pressure capacity in pipelines, applying B31G, Modified B31G, and Effective Area methodologies to assess irregular metal-loss defects, microbially influenced corrosion, defect growth, and predicted failure pressure.
- Performed thermal, pressure, and structural assessments of insulated hydrocarbon pipelines, evaluating restrained, unrestrained, and partially restrained thermal expansion together with resulting forces, stresses, strains, displacements, and coating and insulation interactions.
- Performed stress, fracture, and fatigue analyses of corrosion-resistant production tubing for carbon dioxide injection wells, evaluating hundreds of pressure and temperature combinations with gravity, buoyancy, hydrostatic, and thermal loading against screening criteria for yielding, fracture, and fatigue.
- Developed and validated thermal-fluid models for annulus-pressure buildup in underground natural-gas storage wells, integrating transient heat transfer, geothermal gradients, thermal expansion, injection and withdrawal cycles, and measured casing-pressure histories across multiple wells.
- Directed development of a three-dimensional geomechanical finite element model for an underground natural gas storage facility, evaluating cavern interaction, salt creep, pillar stability, casing strains, pressure cycling, cavern closure, and long-term integrity of solution-mined storage caverns.

- Developed a risk-based methodology for post-earthquake pipeline assessment, evaluating transmission-pipeline capacity, pressure utilization, material characteristics, construction attributes, inspection data, and seismic loading criteria to support integrity-management and emergency-response decisions.
- Investigated the failure of a large-diameter submerged water-transmission pipeline, evaluating pipe-joint behavior, support-system design, pressure-thrust loading, hydraulic transients, lateral stability, and failure mechanisms against applicable industry standards.
- Investigated a municipal waterline pressure-release incident during pipeline tie-in operations, evaluating pipeline design, pressure-testing procedures, trapped-air mechanisms, valve configurations, air-relief and flushing provisions, construction sequencing, and engineering controls.
- Investigated a natural-gas release, fire, and explosion associated with underground utility and horizontal directional drilling (HDD) construction, evaluating directional-drilling operations, utility-locate practices, damage-prevention requirements, excavation procedures, contractor oversight, emergency planning, and pipeline-operator responsibilities.
- Evaluated offshore natural-gas pipeline integrity and pigging operations following a rupture incident, reviewing inline-inspection programs, stuck-pig scenarios, operating procedures, pressure management, emergency-response plans, operator qualification, and applicable regulatory requirements.
- Performed failure analysis of production tubular systems, evaluating tubing performance, mechanical integrity, operating loads, failure mechanisms, and remediation alternatives for downhole completion equipment.
- Investigated a casing leak and subsurface gas-release event at a horizontal shale well, performing site inspection, evidence documentation, casing evaluation, corrosion assessment, and failure-mechanism analysis to evaluate causes of lost well integrity.
- Developed engineering protocols for inspection, testing, documentation, and preservation of pipeline evidence associated with large energy-infrastructure incidents, addressing integrity-management, regulatory, and litigation-support considerations.
- Evaluated a midstream pipeline network, applying pipeline-mechanics and integrity principles to assess system performance and engineering issues across an onshore pipeline system.
- Performed failure analysis of an onshore oil and gas pipeline, evaluating mechanical integrity, loading, operating conditions, and potential failure mechanisms.
- Developed and applied advanced models for high-strain pipeline and tubular behavior, including reeling and liner installation, residual-stress effects, frost-heave and geotechnical loading, pipeline walking, and rehabilitation of damaged pipelines.
- Led sour-service materials qualification and integrity research for pipelines and tubulars, integrating high-pressure hydrogen sulfide testing, fracture-toughness assessment, mechanics and hydrogen-diffusion modeling, and full-scale validation to evaluate carbon-steel performance in severe sour environments.
- Developed and validated a fit-for-purpose methodology for residual-stress effects in pressurized tubulars, using a large parametric finite element program to quantify structural response and reduce reliance on case-specific nonlinear analyses.
- Supported integrity and return-to-service decisions for damaged pipelines, evaluating stress concentrations, strain demand, hydrotest and restart considerations, and rehabilitation strategies under time-critical operating conditions.

Oilfield Accidents, Pressure-Release Incidents & Personal Injury Investigation

- Investigated a fatal well-control and pressure-release incident during gas-well reactivation operations, evaluating pressure-management procedures, piping-system integrity, hazard identification, exclusion zones, job-safety analyses, and contractor responsibilities to assess engineering causation and operational decision-making.
- Analyzed a high-pressure wellhead maintenance incident involving an unexpected pressure release during production-equipment changeout, evaluating hydrate formation, pressure-isolation practices, wellhead configuration, operating procedures, and industry standards governing pressurized operations.
- Evaluated a pressure-containing equipment failure that resulted in worker injury during compressor operations, assessing mechanical integrity, maintenance, attachment-system performance, inspection practices, and failure causation.
- Evaluated an uncontrolled high-pressure release during hydraulic-fracturing operations, assessing pressure-containing equipment, evidence preservation, failure-analysis methodology, operational records, and the ability to determine causation after physical evidence was lost or altered.
- Evaluated a fatal drilling-rig incident involving failure of high-pressure wellhead and well-control equipment, assessing wellsite operations, pressure-containing systems, hose behavior and stability, operational procedures, and rig safety practices.
- Conducted a multidisciplinary root-cause investigation of a mobile drilling-rig overturn, integrating rig systems, roadway geometry, environmental conditions, operator actions, human factors, fatigue management, equipment condition, and accident reconstruction.
- Investigated a wellsite incident involving pressure-containing oilfield equipment and associated property damage, evaluating drilling and completion operations, casing and tubular performance, operating conditions, and physical evidence.
- Investigated a wellsite injury involving a production-casing strike during managed-pressure-drilling operations, evaluating casing stabbing and handling operations, pressure-bearing equipment, rig operating practices, mechanical conditions, and engineering causation.

Engineering, EPC/EPCI & Construction Disputes, International Arbitration

- Served as a technical expert in an international energy arbitration involving offshore exploration and development, evaluating well design, drilling-cost assumptions, anticipated pressure conditions, casing-program complexity, rig capability, and technical feasibility relevant to disputed project obligations.
- Provided engineering analysis in an offshore operatorship dispute concerning a shared subsea production system, assessing subsea infrastructure performance, system integrity, production constraints, repair activities, and technical responsibilities under operating agreements.
- Served as an independent expert in litigation concerning engineering, procurement, and construction of a heated, insulated pipeline, evaluating thermal expansion, restraint conditions, cyclic operation, pipeline stresses, alleged coating and insulation damage, and an opposing expert's methodology.
- Served as an engineering expert in an international offshore-energy arbitration concerning FSRU mooring-system selection and feasibility, evaluating environmental loading, mooring design,

vessel motions, metocean criteria, operational constraints, and accepted marine-industry practices.

- Served as an expert in an international arbitration involving offshore geotechnical-survey technology for a floating offshore wind development, evaluating engineering design, equipment performance, field operations, testing programs, project execution, and alleged delays in subsea drilling and survey systems.
- Served as an engineering expert in an international arbitration concerning the design, construction, and long-term structural integrity of an offshore production facility, evaluating fatigue analyses, structural design, welding quality, classification-society requirements, transportation and environmental loading, and service-life expectations.
- Supported international arbitration involving offshore drilling and production facilities, evaluating engineering, design, operation, maintenance, and integrity of offshore infrastructure to assess technical responsibilities, failure mechanisms, and project-performance issues.
- Provided engineering analysis in a dispute over design, construction, and commissioning of a large wave-generation and recirculating-water facility, evaluating contractor performance, construction quality, mechanical-system installation, piping supports, pumps, filtration equipment, specification compliance, and remediation requirements.
- Evaluated engineering responsibilities and specification interpretation for a refrigerated-ammonia storage facility insulation system, assessing contract requirements, code compliance, wind-loading criteria, risk-assessment obligations, and allocation of technical responsibility among project participants.
- Supported a marine and offshore construction dispute involving fabrication and delivery of major offshore assets, evaluating engineering scope, technical execution, and contractual-performance issues raised in the parties' submissions.

Mechanical Failure Analysis, Forensic Engineering, Structural Integrity & Fitness-for-Service

- Investigated the structural failure of a large fiberglass process tank, evaluating competing failure theories, structural instability, shell-buckling behavior, material performance, and operating conditions leading to loss of containment.
- Performed root-cause evaluation of a large industrial storage-tank failure, assessing structural-instability mechanisms, shell behavior, material performance, operating history, and forensic evidence supporting competing causation theories.
- Developed a coupled thermal-stress finite element and codes-and-standards evaluation framework for pressurized hydrogen equipment, addressing pressurized-component modeling, thermal expansion, process- and hydrogen-piping requirements, ventilation provisions, and applicable ASME, NFPA, and CGA standards.
- Performed technical evaluation of a residential plumbing and water-system failure, assessing mechanical-system operation, installation practices, failure mechanisms, and potential sources of water-related property damage.
- Evaluated design and construction defects involving a specialized hydraulic/recreational-water facility, including mechanical systems, piping, pumps, supports, installation deficiencies, vibration, and equipment performance.

- Evaluated an injury involving shifting cargo within an intermodal container during unloading, addressing loading configuration, blocking and bracing, cargo securement, handling practices, and the transport chain.
- Performed failure analysis and provided fitness-for-service support for critical mechanical and pipeline equipment, including fatigue assessment of field piping components, fracture and ECA evaluation of compressor equipment, chain-contact FEA, and life-extension assessment of flexible risers.

Mechanical Engineering, Marine & Energy Intellectual Property, Patent & Trade Secret Disputes

- Provided independent technical analysis in an international intellectual-property dispute involving oilfield tools, patents, and licensed technology, evaluating patent claims, prior art, technology-development pathways, engineering functionality, and whether later inventions were technically derived from licensed technology.
- Analyzed infringement and validity across multiple patent disputes involving downhole friction-reduction tools, evaluating positive-displacement motor lobe ratios, multi-port flow head and flow restrictor geometry, and irregular pressure signatures produced by eccentric rotor motion; directed full-scale flow-loop testing and applied Fourier decomposition and total-flow-area modeling to distinguish tool-generated pressure rhythms from pump and facility noise.
- Analyzed directional-drilling control patents in post-grant proceedings, evaluating bottom-hole-assembly convergence paths, drill-path curvature determination, and asserted prior-art combinations in rebuttal to opposing expert declarations and deposition testimony.
- Provided independent engineering review of a proprietary premium threaded tubular connection system, evaluating design methodology, API qualification testing, finite element analysis, sealability criteria, load-path behavior, connection scaling, strain measurements, and full-scale test performance to assess qualification-test failures and identify potential design improvements.
- Evaluated trade-secret claims involving an orientation-free subsea tree and tubing-hanger system, addressing rotatable orientation rings, annulus routing through the production stab, lock-ring configurations, automatic space-out mechanisms, and coupler materials, and whether each feature was generally known or readily ascertainable in the art.
- Performed stress and dimensional calculations supporting post-grant review of a one-piece production/annulus bore stab patent, determining the bore diameters, wall thicknesses, and stab lengths required to route annular flow through the stab body, and evaluating alleged design obstacles against routine practice for a person of ordinary skill.
- Developed invalidity analysis for patents on pressure-containing wellhead and frac gate valves, evaluating seat and body-bushing sealing arrangements, cavity pressure management, non-elastomeric seal redundancy, state of the art in fail-safe valve design, motivation to combine, and written-description support.
- Assessed patents covering electric hydraulic-fracturing systems, analyzing turbine-generator and mobile power-grid architectures, transformer and switchgear arrangements, variable-frequency-drive and automated pump control responsive to measured wellsite parameters, pump drive-train configurations, and prior art support for proposed substitute claims.
- Evaluated patents directed to distributed energy and thermal systems, including on-site power generation from stranded and flared natural gas integrated with mobile computing loads, and claim construction and indefiniteness analysis for modular data-center cooling addressing airflow turbulence, progressive airflow through processor racks, and the level of ordinary skill in the art.

Editorships & Editorial Review Boards

Associate Editor for the ASME Journal of Pressure Vessel Technology

Peer Reviews

International Journal of Solids and Structures

Journal of the Mechanics and Physics of Solids

European Journal of Mechanics A/Solids

Journal of Pressure Vessel Technology

International Conference on Ocean, Offshore & Arctic Engineering (OMAE)

International Ocean and Polar Engineering Conference (ISOPE)

International Pipeline Conference (IPC)

The Society of Naval Architects and Marine Engineers (SNAME) Offshore Symposium

World Petroleum Congress (WPC)

Offshore Technology Conference (OTC)