

Exponent®
Engineering & Scientific Consulting

Mario Guerra, M.S., P.E.

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Professional Profile

Mario R. Guerra, M.S., P.E., is a metallurgical and corrosion engineering expert with over 20 years of experience in failure analysis, corrosion evaluations, welding engineering and materials selection. He specializes in downhole integrity, HPHT (high-pressure, high-temperature) materials qualification, fracture mechanics, and sour service evaluations across the energy industry. Additionally, he has applied his metallurgical and corrosion engineering expertise to the aerospace and heavy manufacturing industries.

Throughout his career, Mr. Guerra has provided critical consulting and expert analysis for operators, equipment manufacturers, and law firms. His project experience spans deepwater Gulf of America HPHT completions, unconventional shale well casing integrity, and carbon capture (CCS/CCUS) materials challenges. He resolves complex integrity issues involving tubular failures, sulfide stress cracking (SSC), hydrogen stress cracking (HSC), and downhole corrosion.

Throughout his work, Mr. Guerra integrates metallurgical laboratory testing with computational and operational well design experience and fracture mechanics. He brings deep technical expertise in understanding how to integrate advanced material testing methodologies and environmental material degradation mechanisms into fitness for service critical assessments. His hands-on fitness for service laboratory capabilities includes the design of standard and customized mechanical testing.

Prior to consulting, Mr. Guerra held senior engineering roles at premier industrial firms. He was a Senior Facilities Engineer at Marathon Oil Company managing the materials and welding engineering QA group for deepwater subsea developments; a Senior Metallurgical & Welding Engineer at GE Oil & Gas (Vetco Gray) designing materials and welding specifications for land and subsea equipment applications; and a Materials, Processes & Physics Engineer at Boeing supporting NASA’s International Space Station program.

An active contributor to the engineering community, Mr. Guerra has presented at ASM IMAT, SPE, and ShaleTech on casing failures and CCS materials challenges, and published peer-reviewed research on friction stir welding of aluminum alloys. Additionally, he is an experienced expert witness, having provided trial and deposition testimony on metallurgical failures, welding defects, and product liability disputes.

Academic Credentials & Professional Honors

M.S., Mechanical Engineering, University of Missouri, Rolla, 2010

M.S., Metallurgical and Materials Engineering, University of Texas, El Paso, 2001

B.S., Metallurgical and Materials Engineering, University of Texas, El Paso, 1999

Prior Experience

Principal Consulting Engineer, Viking Engineering (a GATE Energy Company), Houston, Texas, 2015–2026

Engineering Advisor/Consultant, Blade Energy Partners, Houston, Texas, 2011–2015

Senior Facilities Engineer, Marathon Oil Company, Houston, Texas, 2009–2011

Senior Metallurgical & Welding Engineer, GE Oil & Gas, Houston, Texas, 2007–2009

Materials, Processes & Physics Engineer/Scientist, The Boeing Company, Houston, Texas, 2005–2007

Metallurgical & Welding Engineer / Quality Manager, Trinity Industries, Inc., Dallas, Texas, 2004–2005

Corporate Metallurgical & Welding Engineer, ABB Vetco Gray, Houston, Texas, 2002–2004

Metallurgical Engineer, ALCOA, Inc., Texarkana, Texas, 2001–2002

Publications

Refereed Journal Articles

Guerra M, McClure JC, Murr LE, Schmidt C, Nunes AC. "Flow Patterns During Friction Stir Welding." Materials Characterization, vol. 49, 2003, pp. 95–101.

Murr LE, Pappu S, Kennedy C, Guerra M. "Shear Band Phenomena in Extreme Deformation Processes: From Ballistic Penetration to Friction-Stir Welding." Presented at the 2002 Minerals Metals and Materials Society Annual Meeting.

Guerra M, McClure JC, Schmidt C, Murr LE, Nunes AC. "Metal Flow During Friction Stir Welding." The Minerals Metals and Materials Society, Indianapolis, IN, November 2001.

Murr LE, Sharma G, Guerra M, et al. "Joining of Dissimilar Aluminum Alloys and Other Metals and Alloys by Friction-Stir Welding." The Minerals Metals and Materials Society, New Orleans, LA, February 2001.

Presentations

Guerra MR. "Carbon Capture and Storage: Downhole Tubular Materials Selection Challenges and Multidisciplinary Approaches to Mitigate Failures and Adhere to Regulatory Compliance." Oral Presentation, International Materials, Applications & Technologies (IMAT) 2025, Detroit, MI, 2025.

Guerra MR. "Oil and Gas Downhole Tubular Failures: Manufacturing and Environmental Case Studies." Oral Presentation, International Materials, Applications & Technologies (IMAT) 2025, Detroit, MI, 2025.

Guerra MR. "Casing Failures in Multi-Frac Horizontal Shale Wells Case Studies." Oral Presentation, International Materials, Applications & Technologies (IMAT) 2024, Cleveland, OH, 2024.

Guerra MR. "Minimizing the Risk of Casing Failures in Multi-Frac Horizontal Shale Wells Based on Historical Lessons Learned." Oral Presentation, ShaleTech Permian, Midland, TX.

Guerra MR. "Minimizing the Risk of Casing Failures in Multi-Frac Horizontal Shale Wells Based on Historical Lessons Learned." Oral Presentation, ASM International, Houston, TX.

Guerra MR. "Minimizing the Risk of Casing Failures in Multi-Frac Horizontal Shale Wells Based on Historical Lessons Learned." Oral Presentation, SPE, Galveston, TX.

Lectures

Guerra MR. "Advanced Corrosion Concepts and Corrosion in the Upstream Oil & Gas Industry." GE Oil & Gas Edison Program, January 21, 2009.

Project Experience

Failure Analysis & Root Cause Investigations

- **Downhole & Midstream Integrity**: Led forensic metallurgical investigations of production tubing, drilling tools, coil tubing, production casings and pipelines.
- **Advanced Material Failures**: Conducted failure analysis of downhole ruptured expandable liner pipes, super duplex stainless-steel components used in offshore facilities, high strength nickel based alloy tubulars used in HPHT wells and cemented, sintered, and hipped powder wear-resistant tungsten carbide (WC) components used in HPHT subsea production systems.
- **OCTG & Subsea Drilling Equipment**: Evaluated high-strength steel OCTG (oil country tubular goods), connections, and structural subsea drilling equipment components (e.g., H4 connectors and other drilling riser components).
- **Industrial Manufacturing**: Managed failure analysis and metallurgical evaluations across construction, energy, and marine business units for a large industrial manufacturing company, including LPG pressure vessels, marine barges, wind towers, and rail car components.

Materials Selection, HPHT & Emerging Energy

- **Multi-Environment Materials Selection**: Handled downhole alloy selection (For subsea, unconventional, HPHT, and highly sour environment applications) across the US,Middle East, and South America.
- **Specialized Alloys, Materials& CRA Qualifications**: Qualified and tested high-performance alloys including Haynes alloy C22HS, JFE UHP 17Cr and 15Cr, Sumitomo 2535, Special Metals 945X, Modified/Super 13Cr martensitic stainless steels (CRM/CRS, HP1/HP2), and several special grades of OCTG high strength low alloy steels.
- **Geothermal & Carbon Capture (CCS/CCUS)**: Optimized materials for carbon capture storage wells and high-temperature geothermal wells (up to 500°F/260°C) containing highly corrosive CO_2 environments and high temperature caustic environments.
- **BSEE Equipment Design Reviews**: Worked with oil & gas operators acting as Materials & Corrosion Subject Matter Expert, reviewing design packages and qualifying subsea and

downhole materials for BSEE regulatory permit approvals for deepwater Gulf of America HPHT wells.

Fracture Mechanics, Corrosion & Sour Service Testing

- **Engineering Critical Assessments (ECAs)**: Performed fracture mechanics-based integrity assessments to establish safe operating pressure limits for low-toughness ERW casing in shale wells and sour service environments.

- **Sour Service Testing & Qualification**: Designed and executed HPHT sour testing protocols (up to 470°F and 25,000+ psi) using standard and customized constant load, fatigue, fracture mechanics and slow strain rate testing methodologies.

- **Environmental & Corrosion Modeling**: Technical lead for guiding and managing a multidisciplinary team of production chemists, corrosion engineers, and well design engineers to model and test materials for corrosion and environmental cracking performance under high-temperature high-pressure conditions for extreme sour service applications in simulated autoclave acid gas environments.

Welding Engineering, Subsea Equipment Manufacturing & Quality Assurance

- **Weld Procedure Qualification**: Evaluated and approved OEM welding procedures (WPS/PQR) in compliance with ASME Section IX, NACE MR0175/ISO 15156, API 6A, API 17D, and AWS D1.1.

- **Deepwater Subsea Equipment QA/QC**: Managed quality assurance programs, equipment manufacturing, factory acceptance testing (FAT), and non-destructive evaluation (including Phased Array UT) for complex subsea tiebacks, pipelines, umbilicals, and Christmas trees.
- Conducted technical manufacturing audits of national and international OCTG steel mills to verify compliance with API Spec Q1 and ensure that the delivered tubular goods meet API 5CT and other client specific requirements.

- **Advanced Cladding Processes**: Qualified laser cladding processes to replace wear resistant thermal spray coatings on components requiring specific abrasion resistant properties.

Aerospace, Metallurgy & Laboratory Management

- **NASA ISS Program Support**: Resolved hardware anomalies and supported materials selection (metallic/non-metallic) for NASA's International Space Station program, evaluating materials for toxicity, flammability, and SCC.

- **Aerospace R&D**: Supported technical proposals involving the use of friction stir welding of high-strength aluminum alloys to develop novel spacecraft vehicle structures.

- **Primary Metals Manufacturing**: Managed metallurgical processes (casting, homogenization, annealing, hot rolling and cold rolling practices) for the manufacturing of non-heat treatable aluminum alloys.

- **Laboratory Leadership & QMS Audits**: Directed a 13-person multidiscipline team of engineers and lab technicians that provided materials & corrosion consultancy services, and included a mechanical and metallurgical testing laboratory. Initiatives involved setting up multiple pieces of testing equipment, including a 500 kN servo-hydraulic mechanical testing frame and ensuring strict compliance to ISO/IEC 17025 and other applicable standards.