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Lance T. Hill
Senior Research Leader

Education

B.S., Aerospace Engineering, Texas A&M University (1991)
M.S., Mechanical Engineering, Texas A&M University (1993)

Areas of Expertise

Lance has 25 years of experience of applying advanced finite element analysis techniques across a wide range of industries to provide insight to the most challenging of engineering problems. His areas of expertise include:

- Nonlinear Finite Element Analysis,
- Computational Fracture Mechanics,
- Probabilistic Structural Analysis, and
- Fitness-for-Service Methodologies.

Experience

7/2013-9/2018

ExxonMobil Research and Engineering Company, Baytown and Spring, TX

Advanced Analysis Discipline Technology Leader (4/2018 – 9/2018)

- Provided engineering analysis support for key developing technologies. Highlights include:
 - Development of High-Temperature Hydrogen Attack (HTHA) fitness-for-service procedures for volumetric and crack-like flaw evaluations for pressure vessels and piping systems.
 - Augmented structural analysis and inspection requirements for vintage thick-walled pressure vessels that operate in hydrogen environments following WRC-562 recommendations.
 - Evaluated and provided coke drum life-extension recommendations for refractory-lining application to inner surface.

Advanced Analysis/Fitness-for-Service Group Lead (2/2016 – 4/2018); Engineering Associate (7/2013-2/2016)

- Manage a five-person team of engineers responsible for all fitness-for-service and finite element analysis evaluations performed for global downstream organization.
 - 40 analyses per year were completed representing \$2M of billed time with ~\$5M value captured for the Corporation.
- Provided time-critical assessments for key operational activities and R&D activities. Highlights include:
 - Led root-cause evaluation for sigma-phase embrittlement of stainless-steel internals.
 - Non-intuitive result showed that a yield-strength level residual driving force in combination with embrittlement were found upon unit shutdown lead to catastrophic failure of key FCCU grids and plenum designs.
 - Weld consumable material selection, initial NDE and geometry optimization changes were made to mitigate and reduce future failure probabilities.
 - Collaborated to develop a unique pinned SENT sample that is a constraint matched for thin-wall ERW axial pipe flaws in vintage pipelines.
 - For thin-walled tanks, implemented an implicit dynamic finite element analysis procedure to demonstrate that liquid filling or mechanical deformation could be used to “pop” deformed tanks back into required tolerances.

8/2007-7/2013

Dassault Systèmes SIMULIA Corp., Lewisville, TX

Energy Lead, Industry Workflows (11/2012- 7/2013)

- Developed and executed strategy to increase visibility in and revenue growth from the Energy Industry worldwide, including Oil & Gas, Nuclear, Wind, Solar, and other alternative energy.
- Established strategic relations with major energy customers and developed solution roadmaps for driving alliances and product portfolio improvements.
- Initiated and managed all Technical Marketing activities targeted at the energy industry.
- Developed and implemented internal training programs to prepare global sales force for opportunities in energy.

Technical Expert, North America Energy Industry Team (1/2010-11/2012)

Principal Engineer, SIMULIA South (8/2007-1/2010)

- Provided support in solving engineering problems related to running the Abaqus (/Standard and Explicit) suite of finite element analysis programs and the Isight design exploration/optimization software package,
- Conducted marketing activities by providing on-site seminars and presentations, performing benchmarks and demos, and visiting existing and prospective customers,
- Taught numerous introductory and advanced training courses (fracture, contact, buckling, submodeling/superelements, etc.), and
- Performed methodology development projects to provide streamlined, cost-effective use of Abaqus by customers with repetitive analyses.

7/1998-10/2003, 1/2005-8/2007

Los Alamos National Laboratory, Los Alamos, NM

Lead Gravity Weapons Structural Analyst, Weapon Response Group

- Performed finite element analyses (FEA) of a complex, non-linear stockpile weapon system using ABAQUS/Standard and Explicit, with emphasis on predicting structural and thermal response including static structural analysis, thermal analysis, transient dynamic response and coupled thermal-mechanical interactions. The highlights of this work include the following.
 - o Development of a 40 component, 750,000 element system-level Abaqus/Explicit FEA model for various transient dynamic loadings. This full 3D FEM was a parameterized statistical representation of component (stack-up) tolerancing.
 - o Validation of this nonlinear FEM was accomplished via correlation with component, sub-assembly and system-level strain-gauge and accelerometer test data.
- Wrote test specifications (design of experiments, recommended instrumentation and loading requirements, fixture design, FEA analysis pre- and post-test) and final reports for baselines and qualification of weapon components and subassemblies.
- Member of two-person team awarded the 2000 LANL Small Team Distinguished Performance Award for B61-11 structural reliability certification efforts.
- Performed scoping gravity weapon design study using modern "Design-by-Analysis" tools. This required leading a team that implemented a framework of analysis tools (parameterized finite element models, Design of Experiments to space-fill the design space, higher-order (Kriging) response surfaces to create a meta-model, and Monte Carlo sampling to estimate system structural reliability). This study showed several design options that meet stringent military requirements.

10/2003 – 12/2004

Lockheed Martin Aeronautics Company, Fort Worth, TX

Senior Aeronautical Engineer, F-16 Service Life

- Conducted linear-elastic and elastic-plastic F-16 Service Life assessments using METLIFE (low-cycle fatigue) and IMAT/CGRO (low- and high-cycle fatigue).

12/1994-7/1998

Hibbitt, Karlsson and Sorensen, Inc., Pawtucket, RI and Detroit, MI

Technical Support Engineer

- Provided customer training and support for advanced engineering simulation with industry-leading Abaqus simulation products.

1/1994 - 12/1994

Areva NP Inc. (then **B&W Nuclear Technologies**), Lynchburg, VA

Staff Engineer (Materials and Structural Analysis Unit, Fracture Mechanics Group)

- Evaluated flaws in nuclear power plant components to ensure compliance with ASME B&PV Cod Section VIII. This involved addressing the ability of the structure to withstand stress-corrosion and fatigue crack growth for its design life.
- Evaluated the two-parameter fracture mechanics (J-Q) theory for use in the assessment of nuclear reactor pressure vessels subjected to severe accident loading scenarios. Results were published at the 1995 ASME PVP conference.

6/1992 – 12/1993

Texas A&M University, College Station, Texas

Research Assistant (Mechanical Engineering Dept., Advisor: Dr. Ted L. Anderson)

Thesis: "Stress Analysis and Fatigue Evaluation of Shell-to-Footer Plate Joint in Liquefied Natural Gas Storage Tanks". Performed fitness-for-service assessment of this assembly by performing a geometrically non-linear contact analysis using ABAQUS/Standard to explain the experimentally determined highly non-linear strain levels near the weld toe for low liquid levels. Based on this analysis, a low-cycle fatigue analysis was then performed to predict the remaining assembly life based on a failure assessment diagram approach.

Selected Publications

- Hill, L.T., & Yoon, K.K. "Two-parameter fracture mechanics assessment of axial flaws in a reactor pressure vessel subjected to pressurized thermal shock." American Society of Mechanical Engineers, *Fatigue and Fracture Mechanics in Pressure Vessels and Piping*. PVP-Volume 304, 1995.
- Macek, R.W. & Hill, L.T., "Probabilistic Structural Analysis Methodology for Estimating System Reliability during Impact Loading," *19th International Modal Analysis Conference (IMAC)*, February 5-8, Kissimmee, Florida, 2001.
- Hill, L.T., "Simulating Pipeline Rupture with Finite Element Analysis," *R&D Magazine*, October 2012, Vol. 54(6), p34.
- Akula, V.M.K & Hill, L.T., "Determining Material Parameters for Low-Cycle Fatigue Analysis of Metallic Structures," *Proceedings of SAMPE Tech 2013 Conference*, October 21-24, Wichita, KS, USA, 2013.