

David J. Eby, Ph.D., P.E.
Managing Engineer

Professional Profile

Dr. David J. Eby is a Managing Engineer in Exponent's Mechanical Engineering practice. Dr. Eby investigates issues related to failure analysis of mechanical systems, strength of materials, and thermodynamics. Dr. Eby has significant expertise in intellectual property infringement and validity analyses, machine design, welds and weldments, structural reinforcements, metal and composite materials testing, material fatigue and fracture, storage and handling of gases and liquids, hydraulic machines, and the evaluation of industrial equipment. Dr. Eby is a registered professional engineer in the State of Michigan.

Dr. Eby's areas of specialization include experimental and analytical stress analyses, experimental and analytical thermal fluids analyses, and the application of design optimization to industrial problems. He has extensive experience with the finite element method (crashworthiness, modeling of metals, modeling of rubbers, and modeling of composites), computational fluid dynamics (high- and low-speed flow, multiphase flow, sloshing/mixing of liquids, and radiant/conductive/convective heat transfer), fluid structure interaction problems, and optimization theories (machine learning, neural networks, genetic algorithms, and evolutionary strategies).

Prior to joining Exponent, Dr. Eby served as the manager of the Advanced Methods Group at CD-adapco and was a co-founder of Red Cedar Technologies.

Academic Credentials and Professional Honors

Ph.D., Engineering Mechanics, Materials Science and Mechanics Department, Michigan State University, 2000

M.S., Engineering Mechanics, Materials Science and Mechanics Department, Michigan State University, 1997

B.S., Engineering Mechanics, Materials Science and Mechanics Department, Michigan State University, 1996

General Motors Scholarship, 1999–2000; DeVlieg Scholarship, 1996–1998

Licenses and Certifications

Licensed Professional Engineer, Michigan, # 6201054813

Professional Affiliations

- American Society of Mechanical Engineers
- ASTM Technical Committee E28 (Mechanical, Impact, and Automated Testing)
- Engineering Society of Detroit
- American Welding Society
- The Minerals, Metals & Materials Society

Publications

Ramirez JC, Eby DJ, Bullen DB, Carpenter AR, Ogle RA. Inerted vessels: Avoiding hazards caused by gas buoyancy. 2008 Annual Symposium, Mary Kay O'Connor Process Safety Center, Texas A&M University, College Station, TX, October 2008.

Madakacherry JM, Eby D, Isaac MB, Bruggeman CA, Farahani A, Averill RC. A process of decoupling and developing body structure for safety performance. 5th European LS-DYNA Users' Conference, 2005.

Eby DJ, Averill RC, Goodman ED, Sidhu RS. Shape optimization of crashworthy structures. Proceedings, 7th International LS-DYNA Users Conference 2003, pp. 7-15–7-21, Livermore, CA, 2003.

Eby D. Optimization of CFD analyses with STAR-CD and modeFrontier. Proceedings, TCN CAE, pp. 1–21, 2003.

Engelstad SP, Berry OT, Averill RC, Eby. Implementation and application of zig-zag finite elements for composite bonded tee-joint modeling. 42nd Annual AIAA / ASME / ASCE / AHS / ASC Structures, Structural Dynamics, and Materials Conference and Exhibit, Seattle, WA, April 16–19, 2001.

Averill R, Eby D, Goodman K. How well can it take a hit? Mechanical Engineering Design, ASME, pp. 26–28, March 2001.

Eby D, Averill RC. Zigzag sublaminar model for nonlinear analysis of laminated panels. Journal of Aerospace Engineering 2000; 13(3):100–109, July.

Eby DJ. Coupled multiobjective optimization of crashworthiness and modal frequencies in structures using genetic algorithms. Doctorial Thesis, Michigan State University, East Lansing, Michigan, 1999.

Eby D, Averill R, Goodman E, Punch W. The optimization of flywheels using an injection island genetic algorithm. pp. 167–190. In: Evolutionary Design by Computers. Bentley P (ed), Morgan Kaufmann, San Francisco, 1999.

Eby D, Averill RC, Punch III W, Goodman ED. Optimal design of flywheels using an injection island genetic algorithm. *Artificial Intelligence in Engineering Design, Analysis and Manufacturing*, Vol. 13, pp. 389–402, 1999.

Eby D, Goodman E, Averill R, Punch W. Parallel genetic algorithms in the optimization of composite structures. pp. 199–208. In: *Soft Computing in Engineering Design and Manufacture*. Chawdry PK, Roy R, and Pant RK, (eds), Springer Verlag, 1998.

Eby D, Averill RC, Punch III WF, Goodman ED. Evaluation of injection island GA performance on flywheel design optimization. *Proceedings, 3rd Conference on Adaptive Computing in Design and Manufacturing*, Plymouth, England, April 1998.

Goodman E, Eby D, Averill RC, Punch W. Genetic algorithms for design of specialized laminated composite structures. *Proceedings, 2nd International Aerospace Congress*, Moscow, Russia, pp. 68–73, 1997.

Eby D, Averill RC, Gelfand B, Punch WF, Mathews O, Goodman ED. An injection island GA for flywheel design optimization. *Invited Paper, Proceedings, EUFIT '97, 5th European Congress on Intelligent Techniques and Soft Computing*, September 1997.

Goodman ED, Averill RC, Punch WF, Eby DJ. Parallel genetic algorithms in the optimization of composite structures. *2nd World Conference on Soft Computing (WSC2)*, June 1997.

Presentations

Eby D. Evaluating the strength of welded T-Joints: comparing experimental and analytical approaches. *FABTECH/AWS Professional Program, Session 15: Weld Joint Properties And Design*, 2008.

Eby D. Failure analysis of a PWR reactor head. *STAR North America User Conference*, 2008.

Eby D. Optimization of CFD analyses with STAR-CD and commercial optimization tools. *STAR European User Conference, 2005; STAR North America User Conference, 2005*.

Eby D. Fluid structure interaction analysis with STAR-CD. *STAR North America User Conference, 2004*.

Eby D. Optimization of CFD analyses with STAR-CD and commercial optimization tools. *STAR North America User Conference, 2004*.

Eby D. Optimization of CFD analyses with STAR-CD and commercial optimization tools. *OPTECH, 2004*.

Eby D. Rotating machinery and fluid structure interaction modeling. *STAR North America User Conference, 2004*.

Eby D. CAD based parametric optimization of STAR-CD CFD analyses using iSIGHT. Engineous User Conference, 2004.

Eby D. The effect of blade mistuning on fluid structure interaction analyses. High Cycle Fatigue Conference, 2004.

Eby D. Optimization of CFD analyses with STAR-CD and modeFrontier. TCN CAE Conference, Sardinia, Italy, 2003.

Eby D. Shape optimization of crashworthiness structures. 6th U.S. National Congress on Computational Mechanics, 2001.

Select Project Experience

Industrial Equipment

Steelmaking equipment failure analysis.
Dewatering press failure analysis.
Scaffolding failure analysis.
High voltage wire fastener failure analysis.
Industrial lifting/rigging failure analysis.
Conveyor belt design and analysis.
Paper shredder performance testing.

Recreational Products

Mountain biking accident reconstruction.
Marine outboard motor accident reconstruction.
Snowmobile suspension failure analysis.
Fitness equipment failure analysis.

Plumbing, Water Supply, and Natural Gas Piping

Failure analysis of a ball valve in a recirculating hot water system.
Failure analysis of residential gas valves.
Failure analysis of soldered joints.
Natural gas propagation from a gas meter in crosswinds.
Failure analysis of natural gas line.
Dezincification of brass plumbing components.
Stress corrosion cracking of brass plumbing components.

Intellectual Property

Infringement/validity analyses of structural reinforcements for automotive crashworthiness.

Infringement/validity analyses of valve lifters in engines.

Infringement/validity analyses of welding wire.

Infringement/validity analyses of blenders.

Infringement/validity analyses of trampolines.