

Curriculum Vitae

ROBERT H. BADGLEY, PhD

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EXECUTIVE SUMMARY

Senior professional engineer, with over 50 years of experience in machinery design and development. Extensive troubleshooting experience, with emphasis on root cause failure analyses and assessments. Experienced in providing practical solutions to difficult problems, quickly, safely, and cost-effectively. Specialized experience in provision of Expert Witness and training services. Also in formation and leadership of technical and professional teams, US and worldwide. Development, startup and problem diagnosis of rotating and reciprocating machinery. Highly effective innovations in maintenance methods and procedures, leading to significant extensions of machinery on-line time between removals. Experienced in developing new products, and in manufacturing and repair troubleshooting.

PROFESSIONAL EXPERIENCE

Principal Consulting Engineer and Owner 2000-Present
Emcon Systems, Round Rock, Texas

A professional engineering consulting business, providing expert witness, training, and engineering design and analysis services.

Expert Witness Services

- Provided Expert Witness support in a patent infringement case involving components of large, lumber recovery machinery used in pipeline operations.
- Provided Expert Witness support in a manufacturing equipment sales contract case involving a machine intended to manufacture laminated insulation materials. Settled prior to litigation.
- Provided Expert Witness support in a personal injury case involving industrial excavating machinery operations. Settled prior to litigation.
- Providing Expert Witness support in a central-station power generating machinery failure case involving turbine inlet water spray systems.

- Providing Expert Witness support in a patent infringement case involving components of large electrical machinery.
- Provided Expert Witness support in a turbine engine test cell generator case. Settled prior to litigation.
- Provided Expert Witness support in an equipment sales contract case involving a machine intended to manufacture laminated sports mats. Settled prior to litigation.
- Provided Expert Witness support in a manufacturing quality case involving a plate and shell heat exchanger. Settled prior to litigation.
- Provided Expert Witness support in an equipment failure case involving a plate and shell heat exchanger. Settled prior to litigation.
- Provided Expert Witness support in an industrial equipment personal injury case involving a fall from a ladder and a fire. Settled prior to litigation.
- Provided Expert Witness support in an industrial equipment personal injury case involving a fertilizer storage and mixing application. Settled prior to litigation.
- Provided Expert Witness support in an industrial equipment personal injury case involving death of a worker due to rupture of a high-pressure flow component.
- Provided Expert Witness support in a class-action case involving development of mold in front-loading washing machines. Settled prior to litigation.
- Provided Expert Witness support in an industrial equipment personal injury case involving an industrial press. Settled prior to litigation.
- Provided Expert Witness support in an industrial equipment personal injury case involving a plastic materials silo auger.
- Provided legal consulting support to US large electric motor manufacturers in dispute mediations.
- Provided legal consulting support following factory explosion with fatalities and multiple injuries. Prepared and presented briefings to attorneys, prepared for and participated in multiple depositions. Case settled prior to litigation.
- Provided Expert Witness support to LG vs. Asko-Daewoo in a patent infringement case involving front-loading washing machines:
 - Retained as an expert by attorneys representing LG Electronics, Inc., and requested to testify about technological issues relevant to the case *LG Electronics, Inc. v. Asko Appliances, Inc., et al.*, Case No. 08-828 (RGA), dealing with infringement of patents owned by LG and dealing with front-loading washing machines.
 - Issues involved inventions described and claimed in U.S. Patents Nos. 6,460,382, 6,914,363, 6,510,716, 7,418,843, and 7,380,424, and included comparisons of claimed inventions to certain Accused Products.
 - Prepare Expert Report regarding infringement of U.S. Patents listed above.
 - Responded to opposing parties' Expert Report regarding Validity of the above patents.
 - Deposed by opposing counsel; subsequently provided approximately three hours of testimony during a jury trial in the United States District Court for the District of Delaware in Wilmington, Delaware during 26-30 November 2012.

- Provided Expert Witness support in Canadian case involving damage to industrial equipment and building due to nearby construction activity. Settled prior to litigation.
- Provided Expert Witness support in case involving design of electric motor components intended for use in liquid natural gas pumps. Settled prior to litigation.
- Provided Expert Witness support in case involving damage to warehouse structures due to vibration from nearby construction waste materials handling machinery.

Engineering Services

- Provided assessment and troubleshooting engineering services for oil pump drive motors operating on drilling platforms.
- Provided design assessment and troubleshooting engineering services for an advanced electric motor for fracking pump drive service.
- Provided an evaluation of ball bearing performance in robot applications.
- Evaluated induction motor design software for acquisition by a manufacturer of large electric motors used in dragline applications.
- Designed and assisted in establishing new test and development laboratory for medium voltage variable frequency drives (4,160 Volts), including design, fabrication, and installation of dynamometers up to 1000 HP.
- Assisted Chinese firm Haier, Inc. in air conditioner evaluations to achieve required efficiencies and product noise levels.
- Prepared and implemented renewal program plans for large 400 Hz motor-generator set for use in US Navy Laboratory, including preparation and on-site support for heavy lifts of motor and generator rotors and stators, and large steel mounting structure; prepared and assisted in lifts from factory floor to transport vehicles, and from transport vehicles through Navy building structure to foundation; verified transit readings demonstrating flatness of foundation.
- Resolved vibration-caused catastrophic failures of electric motor-driven air circulation HVAC fans in Smithsonian Air & Space Museum at Dulles Airport.
- Conducted successful startup troubleshooting to reduce vibration in large vertical electric motors located in King County, Washington State.
- Conducted vibration failure analyses for induced draft fans, turbines, generators, gearboxes and electric motors in a variety of industrial plants.
- Conducted torsional vibration analysis of heavy industrial equipment and drive systems for resolution of coupling problems in steel mill application.
- Conducted fan vibration-caused failure analysis for air supply and return fans in commercial buildings.
- Conducted motor failure, torsional vibration analysis of industrial reciprocating compressor drive systems.
- Conducted motor failure vibration analysis of centrifugal re-injection compressor drive in arctic.

- Conducted failure vibration analysis of electric motor compressor system involved in fire.
- Designed high-speed, low-vibration, high-horsepower electric motors for industrial drives.
- Designed efficiency testing laboratory for electric motor manufacturer.
- Provided startup vibration troubleshooting for large induction and synchronous motors.
- Conducted failure and vibration analysis for turbines, generators, and motors.
- Prepared vibration measurement plans for high-precision machinery diagnostics.

Training Services

Presented engineering short courses:

- Root Cause Machinery Failure Analysis (United Arab Emirates 2005)
- Advanced Vibration Analysis (Bangkok, Thailand 2007)
- Advanced Vibration Analysis (Kuala Lumpur, Malaysia 2008)
- Vibration Analysis Excellence (Kuala Lumpur, Malaysia 2009)
- Turbines, Compressors & Pumps Oil Analysis for Brunei Liquefied Natural Gas (Kuala Belait, Brunei 2009)
- Lubrication and Bearing Failure (Kuala Lumpur, Malaysia 2010)
- Turbines, Compressors & Pumps Oil Analysis for Brunei Liquefied Natural Gas (Kuala Belait, Brunei 2011)

Other available courses:

- Vibration Analysis Software Application to Engineering Systems (DyRoBeS)
- How to Become a Consultant

Course currently in preparation:

- Shell and Tube Heat Exchangers

Director of Engineering

1999-2000

TECO-Westinghouse Motor Company, Round Rock, Texas

A \$150 million annual sales manufacturer of large industrial motors, generators and controls.

- Provided leadership of a diverse department with over 70 staff members.
- Provided technical leadership of engineering cost center during ISO 9001 certification.
- Directed development of new low cost OEM motor family using innovative materials and construction.
- Prepared design innovations for electric motors and generators for lower vibration and noise, and life cycle costs.

Manager of Research and New Product Development

1998-1999

TECO Westinghouse Motor Company, Round Rock, Texas

A \$150 million annual sales manufacturer of large industrial motors, generators and controls.

- Managed successful OEM motor product development, and integration with chiller machinery for very low vibration and machinery room noise.
- Successfully developed very low vibration and noise OEM motor air cabinet, through innovative use of advanced software systems (e.g., Fluent (CFD) and COSMOS (FEA) and design of special tests.
- Implemented “design-for-quality” processes using existing and virtual reality engineering and product data management software.

Senior Consulting Engineer, President, and Owner 1993-1998
ESIC, Inc., Reston, Virginia

An incorporated consulting firm, established to conduct commercial US business.

- Designed and installed vibration knowledge-based expert system software to determine quality of equipment in electricity generating plants, including motors, pumps, and large combustion gas turbines.
- Prepared quality assurance procedures for large, international electric generator manufacturer, including advanced vibration analysis methods.
- Developed and applied vibration methods for diagnosing in-service condition of rail traction motors for New Jersey Transit.
- Developed and applied vibration methods for diagnosing in-service condition of rail car wheels on high-speed AMTRAK Metroliner passenger rail service in US Northeast Corridor.

Manager of Operations and Joint Venture Co-Owner 1993-1995
Catalytic Expert Systems, Mississauga, Ontario, Canada

A Canadian Joint Venture between ESIC, Inc. and Delta Catalytic Corporation, Calgary, Alberta, Canada, formed to bring new machinery condition assessment technology to Delta Catalytic Corporation’s world-wide maintenance services.

- Conducted machinery condition assessment projects in Canada, Germany, United Kingdom, United Arab Emirates, India, Saudi Arabia, Kuwait, Singapore, Malaysia, and Indonesia.

Senior Consulting Engineer, President, and Owner 1984-1993
Expert Systems, Inc., Reston, Virginia

An incorporated small business established to conduct machinery and vibration contract efforts.

- Set up and implemented vibration analysis based helicopter rotor drive train and fixed-wing aircraft engine battle damage program for US Naval Air Systems.
- Served as Lead Consulting Engineer under contract to Office of the Chief Engineer for Quality, US Naval Sea Systems Command.

- Successfully resolved damaging vibration problems in LM2500 main propulsion gas turbine engines in US Navy surface ships, including FFG-7, DDG-963, CG47, and DDG-51 ship classes. Assisted in extending engine service life from 6,000 hours to over 25,000 hours, avoiding removals of more than 150 engines for rework, with savings of over \$400,000 per engine, for total program savings of more than \$60 million.
- Successfully resolved torsional vibration problems in lift fans, gas turbine engines and gearboxes of US Navy Air Cushion Landing Craft (LCAC).
- Successfully resolved manufacturing quality problems on V-16 diesel-generator sets leading to engine failures in service.

Executive Vice President 1983-1984

Dynamic Science, Inc., Phoenix, Arizona and Fairfax, Virginia
An incorporated firm established to conduct Government contract efforts

- Responsible for firm's Eastern US operations.
- Managed US Army artillery range operations at Aberdeen Proving Grounds.
- Managed US Army tank & truck testing at Aberdeen and Yuma Proving Grounds.
- Managed groups conducting vehicle crash analysis for US Dept of Transportation.

President and CEO 1982-1983

Xebec Corporation, Rockville, Maryland
An incorporated firm established to conduct US Government contract efforts

- Responsible for firm's classified business and technical operations.

Director of Washington DC Operations 1979-1982

Mechanical Technology, Inc., Latham, New York
An incorporated firm established to conduct US Government contract efforts

- Responsible for firm's Washington DC business and technical operations.
- Provided engineering support to US Navy Naval Sea Systems Command.

Engineer, Supervisor, and Department Manager 1967-1979

Mechanical Technology, Inc., Latham, New York
An incorporated firm established to conduct US Government contract efforts

- As Department Manager, developed Department to 50 staff members, conducting projects in machinery design, development, and advanced vibration methods.
- As Supervisor, managed technical staff conducting projects in machinery design, development, and advanced vibration methods.
- As Engineer, provided engineering expertise and support to projects in machinery design and development, including advanced methods for measurement of machinery performance and condition assessment, including proximity sensors, pressure sensors, strain gages, and accelerometers.

US Army Officer

1961-1963

US Army, Sandia Base, New Mexico

- Managed nuclear weapons field test projects at Nevada Test Site and Johnston Island Pacific Ocean locations.
- Provided instruction in Nuclear Weapons Accident Mitigation to Officer and Enlisted Personnel at Department of Defense School at Sandia Base, Albuquerque, New Mexico

EDUCATION

Ph.D., Cornell University: Major - Mechanical Design; Minors – Industrial Engineering, Thermal Power.

M.S., Massachusetts Institute of Technology: Nuclear Engineering.

B.S., Rutgers University: Mechanical Engineering.

PROFESSIONAL ENGINEERING CERTIFICATION

New York State, 1967 – Currently Active

PROFESSIONAL AFFILIATIONS

Life Member - American Society of Mechanical Engineers;

Member – Tau Beta Pi Honorary Engineering Society;

Member – Pi Tau Sigma Honorary Mechanical Engineering Society;

Member – Sigma Xi Honorary Society

PUBLICATIONS

Author or coauthor of 43 technical publications and numerous technical reports

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