

Albert V. Karvelis, Ph.D., P.E.
Principal Engineer and Office Director

Professional Profile

Dr. Albert V. Karvelis is a Principal Engineer in Exponent's Mechanical Engineering practice and is the Director of the Chicago-area offices. His practice area for 40 years has been machinery and manufacturing. This includes all aspects of machinery, from R&D and intellectual property through design, manufacturing, safety/risk assessment, test, failure analysis, and performance assessment. His practice areas include mechanical power transmission, machine design, vibration and acoustics; failure analysis of machinery; fluid dynamics and fluid machinery.

Dr. Karvelis has been employed as an Engineer, Engineering Manager and Vice President, and Consultant in a wide variety of industries, including HVAC (Trane Company), nuclear and fossil power (Babcock & Wilcox), aerospace (US Navy), automotive components, petrochemicals, and materials processing (Borg Warner). He has participated or led design teams in the design/test/analysis of products such as valves, pumps (Byron Jackson & Centralift), fans/compressors (TLT Babcock, Emerson), power transmission systems and components (Borg Warner Corporation, Borg Warner Chemicals, Morse Chain, Wells Fargo & York International), automated assembly/fabrication machinery, medical devices, sensors, and consumer products. While at Packer Engineering, he served as head of the Machinery and Manufacturing consulting division and led the Intellectual Property practice area.

For over 20 years, Dr. Karvelis has been active in and held leadership positions within the American Society of Mechanical Engineers, in the Design Engineering Division and the Codes & Standards Division. In 1996, he was Chair of the ASME 7th International Power Transmission and Gearing Conference and co-editor of the Proceedings. He has also been elected to serve on the ANSI Standards drafting committees of The Association of Manufacturing Technology. As Adjunct Professor of Mechanical Engineering, he has taught graduate courses in fatigue, fracture mechanics, and vibration, and has lectured on ethics and safety in design for over 15 years. Dr. Karvelis also co-authored a chapter on ergonomics and workplace in the recently published McGraw-Hill Manufacturing Engineering Handbook.

Dr. Karvelis was elected to the rank of ASME Fellow in 2008. The American Society of Mechanical Engineers Fellow Grade is recognition of significant engineering achievements and contributions to the engineering profession.

Dr. Karvelis has testified in State and Federal Courts as a mechanical engineering expert in matters involving intellectual property and machine design and performance issues, and has served as a court-appointed neutral party in binding arbitration of complex machinery performance.

Academic Credentials and Professional Honors

Ph.D., Engineering Acoustics, Pennsylvania State University, 1975

M.S.E., Aerospace Engineering, University of Michigan, 1967

B.S.E., Aerospace Engineering, University of Michigan, 1966

Fellow, American Society of Mechanical Engineers, Elected 2008

NASA Fellow, Penn State University, Mechanical Engineering Department, 1970–1973

Elected to Honorary Sigma Xi Research Society 1973

Licenses and Certifications

Licensed Professional Engineer, Connecticut, #24271

Licensed Professional Engineer, Florida, #62164

Licensed Professional Engineer, Illinois, #062-050540

Licensed Professional Engineer, Michigan, #6201051092

Licensed Professional Engineer, Texas, #97096

Licensed Professional Engineer, Wisconsin, #36728-006

Languages

Lithuanian

Text Book

Curry DG, Karvelis AV. Ergonomics. Chapter 58, pp. 58.1–58.40. In: Manufacturing Engineering Handbook. Geng H (ed), New York: McGraw-Hill, June 2004.

Publications and Recent Presentations

Karvelis A. Designing around a patent—What every engineer should know. American Society of Mechanical Engineers International Short Course, January 7, 2011.

Karvelis A (ed). Proceedings, 7th International Power Transmission and Gearing Conference, 1996.

Karvelis A. A contextual analysis of the effectiveness of backup alarms. Proceedings, 14th International System Safety, August 12–17, 1996.

Karvelis A. Self-locking worm gears: Fact or fiction? Power Transmission Design, March 1996.

Karvelis A. Computer aided 3-D surface reconstruction during high speed crush events. SAE Special Publication SP-851, Technical Paper No. 910320, February 1991.

Karvelis A, Liubinskas A, Anderson C. 3-D coordinate reconstruction of high speed mechanically dynamic experiments. Presented at Image Acquisition & 10 Image Processing of Optical Engineering Midwest Conference, September 27–28, 1990.

Karvelis A (ed). Advanced topics in vibration. In: ASME Publication DE-Vol. 8, 1988.

Karvelis A. A systems approach to reducing gear rattle. SAE Technical Paper 870396, presented at SAE Congress, February 1987.

Karvelis A, Lapple W. Fluid dynamic forces in an atmospheric fluidized bed combustor. Proceedings, Fluid Mechanics of Combustion Systems, ASME, June 1981.

Karvelis A, Minoofar D. Practical considerations in noise testing of quiet valves. Proceedings, INTERNOISE-80 December 1980.

Karvelis A, Reethof G. A cross-correlation technique for investigating internal flow noise. Proceedings, ASME Noise & Fluids Engineering, November 1977.

Karvelis A, Reethof G. Valve Noise research using internal wall pressure fluctuations. Proceedings, INTERNOISE-74, 1974.

Karvelis A, Reethof G. Internal wall pressure field studies downstream from orificial-type valves. Instrument Society of America, Paper 74-827, 1974.

Reports

Karvelis A, Campbell K. Pressure delivery device for Meniere's disease. Report to Public Health Service, National Institute of Health, National Institute of Deafness and Other Communication Disorders, November 9, 1993.

Karvelis A, Raj D, *et al.* Acoustic monitoring of nuclear safety and relief valves. EPRI Final Report No. 3332, December 1983.

Olszewski JS, Anthony JM. Development of sensors and instrumentation for the TMI-2 OTSG Tube Vibration Measurements program. NP-1875 EPRI Research Project S140-1, June 1981.

Prior Experience

Senior Vice President, Packer Engineering, 2001–2008

Vice President, Packer Engineering, 1989–2001

Manager, Engineering Mechanics, Borg Warner Corporation, 1982–1988 (Responsible for Fluid-Thermal Group, Stress Analysis Group, Machinery Design Technology Group, Transmission Group)

Senior Research Engineer, Group Supervisor, Babcock & Wilcox Research Center, Mechanical Engineering Laboratory, 1977–1982

Research Engineer, The Trane Company, 1975–1977

Executive Officer-USNR-R, Intellectual Property Auditor, Department of the Navy, Office of Naval Research Reserve Unit 4-4, 1970–1975

Various Positions, U.S. Navy, Naval Air Systems Command, including tour as Senior Project Officer at Headquarters, Propulsion Division, 1967–1970 and student naval aviator

Project Experience

(Sample Projects as Principal Investigator/Manager)

Design, test, and installation of electromechanical mechanisms and sensors in: Mach 8 wind tunnel, nuclear reactor steam generator. Directed development of laser Doppler enabled *in-situ* fluid flow measurement technology in automotive torque converters. Led the design and development of a commercial high-speed die-cut and foil-transfer machine for paper-converting application.

Directed or participated in independent mechanical design reviews and/or safety reviews of: cookware, control and pressure relief valves, power boilers, hospital lifts, home elevators, aluminum ingot portable plant (casting and machining), steel fabrication equipment, Mars Lander deployer mechanism, automated remote maintenance systems, electric motor bearings, road milling machines, infant walkers, crop converter, and others.

Design of test facilities and execution of valve testing ranging from 1 cc/min gas flow simulation in silicon chip manufacturing to 1 million lbs /hour steam blowdown testing for nuclear PRV valves for post-Three Mile Island evaluations. Other testing has included accelerated life testing for high temperature liquid control valves.

Principal Investigator on a National Institutes of Health SBIR development of a portable pressure devices for alleviating the symptoms of Menier's Disease. Also performed independent mechanical and electrical design review for open MRI production version prior to commercial release. Developed reduction-to-practice process for infant heart-lung equipment and key design improvements for a miniaturized portable oxygen concentrator for patients.

Numerous failure and product recall investigations of industrial products such as valves, milling machines, hydraulic mobile cranes, windmill gearboxes, truck components, air compressors, and HVAC fire/smoke dampers crankshafts. Studies for product recall include consumer products such as infant toys and furniture, and boat transmissions, , and kitchen appliances.

Patent/trade secret projects: design-around patented technology for rail car components; reduction to practice for medical devices, infringement analysis; validity analysis for paper converting machinery, valves, and gas delivery systems, including trial testimony. Trained by the Office of Naval Research in 1970, later served on the Corporate Patent Committee at Borg Warner Corporation.

Led the design/NRC qualification /build and install of vibration sensors for nuclear steam generator monitoring at Duke Power and GPU (Three Mile Island II). At Oconee Unit II, the

team installed the sensors during a fuel outage in a radioactive environment requiring special safety procedures and equipment.

Directed the development of finite difference based fluid flow modeling for internal flows for US Navy Nuclear Fuels Program. Validation of code through closed form solutions of potential flow and experiments data on backward facing steps.

Appointed by the Wisconsin court to serve as the neutral member in a three person panel of experts in a mandatory arbitration involving an automated welding assembly line machine for car/truck frames. The dispute dealt not only with contract performance issues but also design and manufacturing practices.

Responsible for directing multi-disciplinary teams of OEM (GM, Ford, Chrysler, Subaru) in solving driveline problems associated with clutches and transmissions interacting with vehicle suspension. The transmission component design group, while under his supervision, was responsible for over 51 patent disclosure submittals filed with the USPTO. Improvements to manual transmissions, continuously variable and automatic transmissions as torque converter design were the focus of many of the patents.

In recognition for his contributions and expertise in machinery design and also in machine safety, Dr. Karvelis was appointed/elected by ASME to serve on both the ANSI/ASME B15.1 Safety Standard – Power Transmission committee and the ASME Design Engineering Division Technical Committee on Power Transmission and Gearing, as well as the ASME Design Engineering Division Design Education Committee. The Association for Manufacturing Technology has also recognized his contributions and expertise and appointed him Chair of the ANSI/AMT Safety Standard- B11.10 Metal Saws.

Academic Appointments

- Staff Faculty Member, Department of Mechanical Engineering, Pennsylvania State University, 1974–1975
- Adjunct Professor of Mechanical Engineering, Northern Illinois, 1986–1989
- Lecturer, Northern Illinois University, Department of Mechanical Engineering, 1990–2004 – Senior Mechanical Engineering Design Course
- Lecturer on “Safety and Ethics in Design & Philosophical Underpinnings of Engineering Ethics,” Northwestern University, 2005; Purdue University Mechanical Engineering Department Seminar on Design, 1984

Advisory Appointments

- US National Renewable Energy Laboratory (NREL) – US Department of Energy (DOE) Advanced Drivetrain Workshop Panel for Wind Turbine Technology, NREL, Denver, CO, June 2010
- Industrial Advisory Board, Northern Illinois University, Department of Mechanical Engineering, 2002–present
- Western Society of Engineers, Board of Directors/Trustee, 2003–2007
- Ohio State Gear Dynamics Laboratory, 1983–1989
- Purdue University, Herrick Labs Industrial Advisory Board, 1983–1987
- University of Iowa, Department of Mechanical Engineering, 1984–1987
- American Institute of Physics, Advisory Board Reviewer, 1972–1975

Peer Reviewer

- *ASME Journal of Mechanical Design*

Professional Affiliations

- American National Standard ANSI B11.10 “Safety of Machinery-General Requirements and Risk Assessment,” Issued December 2, 2010, Standard Developer/Committee Member
- ASME Design Engineering Division – Design Engineering Education Committee – Treasurer, Peer Review Journal Articles, 2008
- Session Organizer – Papers Reviewer: ASME 7th Symposium on International Design and Design Education- Best Practices in Design and Design Education – Montreal Canada
- Association for Manufacturing Technology- Subcommittee Machinery Safety Standard B11.19 Revision 2010
- ASME International Design Engineering Technical Conference/ IDETC/CIE 2009 – Technical Papers Review Coordinator, Paper Reviewer
- ASME Power Transmission & Gearing Technical Committee, Member 1985–present; Chairman 1992–1996
- Association for Manufacturing Technology (AMT) – ANSI B11.10 Safety Metal Saws Subcommittee Chair
- ASME International Design Engineering Technical Conferences, Session Organizer, Paper Reviewer, Las Vegas, NV, 2007
- HFES 51st Annual Meeting, Papers Reviewer, Assigned Co-Chair Warning Session, Baltimore, MD, 2007
- ASME International Design Engineering Technical Conferences, Session Organizer, Paper Reviewer, Long Beach, CA, 2005
- Western Society of Engineers (WSE) Board of Directors, Trustee, 2004–2008
- ASME Design Engineering Technical Conference, Paper Reviewer, Session Chair, Chicago, IL, 2003

- ASME Design Engineering Technical Conference, Paper Reviewer, Session Chair, Montreal, Quebec, 2002
- ASME Design Engineering Technical Conference 2000 Session Organizer, Technical Session Chair, Baltimore, MD, 2000
- Human Factors Society Technical Programs Committee Annual Conference, 1998
- Chair, ASME 7th International Power Transmission and Gearing Conference, San Diego, CA, 1996
- American Society of Mechanical Engineers – 6th International Power Transmission and Gearing Conference, Session Chairman, “Transmissions,” 1992
- SAE International Congress & Exposition, Session Chairperson, “Side Impact Occupant Protection Technologies,” 1991
- U.S. Small Business Administration – Small Business Innovation Research Program, Invited Speaker, “Small Business R & D – The Not So Obvious Benefits”
- Society of Automotive Engineers Personal Watercraft Safety Committee, 1990–1991
- American Society of Mechanical Engineers 5th International Power Transmission and Gearing Conference, Session Organizer and Session Chair, San Diego CA, 1989
- Industrial Research Exposition/Conference, Session Chairman, “Recent Trends in Mechanical Design,” September 1989, Chicago, IL
- Industrial Research Exposition/Conference, Organizer/Session Chair, “Recent Trends in Mechanical Design – Coordinating Design with Manufacturing,” September 1989, Chicago, IL, 1989
- American Society of Mechanical Engineers Design Technology Conference, Session Organizer, “Micro-Computer Applications in Vibrations,” Proceedings Editor, 1987
- Department of Mechanical Engineering, Purdue University; Pennsylvania State University, Invited Speaker, “Industrial Engineering Practice,” 1986
- Mechanical Failures Prevention Group (sponsored by Office of Naval Research & National Bureau of Standards), Reliability and Maintainability Conference, Naval Air Test Center, Session Chairman, “Wear Monitoring,” 1986
- American Society of Mechanical Engineers Design Division, Technical Committee on Sound and Vibration, 1980–1984; Vice Chairman, 1982–1984
- NBS/U.S. Navy, Mechanical Failures Prevention Group, Committee Member, 1984–1987
- American Society of Mechanical Engineers 4th International Conference on Power Transmission, Session Chairman, 1984
- Mechanical Failures Prevention Group Conference, Session Chairman, “Artificial Intelligence, Diagnostics,” Gaithersburg, MD
- Acoustical Society of America, S-4 Standards Committee Member, 1982–1984
- American Society of Mechanical Engineers Design Engineering Conference, Session Organizer and Chairman of Session 3.1, “Integrating Dynamic Testing into the Design and Development Cycle” Boston MA, 1981
- American Society of Mechanical Engineers Design Engineering Conference, Organizer and Chairman, “Signal Processing” Session, 1980
- OAI Digital Time Series Analysis Short Course, Lecturer, “Quality Assurance and Computer Software,” Santa Clara, CA

- Instrument Society of America, Standards and Practices Committee: SP-79, Control Valve Noise Measurement and Prediction, 1972–1976
- American Institute of Physics Advisory Panel on Publishing, 1972–1975
- Executive Officer, Office of Naval Research Reserve Unit 4-4, State College, PA, 1970–1975
- Summer Active Duty 1972–1973: Chicago ONR Office Technical Audit of ONR-sponsored research at Mid-West Universities
- Pentagon, Office of the Chief of Naval Operations, responsible for drafting OPNAVINST 3605 – Environmental Policy Manual for Military Airports, summer 1974