

**Alexander Kusko, Sc.D., P.E.**  
**Vice President****Professional Profile**

Dr. Kusko is an Electrical Engineer, a Life Fellow of the Institute of Electrical and Electronic Engineers (IEEE). His expertise is in the areas of electric power systems, electric machinery, and power-electronic equipment. In these areas, he has provided consulting services to government, commercial and industrial clients. Dr. Kusko holds twenty-one patents, as well as serving as an expert witness in numerous patent litigations. His publications include over 160 technical papers, nine books, of which the most recent, "Power Quality in Electrical Systems," co-authored with Dr. Marc T. Thompson, was published in 2007 by McGraw Hill. Dr. Kusko has received several awards including the Purdue University Distinguished Alumnus and the IEEE William E. Newell Power Electronics Awards. Examples of Dr. Kusko's recent electrical engineering work include serving as an expert witness in two patent litigations on brushless dc motors, investigation of a switchgear explosion in a utility substation and specifying the power-electronic drive system for a large motor-driven pump on a dredge. Prior to joining Exponent, Dr. Kusko served on the faculty of MIT as Associate Professor of Electrical Engineering, and as President of Alexander Kusko, Inc., Consulting Engineers. He also served as an Electronics Maintenance Officer in the US Navy on Guam and in the Philippine Islands.

**Academic Credentials and Professional Honors**

Sc.D., Electrical Engineering, Massachusetts Institute of Technology, 1951

S.M., Electrical Engineering, Massachusetts Institute of Technology, 1944

B.S., Electrical Engineering, Purdue University, 1942

Sigma Xi; Tau Beta Pi; Eta Kappa Nu; Life Fellow, Institute of Electrical and Electronics Engineers; IEEE William E. Newell Award for Outstanding Achievement in Power Electronics; Purdue University Distinguished Alumnus Award

**Licenses and Certifications**

Registered Professional Electrical Engineer, Massachusetts, #6173

## Publications

“An Enhanced Dynamic Battery Model of Lead-Acid Batteries Using Manufacturers’ Data,” presented at the INTELEC 2006 Conference, Providence, RI, September 12, 2006 (with N.K. Medora).

“Economic and Technical Comparison of Dynamic Voltage Compensator with Uninterruptible Power Supply,” presented at the Power Quality Conference, Long Beach, CA, October 24–26, 2006 (with N.K. Medora).

“Fault Sensing with an Artificial Reference Potential Provided by an Isolated Capacitance Effect,” presented at the 2006 IEEE Symposium on Product Safety & Compliance Engineering, Irvine, CA, October 23–24, 2006 (with N.K. Medora).

“Satisfying the Demand for High-Quality Electric Power Service from Clean Electricity Supplies,” presented at the AGS Annual Meeting, Barcelona, Spain, March 18–21, 2007.

“Analysis of Battery Cable Faults Using A Dynamic Battery Model,” presented at the 2007 Battcon Battery Conference, Tampa, FL, May 1–3, 2007 (with N.K. Medora).

“Failures of Electrical Connectors-Selected Case Studies,” presented at the 2007 IICIT Symposium and Expo, Dedham, MA, May 8–9, 2007 (with N.K. Medora).

“An Enhanced Computer Simulation Model of the IEEE Std C62-41.2-2002 Surge Generator for Simulated Surge Testing of Electrical Systems,” for presentation at IEEE Product & Safety Society Symposium, Denver, CO, October 22–23, 2007 with (N.K. Medora).

“New Concepts in Large AC Motor Protection,” *EC&M*, March 2006, pp. 22–24 (with J. Ayoub).

“An Enhanced Dynamic Battery Model of Lead-Acid Batteries Using Manufacturers’ Data,” for presentation at the INTELEC 2006 Conference, Providence, Rhode Island, September 12, 2006 (with N.K. Medora).

“Economic and Technical Comparison of Dynamic Voltage Compensator with Uninterruptible Power Supply,” for presentation at the Power Quality Conference, Long Beach, CA, October 24–26, 2006 (with N.K. Medora).

“Fault Sensing with an Artificial Reference Potential Provided by an Isolated Capacitance Effect,” for presentation at the 2006 IEEE Symposium on Product Safety and Compliance Engineering, Irvine, CA, October 23–24, 2006 (with N.K. Medora).

“Selecting the Right Battery,” *EC&M*, pp. 28-32, August 2005.

“Short-Term, Long-Term, Energy Storage Methods for Standby Electric Power Systems,” presented at IEEE IAS 40<sup>th</sup> Annual Meeting, Hong Kong, October 2005 (with J. De Dad).

“Dynamic Battery Modeling of Lead-Acid Batteries Using Manufacturers’ Data,” presented at the Intelc 2005 Conference, Berlin, Germany, September 20, 2005 (with N.K. Medora).

“Impact on Power Quality of Restoration of Air-Conditioning Load Following Service Interruption,” for presentation at Power Quality 2005 Conference, October 25–27, 2005, Baltimore, MD (with N.K. Medora).

“New Concepts in Large AC Motor Protection,” *Electrical Construction and Maintenance*, 2005.

“Single-Frame Dual-Voltage Generator, AC and DC Output with Independent Control,” Presented at INTELEC 2004 Conference, Chicago, IL, September 21, 2004.

“Reduction of Harmonic Voltage by Induction Motors in Industrial Power Systems,” Presented at Power Quality Exhibition and Conference, Chicago, IL, November 17, 2004.

“The Case of the Live Neutral Conductor,” *Electrical Construction and Maintenance*, pp. 16–18, October 2004.

“The Case of the Missing Fuses,” *Electrical Construction and Maintenance*, pp. 14-18, April 2003.

“Poor Equipment Placement Can Have Disastrous Consequences,” *Electrical Construction and Maintenance*, pp. 14–15, June 2003.

“Single-Frame Dual-Voltage (e.g. 42/14V) Alternator,” presented at M.I.T./Industry Consortium on Advanced Automotive Electrical/Electronic Components and Systems Program Review Meeting, Tokyo, Japan, October 28–29, 2003.

“TV Technician Draws the Short Stick,” *Electrical Construction and Maintenance*, pp. 12–14, May 2002.

“Power Factor Correction for Induction Motors,” presented at INTELEC 2001 Conference, Chicago, IL, 2001.

“The Case of the Faulty Circuit Breaker,” *Electrical Construction and Maintenance*, pp. 20–22, September 2000 (with M.B. Jacobs).

“Computer-Aided Design and Analysis of Power-Harmonic Filters,” *IEEE Transactions on Industry Applications*, pp. 604–613, March/April 2000 (with N.K. Medora).

“Electrical Arcing -- Its Impact on Power Quality,” *Power Quality Assurance*, May/June 1996 (with R. Blanchard).

“Power Electronic Equipment Protection,” *Power Quality Assurance*, pp. 60–62, January/February 1996 (with R. Blanchard).

“Application of 12-Pulse Converters,” *Elevator World*, February 1992.

“Handling Nonlinear Loads with an Emergency Generator,” *Power Quality Magazine*, 1990.

“Minimize Cost of Engine/Generator Protection with Static Relays,” *Power*, May 1987 (with S.M. Peeran).

“Long-Term Reliability System Specifics Affect Power Supply Choice,” *Computer Technology Review*, Fall 1986.

“Selecting Electric Motor Drives for the Chemical Processing Industries,” *Chemical Processing*, August-September 1986 (with D. Galler).

“High Frequency SCR Chopper Circuit Improves DC Servo Motor Response,” *Control Engineering*, p. 44–47, March 1977 (with T. Knutrud).

“Designing Reliability into Equipment Having Power Semiconductors,” Part 1, *Electronics*, p. 111–115, March 1976 (with T. Knutrud and J. Cain).

“Computer Design Analysis of the Leakage-Reactance Ballast,” *Illuminating Engineering*, April 1966 (with T. Wroblewski).

“A New Educational Program in Energy Conversion,” *Electrical Engineer*, February 1956 (with G. Brown and D.C. White).

## **Presentations**

“Standby Engine Generator Interaction with UPS Harmonic Input Filters,” Presentation, 2008 Power Quality and Reliability Conference, Las Vegas, NV, February 26–29, 2008 (with N.K. Medora).

“Selection and Specification of Harmonic Filters to Maintain Power Quality,” Presentation, Power Systems World, Boston, MA, October 2, 2000 (with S.M. Peeran).

“Design of Electrical Interface: Utility to Critical Load Facility,” Presentation, Intelec 2000, Phoenix, AZ, September 2000 (with J. Ayoub).

“High-Power, High-Frequency, Series-Resonant Inverters,” Presentation, 18<sup>th</sup> Annual Conference on Properties and Applications of Magnetic Materials, Illinois Institute of Technology, Chicago, IL, April 26, 1999.

“Computer-Aided Design of Power Harmonic Filters,” Presentation, Institute of Electrical and Electronics Engineers Industry Applications Conference, 33<sup>rd</sup> IAS Annual Meeting, St. Louis, MO, October 1998 (with N.K. Medora).

“Impact of Tuned Harmonic Filters and Power Factor Correction Capacitors on Long-Duration Arcing Fault Current,” Presentation, Institute of Electrical and Electronics Engineers Industry Applications Conf., 33<sup>rd</sup> IAS Annual Meeting, St. Louis, MO, October 1998 (with N.K. Medora).

“Electrical System Safety Issues,” Presentation, M.I.T./Industry Consortium on Advanced Automotive Electrical/Electronic Components and Systems Program Review Meeting, Cambridge, MA, June 23, 1998 (with J. Rennecker).

“What Kinds of Catastrophes Can Occur in the Provision of Electrical Energy?” Presented at the American Bar Association Annual Meeting, San Francisco, CA, August 1, 1997.

“Survey of Rotary Uninterruptible Power Supplies,” Presented at the IEEE Intelec ‘96, October 6–10, 1996 (with S. Fairfax).

“Utility Interface Issues of Power Electronic Converters,” Tutorial Paper, presented at 1995 IEEE-IAS Annual Conference, Orlando, FL, October 8–12, 1995.

“Failures of Electronic/Equipment,” Professional Advancement Course presented at Power-systems World© Conference, Long Beach, CA, September 9–15, 1995 (with R. Blanchard).

“Power Harmonic Problems at a Plastics Extrusion Plant,” Presentation, Institute of Electrical and Electronics Engineers Industrial Applications Society 30<sup>th</sup> Annual Technical Conference, Orlando, FL, October 1995 (with N.K. Medora).

“Power Factor Correction IC’s—A Topological Overview,” Presentation, Intertec International, Inc. High Frequency Power Conversion Conference, San Jose, CA, May 1995 (with N.K. Medora and R. Blanchard).

“Switching of Power Harmonic Filters,” Presentation, Institute of Electrical and Electronics Engineers Industrial Applications Society Annual Meeting, Denver, CO, October 1994.

“Successful Demand Side Management Involves System Analysis,” Presentation, Power Quality ‘94 Conference, Dallas, TX, September 1994 (with J. Ayoub).

“Impact of Power Harmonics on Electric Power System Equipment,” Presentation, Power Engineering Society Boston Chapter, Power Quality in the Electric Utility Industry Seminar, Boston, MA, May 1994.

“Operation of Electrical Loads Supplied from Sine-Wave Current-Source UPDS,” Presentation, High Frequency Power Conversion Conference, San Jose, CA, April 1994.

“Utilizing Reliability Models for the Optimization of Maintenance Costs,” Presentation, Conference on Controlling Overhead and Management Costs in the Power Industry, Institute for International Research Conference, Washington, DC, December 1993.

“Distributed UPS Systems,” Presentation, Uninterruptible Uptime Users Group (UUUG) Meeting, October 1993 (with D. Diamond).

“Distributed vs. Central Uninterruptible Power Systems (UPS),” Presentation, Disaster Avoidance and Recovery, 2nd Annual Conference, New York, NY, May 1993.

“Impact of Source Impedance on the Operation of Power Semiconductor Converters,” Presentation, IEEE Power Engineering Society Jamborruption, Boston, MA, May 1993.

“Electric Power Distribution Practice in the United States,” Presentation, Power Quality Europe, Munich, October 1992.

“Electrical Disasters Causes and Avoidance,” Presentation, The First International Disaster Avoidance and Recovery Conference, Chicago, IL, July 1992.

“Measurement of Permanent Magnet Rotor Magnetization Characteristics of DC Brushless Motors,” Presentation, IEEE Industrial Applications Society Annual Technical Conference, Houston, TX, October 1992.

“VAR Compensator Correction of Gross Voltage Fluctuations,” Presentation, First International Disaster Avoidance Conference, Chicago, IL, June 1992.

“Air-Core vs. Iron-Core Inductors for Power Electronics Applications,” Proceedings, 4th European Conference on Power Electronics and Applications, Florence, Italy, September 1991.

Design of Power Harmonic Filters,” Power Quality Conference, Paris, France, November 1990 (with S.M. Peeran).

“Nonlinear Loading of Static and Rotating Uninterruptible Power Supplies,” International Power Electronics Conference, Tokyo, Japan, April 1990 (with S.M. Peeran and D. Galler).

“Arcing Fault Protection of Low-Voltage Distribution Systems in Buildings,” Presentation, IEEE Industrial Applications Society Annual Meeting, Atlanta, GA, October 1987 (with S.M. Peeran).

“Brushless DC Motors Using Unsymmetrical Field Magnetization,” Presentation, IEEE Industrial Applications Society Annual Meeting, Denver, CO, October 1986 (with S.M. Peeran).

“Survey of Electrical Protection Systems in Modern Rapid Transit Cars,” Presentation, IEEE Industrial Applications Society Annual Meeting, Toronto, Ontario, October 1985.

“Current Balance in Parallel Power Diodes in Three-Phase Rectifiers,” Presentation, IEEE Industrial Applications Society Annual Meeting, Toronto, Ontario, October 1985 (with S.M. Peeran, W. Hodgson, and F. Fellendorf).

“Tuned Filters for Traction Rectifier Sets,” Presentation, Joint American Public Transit Association Technical Liaison Board and International Rail Transit EMI/EMC Technical Working Group Meeting, U.S. Department of Transportation, Transportation Systems Center, Cambridge, MA, January 1984 (with S.M. Peeran).

“BART Traction Motor Improvement Program,” IEEE Industrial Applications Society Annual Meeting, San Francisco, CA, October 1982 (with M. Clapp and J.H. King).

“Survey of Microprocessors in Industrial Motor Drive Systems,” IEEE Industrial Applications Society Annual Meeting, San Francisco, CA, October 1982 (with D. Galler).

“Potential Use of Extended Speed Range AC Drives for Cranes and Hoists,” Presentation, Control Engineering Conference and Exposition, Chicago, IL, May 1982 (with D. Galler).

“A Fast Response Transistor Current Regulator for Welding Research,” Presentation, IEEE Industrial Applications Society Annual Meeting, Philadelphia, PA, October 1981 (with D. Galler and J. Converti).

“Grounding Practice for Electric People Mover Vehicles,” Presentation, IEEE Industrial Applications Society Annual Meeting, Cincinnati, OH, September/October 1980 (with J.J. La Marca and J.D. Glover).

“Power Supplies for Superconducting MHD Magnets,” Presentation, Super Conducting MHD Magnet Design Conference, Cambridge, MA, March 1980.

“Can Adjustable Speed AC Motor Drives Conserve Energy,” Testimony for Presentation to U.S. Senate Subcommittee on Antitrust, Monopoly and Business Rights Committee on the Judiciary, June 26, 1979.

“State of the Art: Solid State AC and DC Motor Drives in Industry,” Proceedings, International Semiconductor Power Converter Conference, Institute of Electrical and Electronics Engineers, Baltimore, MD, May 1972.

“Analysis of Forces in Permanent Magnet Transducers,” Presentation, Institute of Electrical and Electronics Engineers Intermag Meeting, Washington, April 1970, published in Transactions on Magnetics, March 1970.

“Quality of Electric Power,” Transactions on Industry and General Applications, Institute of Electrical and Electronics Engineers, Vol. IGA-3, No. 6, p. 521–524, Nov./Dec. 1967.

“Concept of Modular Static Uninterruptible Power System,” Conference Record, 2nd Industrial and General Applications Group Annual Meeting, Institute of Electrical and Electronics Engineers, Pittsburgh, PA, October 1967 (with F. Gilmore).

“Vehicle Electric Drive Systems,” Presentation, Society of Automotive Engineers Power Plant and Transportation Meeting, Chicago, IL, October 1966 (with L. Magnuson).

“High Voltage D-C Transmission,” Institute of Electrical and Electronics Engineers, One Day Institute on EHV System Design, Boston Section - Power Chapter, May 1966.

“Polyphase Closed-Core Reactors,” Transactions on Power Apparatus and Systems, Institute of Electrical and Electronics Engineers, Vol. PAS-84, No. 1, p. 57–64, January 1965.

“Thermal Considerations of Generators in High-Speed Aircraft,” Transactions, American Institute of Electrical Engineers, Vol. 76, Part II, p. 205–208, 1957.

## **Books**

*Power Quality in Electrical Systems*, A. Kusko and M.T. Thompson (eds), McGraw-Hill, McGraw Hill, 2007.

*“Electronic Failure Analysis Handbook,”* McGraw Hill, 1999.

*“Emergency/Standby Power Systems,”* McGraw Hill, 1989.

*“Standard Handbook for Electrical Engineers,”* Section 20, titled “Motors,” 12<sup>th</sup> Edition, McGraw Hill, 1987.

*“Standard Handbook for Electrical Engineers,”* 11th Edition, McGraw-Hill, 1971.

*“Electric Machinery,”* 3rd Edition, McGraw-Hill, 1971 (with Fitzgerald and Kingsley).

*“Solid-State DC Motor Drives,”* The M.I.T. Press, 1969.

*“Computer-Aided Design of Magnetic Circuits,”* The M.I.T. Press, 1969 (with T. Wroblewski).

## **Professional Affiliations**

- Institute of Electrical and Electronics Engineers, IEEE (member)
- IEEE Committees: Industrial Drive; Energy; Fellows and Awards
- Lamme Medal Award; M.I.T./Industry Power Electronics Collegium Steering Committee (member)