

James C. Fitch

jfitch@tesibis.com

+1 918 605 5465

Curriculum Vitae

Updated 10/30/2025



EDUCATION

Georgia Institute of Technology, BIE, Industrial and Systems Engineering, 1978.

University of Tulsa, MBA, Business Administration, 1981.

FIELDS OF SPECIALIZATION

Lubricant Analysis	Gear Failure Analysis	Lubrication Systems
Contamination Analysis	Tribology & Wear	Filtration & Separation
Hydraulic Fluids	Oil Analysis	Wear Particle Analysis
Petroleum Analysis	Compressor Lubrication	Grease Analysis
Particle Analysis	Bearing Failure Analysis	Motor Oils & Engine Lubrication

EMPLOYMENT AND PROFESSIONAL HISTORY

Tesibis LLC. Self-employed. Consulting and expert testimony and support services. www.tesibis.com

Luneta LLC. Owner/Director but not active in business operations. Luneta is a leading producer of proprietary inspection products.

Pabelon LLC. Owner/Director but not active in business operations. Pabelon offers consolidated workforce training solutions based on competency testing.

Noria Corporation - Tulsa, OK, Founder and CEO (1997-2025). Global leader in technical consulting and education in the fields of lubrication, tribology, machine reliability and oil analysis. Business offices and operations in 25 countries. Publishers of *Machinery Lubrication* magazine. Noria educates thousands of people each year. World's leading lubrication and oil analysis consulting organization. Noria is a vendor-neutral organization. For details on Noria Corporation, go to www.noria.com. Noria was sold to Boston-based Battery Ventures in March of 2025.

Diagnetics, Inc. - Tulsa, OK, Founder and CEO (1982-1997). The company was sold to the Entek Division of Rockwell International, June 1997. Business highlights:

- Developed, manufactured and marketed proprietary lubricant analysis instruments, software and services for the maintenance technology field.
- Products were sold in more than 40 countries and were endorsed by Caterpillar, U.S. Department of Defense (JOAP) and numerous other major corporations.

- The international market research firm Frost & Sullivan, in their 200-page report on the condition monitoring industry, stated, "Diagnetics is the industry leader worldwide in oil analysis equipment for predictive maintenance."
- Designed and implemented a full-service commercial oil analysis laboratory for industrial customers.

Utica Research and Development Corporation, Tulsa, OK - Founder and President. General Partner of an R&D limited partnership to develop a hybrid engine producing both hydraulic and mechanical power. 1983 to 1988.

Fluid Engineering Services, Tulsa, OK - Consulting Engineer. 1980-1981.

Monsanto Chemical Company, Pensacola, FL - Project Engineer. 1978-1980.

Fluid Power Research Center, Oklahoma State University, Stillwater , OK – Laboratory Technician. 1974 to 1977.

PATENTS

- U.S. Patent No. 4,588,505, awarded May 13, 1986, "Moisture-In-Oil Extraction Device." Licensed in 1987 to Polysorb Corporation.
- U.S. Patent No. 5,095,740, awarded March 17, 1992, "System for Monitoring and Analyzing Solid Contaminants in Fluids."
- U.S. Patent No. 5,385,043, awarded June 13, 1994, "In-line Contamination Measurement Device."
- U.S. Patent No. 5,388,447, awarded August 30, 1994, "Viscosity Measurement Apparatus."
- U.S. Patent No. 5,708,198, awarded January 13, 1998, "Ferrous Particle Counter."
- U.S. Patent No. 5,540,089, awarded July 30, 1996, "Particle Collection Apparatus."
- U.S. Patent No. 5,563,337, awarded October, 10, 1996, "Moisture Monitor Apparatus For A Fluid System."
- Patent Pending (serial number 10/835,723), "Automated Machinery Lubrication Service and Maintenance Planning System," April, 2004
- U.S. Patent No. 9,632,072 B1, awarded 4/25/2017, "Lubrication Condition Monitoring Pod for Pressurized Applications"
- U.S. Patent No. 9,982,838 B2, awarded 5/29/2018, "Condition Monitoring Pod"
- U.S. Patent No. 10,436,385 B2, awarded 10/8/2019, "Condition Monitoring Pod"
- U.S. Patent No. 10,539,054 B2, awarded 1/21/2020, "Condition Monitoring Sight Glass with Remote Sensing Ports"
- U.S. Patent No. 10,545,045 B2, awarded, 1/28/2020, "Machine Fluid Condition Monitoring System"
- U.S. Patent No. 11,047,758 B1, awarded 6/29/2021A, "Pressure Indicator for Static Storage Container"
- U.S. Patent No. 11,137,110 B2, awarded 10/5/2021, "Condition Monitoring Pod"
- U.S. Patent No. 11,525,724 B2, awarded 12/13/2022, "Machine Fluid Condition Monitoring System"
- U.S. Patent No. 11,525,725 B2, awarded 12/13/2022, "Machine Fluid Condition Monitoring System"

AWARDS

- American Society for Business Publication Editors Editorial Award, September, 2006.
- Outstanding Service Award, Korea Plant Service and Engineering Association, 1997.
- Outstanding Engineer Award for 1996, Oklahoma Society of Professional Engineers.
- Outstanding Engineering Achievement Award for 1995, Oklahoma Society of Professional Engineers.
- Society of Automotive Engineers (SAE) Literary Award for Paper No. 861308. By Engineering Activity Board. SAE 1986 Transactions.
- Society of Automotive Engineers (SAE) Literary Award for Paper No. 860738. By Engineering Activity Board. SAE 1986 Transactions.

CONSULTANCY (Partial List of Failure Investigations, Forensic Investigations, Technical Consulting, etc.)

3M - Hutchison Plant - Plant Lubrication Modernization and Transformation

A2 Technology - Oil Analysis Instrument Development

AAI Textron - Fluid Related Failure Investigation

AeroJet (Div. of GenCorp, Inc.) - Failure Investigation Relating to Titan IV Missile Lubrication

American Crystal Sugar - Bearing Failure Investigation and Lubricant Study

American Crystal Sugar - General Lubrication and Oil Analysis Consulting

Analytical Systems Laboratories - General Consulting Relating to Electrostatic Separators

Arch Coal - Consulting on Lubrication of Bearings

Asarco Mining Mine Site - Lubrication Modernization Consulting

Babcock and Wilcox - Pulverizer Gearbox, Failure Investigation

Bechtel - Rack and Pinion Gear Failure Investigation

Belvac Production Machinery - Lubrication Systems Consulting

BioBlend - Litigation

Bryon Nuclear/MPR Associates - Lubricant Oxidation Stability Study

Buena Borough – Litigation related to gearbox lubricant failures

Bunge North America – Development of a Corporate Oil Analysis Manual

C.C. Jensen - Testing Study for Separation of Carbon Insolubles from Lube Oils

California State University Long Beach – Expert Witness relating to an Elevator Hydraulic System Failure Case

Callaway Nuclear Generating - Turbine Bearing Failure Investigation

Calpine Energy - Failure Investigation, Gas Turbine Varnish

Calvert Nuclear - Grease Oxidation Study

Cargill, Inc. - General Lubrication and Oil Analysis Consulting

Carleton Life Support - Vacuum Pump Lubricant Study for Aerospace Applications

Carolina Power & Light - Harris Nuclear - Failure Investigation Regarding Reactor Coolant Pump

Caterpillar, Inc. - Bulk Oil Handling and Storage Project

Caterpillar, Inc. - Technical Report and Consulting on Diesel Engine Lubrication and Contamination Control

Cerestar (Cargill Div.) - Compressor Failure Investigation - Lubrication Related

Champion International - Plant Lubrication Modernization Consulting

Chelan PUD Hydro Electric - Turbine Oil Varnish and Aeration Failure Investigation

CHS – Refinery oil mist lubricant selection and testing (two projects)

Clarcor Corporation - Contamination Control and Filtration Project

Columbia Gulf Corporation - Failure Investigation on Main-Line Natural Gas Engine and Compressor Corrosion Problems
Lubricant Selection Study

Colonna Shipyard - Hydraulic System Failure Investigation & Litigation

Columbia Transmission Company - Oil Analysis Study For Gas Compressors Lubricant Selection Study

Coman-Chrysler - Rolling Element Bearing Failure Investigation

Country Flame Technologies, Inc. - Expert Witness - Gearbox and Bearing Failure

Crane Engineering - Lubricant Formulation Study Machine Tools

Cummins Engine Company - Failure Investigation Relating to Diesel Engines on a Fleet of Mobile Equipment

Cymer Inc. - Bearing Failure Investigation

CWL - Gear Coupling Failure Investigation

Detroit Edison: Fermi II Nuclear Station - Oil Analysis and Lubrication Procedure Manual Development

Delek - Compressor Thrust Bearing Failure Investigation

Dresser Rand - Compressor Radial Shaft Bearing Failure Investigation

Duke Energy - Turbine Oil Performance Study

Duke Energy - Wind Turbine lubricant study

Duke Energy – Microbial contamination of turbine oil consulting and testing

DuPont Chemical Company - Development of Corporate Lubricant Interchange Guide

Duquesne Light & Power - Plant Lubrication Modernization Consulting

Eaton Corporation - Advisory Services and Testing of New Dielectric Oil Analysis Instrumentation for Motor Oils

Electric Power Research Institute - General Lubrication and Oil Analysis Consulting

Eli Lilly - Lubricant Selection Project

Entergy Corporation (Waterford 3 Nuclear Station) - Failure Investigation on Lubrication of a Reactor Coolant Pump

Equistar Chemical Company - Refrigeration Compressor Bearing and Turbine Oil Failure Investigation

Esco Corporation - Contamination Control Project for Hydraulic Systems

Exelon Corporation (Peachbottom Nuclear Generating Station) - Failure Investigation of a Radiologically Contaminated
Turbine Lubricant

Exelon Corporation (Quad Cities Nuclear Station) - Onsite Lubrication Survey for Plant Modernization

Exelon Corporation: LaSalle Nuclear Power Station - Failure Analysis of Electro Hydraulic Control (EHC) Synthetic Fluids -
Varnish Related

ExxonMobil Corporation - Expert Witness - Tractor-Trailer Wheel-End Bearings - FFE Case
ExxonMobil Corporation - Expert Witness - Tractor-Trailer Wheel-End Bearings - Comcar Case
ExxonMobil Corporation - Expert Witness - Tractor-Trailer Wheel-End Bearings - Lori Jones Case
ExxonMobil Corporation - Re-engineering of Oil Analysis Services Program and Laboratory Study
FA Technology Ventures - Technical Consulting Relating to Electrostatic Oil Reclamation
Fluid RX Corporation - Automotive Lubricants Service Interval Survey
GasTops - General Oil Analysis Consulting
General Dynamics/U.S. Marine Corps - Hydraulic Contamination Failure Investigation for the Expeditionary Fighting Vehicle
General Electric Co. - Gas Turbine Lubricant Varnish Project
Georgia-Pacific Corporation - Plant Lubrication Modernization Consulting
Goodyear Tire & Rubber (Americana) - Hydraulic System Condition Monitoring Program Design
Goodyear Tire & Rubber Co. - Lubrication Procedures Development Contract
Gulf Coast Filters - Expert Witness Relating to Filter Performance Testing
Hangsterfers, et al – Expert Witness Relating to a Slideway Lubrication
Hellman & Friedman - Market Research of Lubrication Industry
Honeywell - Consulting Relating to Lubricant/Metallurgy Compatibility
Houston Lighting & Power (Reliant Energy) - Oil Analysis Laboratory Procedures Study
Hurricane Rita Bus Case - Court Case Related to Bus Wheel Bearing Failure
Hyundai/SK Lubricants – Lubricant failure investigation
Hyundai v. Napleton – Litigation related to engine connecting rod bearing failures
Idemitsu Chemical - Lubricant Testing Study
Ingram Barge - Failure Investigation on Marine Propulsion Engines and General Consulting
International Paper - Failure Investigation - Hydraulic Servo Valves
International Paper - General Lubrication and Oil Analysis Consulting - Site Visits to 11 Mills
ISOPur Corporation - Turbine Oil Degradation Laboratory Study
Jacobs Vehicle Systems - Forensic Investigation on Diesel Engine Lubrication
John Deere - Hydraulic Fluid Contamination Control Consulting
Kimberly Clark - Bearing Corrosion Root Cause Failure Analysis
Koch Industries: Corpus Plant - Failure Investigation Regarding Lubrication on Compressors
Koch Industries: Pine Bend Plant - Failure Investigation Regarding Sludge and Varnish Problems in Compressors
Koch Petroleum - Compressor Lubricant Failure Investigation - Sludge and Varnish Related
Kongsberg - Wormgear Reliability Study
Lehigh Cement Company - Gear Coupling Failure Investigation - Lubrication Related
Lockheed Martin - Aircraft Hydraulic Contamination Control Study
Lone Star Industries - Gearbox Failure Investigation - Lubrication Related
Louisiana Hydro Electric Co. - Failure Investigation of a Step-Up Gearbox and Laboratory Testing of Candidate New Lubricants
Louisiana Hydro Electric Co. - Lubricant Testing and Analysis Project Gear Oils
Lubrizol Corporation - Technical Consulting Relating to Sensor Development
MAC Steel USA (Cargill Div.) - Design and Development of Bearing Lube Oil System
Mars Petcare - High Temperature Oven Lubrication
Measurement Analysis Corporation - Technical Consulting - Synthetic Lubricant Selection
Medtronic - High-Temperature Lubricant Study
Medtronic, Inc. - Failure Investigation Relating to Bearing Lubrication of Surgical Drills
Meridian - Linear Bearing Failure Investigation
Metropolitan Washington Airport Authority - Forensic Gearbox Failure Investigation
Michelin Tire Company - Lubricant Compatibility Lab Study
Michelin Tire Company - Technical Consulting - Modernization of Plant Lubrication
Ministry of Defense, Netherlands - General Lubrication and Oil Analysis Consulting
Mitsui & Co. – Market Research Consulting
Model T Ford - Litigation on Diesel Engine Failures
Monsanto Chemical Company - Aircraft Lubricant Contamination Control Project

NASA/Lockheed Martin - Failure Investigation Relating to Space Shuttle Hydraulics
Nautor Swan Yachts - Litigation Hydraulic System Failure
New York Power Authority - Power Plant Lubrication Study
Northwood Pulp & Paper - Plant Lubrication Modernization Consulting
Oceaneering - Hydraulic Fluid Selection Study
OCI Global - Two
Ontario Power Generation (Pickering Nuclear Station) - Failure Investigation Relation to Nuclear Plant Refueling Hydraulic Systems
Owens Corning - High Temperature Chain Lubricant Failure Investigation
Pacific Gas & Electric - Turbine Lubricant Failure Investigation
PacificCorp - Wind Turbine Gearbox Failure Investigation
Pall Corporation – General Consulting Services
PANalytical, Inc. - Application Consulting on XRF Spectroscopy
PEMEX Petroquimica (Mexico) - Gas Plant Lubrication Modernization
Phillips Petroleum - Lubrication Selection and Technical Advisory Services
Piedmont Group - General Consulting on the Lubrication Industry
Portugen Energia, S.A. - Gas Turbine Failure Investigation Relating to Aeration of Turbine Oil
Progress Energy, Inc. - Combustion Turbine Failure Investigation - Varnish and Sludge Related
Progress Energy, Inc. - Lubrication Management Consulting for Fossil Fuel Plants
Public Service of Indiana - Plant Lubrication Modernization Consulting
Qafco Fertilizer - Lubricant Compatibility Study
Reviva Corporation - Contamination Control of Diesel Engine Remanufacturing
Reynolds Brand - High-Temperature Grease Failure Study
Rockwell Automation - General Lubrication and Oil Analysis Consulting
Royal Purple Lubricants - Expert Witness, Failure Investigation Relating to Marine Lubricants
SC Johnson - Bearing lubrication and Auto Lube Systems
Seaspan International - Hydraulic Pump Failure Investigation
Sentinel Capital Partners - Expert Advisor for the Acquisition of a Lubrication Supply Company
SFW Capital - Oil Analysis Market Research
Shikoku Electric - Oil Analysis Performance Study
Sikorsky Aircraft - Expert Witness - Gearbox Failure on Helicopters
SPX Service Solutions - Contamination Control Product Development
Staley Corporation - Plant Lubrication Audit for Modernization
Stolle Machinery -Lubricant Selection for Production OEM Machinery
Symyx Technologies, Inc. - General Consulting relating to Online Lubricant Sensors
TECH Appraiser, Inc. - Diesel Engine Lubricant Failure Investigation
Texas Utilities - Bowl Mill Gearbox Lubrication Study
Texas Utilities - Turbine Oil Technical Consulting - Several Power Plants
ThermoFisher - Consulting for Lubricant Analysis Instrumentation
TigerCat Equipment Co. - Failure Investigation Relating to a Corrosion Problem on Tractor Hydraulics
Timken Bearing Company - Technical Consulting - Wear Debris Sensor Technology
Torres Crane – Litigation related to crane failure gearbox and coupling
Trane – Consulting related to lubricant hydrolytic stability
Translume, Inc. - Consulting Relating to Optical Oil Sensor Development
Trico Manufacturing - Lubrication Formulation Testing
U.S. Airforce/Spectro – General Oil Analysis Consulting
U.S. Enrichment Corporation - Turbine Oil Failure Investigation for Gas Compressors
U.S. Steel Corporation - Failure Investigation Relating to Steel Straddle Carrier Hydraulics
Union Pacific Railroad - Development of New Contamination Control and Oil Analysis Programs
United Forest Products Case – Litigation related to Tractor Trailer Rig landing gear
Valero - Varnish and Sludge Study on Compressor Lubricant

Warren Distribution - Expert Witness relating to Turbine Oil Failure
WaterPik – Failure Investigation related bearing and lubricant failures
Westar Energy - Failure Investigation, Turbine-Generator Varnish
Westar Energy Inc. - Failure Investigation of Turbine Oil Sludge
Western Construction – Litigation related to a tower crane case
Westlake Chemical - Lubricant Contamination Investigation (two cases)
West Port – Failure investigation related to hydraulic fluid degradation and insolubles
Weyerhaeuser Company - Plant Lubrication Modernization Consulting
Weyerhaeuser Company (Cedar River Paper) - Failure Investigation - Lubricant Sludge and Varnish
Whisper Gen - Rolling Element Bearing Study
Windward Petroleum - Expert Witness for Lubricant Cross-Contamination Case
Zeigler Coal - General Lubrication and Oil Analysis Consulting
Zellstoff Celgar Pulp – Turbine Oil Foam and Aeration Investigation

BOARD MEMBERSHIPS & PROFESSIONAL AFFILIATIONS

ASTM - Member of D02 SC96 committee for standards development relating to the analysis of in-service lubricants.

International Council for Machinery Lubrication (ICML) – Founder/Director. Volunteer position. The ICML is a non-profit professional organization. Serves as ANSI (American National Standards Institute) TAG member to ISO (International Standards Organization) and is involved in international standards development, professional certifications in lubrication and oil analysis, curriculum development, annual achievement awards and scholarship. Visit www.lubecouncil.org for more information.

International Standards Organization (ISO) - Serve as United States Delegate on Technical Committee TC108/SC5. Convenor (2001–2005) of Working Group 4 for Tribology and Lubricant Analysis Standards. Visit www.iso.org for more information. TC 251. Member related to asset management and ISO 55000.

Journal of ASTM International (JAI) - Member of the Editorial Board, joined 2004.

Electric Power Research Institute (EPRI) - Member NMAC Predictive Maintenance Technical Advisory Group (TAG), 2003.

American Society for Testing and Materials (ASTM) - Founding member of Inter-laboratory CrossCheck Program for In-Service Lubricants. Member of the In-Service Lubricant Testing and Condition-Monitoring, Subcommittee D02.96. Visit www.astm.org for more information.

Society for Tribologists and Lubrication Engineers (STLE) - Oil Monitoring Analysis Certification Committee, Past Chairman Educational Programs, member of STLE since 1988. Visit www.stle.org for more information.

Appointed “Expert Referee” - 15th International Conference on Wear of Materials, April 24-28, 2005, San Diego, Calif.

Appointed “Technical Reviewer” - for STLE Publications, Tribology Transactions and Lubrication Technology, November 2004.

17th & 18th Annual Pulp & Paper Reliability and Maintenance Conference and Exhibition - Member of the Board of Advisors.

Society of Automotive and Aerospace Engineers (SAE) - Member since 1986. Member of the Filter Test Methods Subcommittee of the SAE Engine Committee (1986-1991). Past member of Committee on Diagnostics and Service Equipment (1992-1996). Past member of the Contamination and Filtration Panel, SAE A-6 Committee on Aerospace Fluid Power and Control Technologies (1986-1991). Visit www.sae.org for more information.

American Society of Mechanical Engineers (ASME) - Member, 1999-2001. Visit www.asme.org for more information.

National Fluid Power Association - Member, Contamination Technology Committee and the Hydraulic Filter and Separation Committee (1988-1990). Visit www.nfpa.com for more information.

National Society for Professional Engineers - Member 1987 to 2000, Registered Professional Engineer, PE 13990. (Registration discontinued due to change in engineering/technical specialty). Visit www.nspe.org for more information.

Editorial Board BHRA - The Condition Monitoring Journal, British Hydromechanics Research Association. 1989-1993. Visit www.bhrgroup.co.uk for more information.

Overseas Technical Advisory Committee - Member, 3rd, 4th and 5th International Condition Monitoring Conferences, through 1996.

PUBLICATIONS

Books, Book Chapters, Training Books, etc.

Wilford, Fred with Jim Fitch, Engine Oils and the Filters; Understanding Oil Lubrication and Contamination Control [Book], Published by Purdue University, 2019.

Fitch, J.C., Inspection 2.0: Condition Monitoring of Lubricated Mechanical Machinery [Book], Publication Pending, Noria Publications, 2019.

Fitch, J.C. with George Totten as Editor, Chapter: "Analysis of In-Service Automotive Engine Oils," ASTM Handbook on Automotive Lubricants, Publication Pending.

Fitch, J.C. with George Totten as Editor, Chapter 5: "Control and Management of Particle Contamination in Hydraulic Fluids," Handbook of Hydraulic Fluid Technology, CRC Press, 2012.

Fitch, J.C. and D. Troyer, Oil Analysis Basics, Noria Publishing, 2nd Edition, 2010.

Fitch, J.C. and Drew D. Troyer, with John McKetta, et al Editors, Encyclopedia of Chemical Processing, Chapter: "Lubrication Performance Factors for Chemical Process Plant Machinery," Marcel Dekker Encyclopedias, 2005.

Fitch, J.C. and Sabrin Gebarin, Martin Williamson and George Arbocur, with George Totten, Editor, Chapter 21: "Foodgrade and the Food Processing Industry", STLE/ CRC Handbook of Lubrication and Tribology, 2005.

Fitch, J.C. with George Totten, Editor, Chapter 32: "Conservation of Lubricants, Materials and Energy," STLE/ CRC Handbook of Lubrication and Tribology, 2005.

Fitch, J.C., Seminar Coursebook, Effective Contamination Control, Noria Publishing, 2005-2006.

Fitch, J.C. and Sabrin Gebarin, Best Practices in Bulk Lubricant Storage and Handling, Noria Publishing, 2004.

Fitch, J. C., How to Select a Motor Oil and Filter for Your Car or Truck, Noria Publishing, 2nd Edition, 2004.

Fitch, J. C. and M. Barnes, et al, with George Totten as Editor, Chapter 24: "Hydrocarbon Analysis," ASTM Fuels and Lubricants Manual, ASTM Press, June, 2003.

Fitch, J. C. & D. Troyer, Editors, Lubrication Excellence Conference Proceedings, Noria Publishing, 2003-2006 Annual Conferences.

Fitch, J.C. with Robert Bolt, Editor, Chapter: "Particle Counting," Lubrication Guide, Published by the Electric Power Research Institute (EPRI), October 2001.

Fitch, J.C. with George Totten as Editor, Chapter: "Advancements in Fluid Analysis Technologies and Strategies for Hydraulic System Condition-Based Maintenance," Hydraulic Failure Analysis: Fluids, Components, and System Effects, ASTM Press, 2001.

Fitch, J.C. and G. Trujillo, D. D. Troyer, Machinery Lubrication Coursebook, Noria Publishing, 2001-2006, Multiple Editions.

Fitch, J.C. with Heinz P. Bloch, Editor/Author, Chapter 19, "Lubrication Analysis for Condition Monitoring," Practical Lubrication for Industrial Facilities, Marcel Dekker, 2000

Troyer, D. D. & J. C Fitch, Oil Analysis Basics, Noria Publishing, 2000-2006, Multiple Editions.

Fitch, J. C. with John Mitchell as Editor, Chapter 11: "Strategies for Machinery Oil Analysis," Operating Equipment Asset Management Handbook, Penn State Publishing, 2000 & 2006. First and Second Editions.

Fitch, J. C., The Lubrication Field Test and Inspection Guide, Noria Publishing, Booklet, 2000.

Fitch, J. C. and Robert Scott, Daily One-Minute Lubrication Inspections and Field Tests, Noria Publishing, 2013

Fitch, J. C., Sourcebook for Used Oil Elements, Noria Publishing, Booklet. 2000.

Fitch, J. C. & D. Troyer, Editors, Practicing Oil Analysis Conference Proceedings, Noria Publishing, 1999-2002 Annual Conferences.

Fitch, J. C., Oil Analysis I & II Coursebook, Noria Publishing, 1998-2006, Multiple Editions.

Fitch, J.C., How to Develop a "Win-Win" Relationship with Your Oil Analysis Lab, Learning Resource Booklet, LRB.9801.1, Noria Publishing, 1998.

Fitch, J. C. with E. Richard Booser as Editor, Chapter 75: "Elements of an Oil Analysis Program," STLE/CRC Tribology Data Handbook, CRC Press, 1996.

Fitch, J. C., Oil Analysis and Proactive Maintenance, Seminar Course Book, Diagnetics, 1996.

Fitch, J. C., with A.K. Mehta as Editor, Chapter 32: "A New Approach to Maintaining Industrial Equipment," Current Trends in Industrial Tribology, McGraw-Hill Publishing Company, 1995.

Fitch, J. C., The Ten Reasons Why Oil Analysis Programs Fail and the Strategies That Effectively Overcome Them, Diagnetics, Inc., 1995 (Booklet).

Fitch, J. C. and H. Borden, "Comparison of Particle Counts Between Eight Commercial Oil Analysis Laboratories." Technical Application Article No.8, Diagnetics, Inc., August, 1992 (Technical Bulletin).

Fitch, J. C., *Handbook of Case Studies on Fluid Contamination Control*, Published by Diagnetics, Inc., 1991, Booklet.

Fitch, J. Bennett and J.C. Fitch, "A Comprehensive , Human-Enabled Lubricant and Machine Inspection Strategy for Early Condition Monitoring," Chapter 3, ASTM International, Standard Guides and Practices that Support the Lubricant Condition Monitoring Industry, STP 1634, M. Villalba and Lisa Williams, editors, 2022.

Fitch, J.C. and J. Bennett Fitch, "Optimizing Lubrication and Lubricant Analysis," Chapter 4, *Condition Monitoring, Troubleshooting and Reliability in Rotating Machinery*, Edited by Robert X. Perez, Scrivener/Wiley Publishing, 2023.

ICML 55—Asset Management Standard for Lubricated Machinery. 2022. Seminal peer-reviewed standard that details 12 interrelated areas of a sustainable, world-class lubrication program. Constructed to be aligned with ISO 55001. Spearheaded the development of the standard and was principal author.

Published Interviews

Motor Equipment News, Interview, March, 2015.

Interviewed by Miguel Guzman, Predictiva 21 Magazine, published Sept 2014.

Interview with Prof. Peter Jost, "Interview with Luminary Professor H. Peter Jost," Machinery Lubrication magazine, January-February issue, 2006

Interviewed by Mr. Krokawa, Editor of Journal of Economic Maintenance Tribology (Japan), "Progress of Lubrication Education and Certification," Published in Vol. No. 475, September 2005.

Interview with Mario Andretti, "The Greatest Racecar Driver of All Times," Practicing Oil Analysis magazine, March-April 2003.

Interviewed by Marian Hookham (Editor), "The Good Oil - Trends in Lubrication in the Mining Industry," Australia's Mining Monthly, October 2002.

Interviewed by Kathryn Carnes (Editor), "Measure by Measure," Published in Lubricants World magazine, June 2001.

Interviewed by Curt Bennink, (Staff Editor), "Maximize Oil Analysis ROI," Published in Equipment Today magazine, August 2000.

Interviewed by Jeff Hawk (Staff Editor), "Online Oil Analysis Speeds Equipment Managers' Response Time," Construction Magazine, October 2000.

Trade Magazines

Practicing Oil Analysis Magazine - 1998-2008

- Five Essential Lube Oil Properties Not Routinely Reported by Your Oil Lab
- Tactics for Identifying Wear Metal and Solid-particle Suspensions
- The Five Cardinal Signs of a Healthy Machine
- The Benefits of Utilizing Wear Debris Analysis in Industrial Machinery
- The Richness of Machine Failure
- The Value of Muck Sampling in a Condition Monitoring Program
- Why Onsite Particle Counting Makes Sense
- Decade in Review: Education and User Empowerment
- Ten Amazing Years
- Diagnosing a Cloudy Oil
- The Truths About Data Trending
- Planned Cleanliness
- The Meaning of a Low Viscosity Reading
- Oil is Like an Egg
- No Contamination, No Wear, No Kidding
- The Hot Stove Effect
- Recognizing the Symptoms of Lubricant Incompatibility
- What is Your Oil's Impurity-holding Capacity (IHC)?
- What Do You Do with a High Particle Count?
- Oil Analysis for the New Millennium, (Republished in ML-Spanish, December 2006)
- The Importance of Provenance

- Tweaking the Eyes and Ears of Oil Analysis
- Beware of What You Measure
- A Much Closer Look at Particle Contamination
- Standby Equipment – Dealing with Oil Without Legs
- What do Canaries and Ferrous Density Meters Have in Common?
- The Agony of Diesel Engine Oil Particle Counts
- The Perils of Aerated Oils
- The Hazards of Water Handles
- Copper and Your Diesel Engine Oils
- Oil Analysis Reports – What's Missing in the Comments?
- Sight Glass Oil Analysis
- Lubrication as a Professional
- Reliability's Dirty Little Secret
- Dipstick Oil Analysis
- What is the No. 1 Cause and the No. 1 Consequence of Wear?
- Silent Assumptions of Bearing Reliability
- Which Questions Does Your Oil Analysis Program Answer?
- How to Convince Your Boss to Let you Attend Lubrication Excellence 2003
- Managing Reliability in Real Time — the Risk Management Grid (RMG)
- Clean Oil Reduces Engine Fuel Consumption
- The Surface Tension Test—Is it Worth Resurrecting?
- Spot Check Your Car's Oil
- Today's Oil Detectives Have a New Bag of Tricks
- The Hidden Cost of an Untrained Workforce
- Fallacies of Sampling Consistently
- How Telephone Poles are Like Filters
- You Can't Fix a Problem You Don't Know Exists
- World Class is What This Year's Conference is About — What it is and How to Get it.
- Oil Analysis Economics — Saving and Making Money
- The Six Most Expensive Oil Analysis Tests
- Top Ten Ways to Not be World Class at Machinery Lubrication
- The Augustus H. Gill Award for Oil Analysis Excellence
- Three Important Words for Success in Lubrication and Oil Analysis
- Ten Compelling Reasons to Attend Practicing Oil Analysis 2000
- In Search of a Definition — What is Oil Analysis?
- Why Should Managers Care About Oil?
- Oil Analysis Standards — What Are We Waiting For?
- Oil Analysis and the Lean Organization
- Is Your Oil Analysis Program a Quart Low?
- Oil is Not a Fine Wine
- Adopt a New Philosophy
- Choose Your Weapon
- First an Idea — Now a Reality
- Deploying the Invisible Filter
- Surviving the Data Jungle
- Your Oil Is Talking ... But Are You Listening?

Machinery Lubrication Magazine - 2001 – 2023

- There is Nothing More Certain Than Change
- Skillful Out-Leakage Detection
- Make Touchstones of Lubrication Excellence Shine

- Are You Ready? Supply Chain Problems Spur the Need for Backup Lubricants
- The Power of 10X Cleaner...Drier...Cooler...Better Aligned...More Training
- Taking the Guesswork Out of Filter Selection
- Reliable Plant 2021: Engineered to Support Your Reliability Initiatives
- Deciphering Important Visual Features of Wear Particles
- The Golden Age of Lubrication
- Dust Cakes: What Causes Them and Why You Should Care
- Risk Management for Lubricated Machines
- The Four States of Water in Oil
- Listen to Your Lubricant
- You Learn What You Learn
- Machinery Lubrication Engineer: A Professional Certification
- Control Moisture Ingression with Tactical Inspection 2.0
- Detection Zone Coding for More Efficient Condition Monitoring
- 5 Ways to Monetize Lubrication Excellence Now
- The Power of Truthful Assessments in Jumpstarting a Reliability Transformation
- Philosophies of Transformational Change and ICML 55
- How the IIoT Is Changing Condition Monitoring
- Blotter Spot Testing for Metallic and Other Solid Particles
- Be Alert to Heat as Both a Contaminant and a Symptom
- Who Should Inspect Your Lubricated Machines?
- Ghost Riders That Haunt Your Oil
- The Importance of Sustainability for Transformational Change
- Guidelines for Developing a World-class Inspection Plan
- How to Make Your Oil Analysis Program Produce More Alerts
- Managing the Perils of Short-volume Oil Changes
- Make the Lube Room Your Lubrication Command Center
- How to Measure the Effectiveness of Condition Monitoring
- Be Proactive to Avoid Root Cause Fault Bubbles
- The 5 States of Machine Inspection 2.0
- How to Visually Inspect the Health and State of Oil
- Inspection 2.0: The Cornerstone of World-class TPM
- Getting Machines to the Proper State of Inspection Readiness
- Why Inspection 2.0 Is Your Best Strategy for Early Fault Detection
- Will ISO 55000 Change the Definition of Lubrication Excellence?
- The Power of Root Cause Pre-failure Analysis
- Understanding How Engines Consume Oil
- Avoiding the Pitfalls of Viscosity-starved Machines
- Remedies for a Bad Maintenance Culture
- How to Select Machines for Oil Analysis
- How to Build a Killer Lube Analyst Résumé
- Take Particle Settling and Oil Sample Agitation Seriously
- Recognizing the Causes and Hazards of Silt Lock
- 5 Ways to Reduce Lubricant Spending
- Develop a Corporate Education Master Plan
- The Wrath of Unscheduled Downtime: Why Oil Analysis is a Wise and Effective Defense
- Advantages of a Unified Condition Monitoring Strategy
- Don't Forget Lubricant Criticality When Designing Oil Analysis Programs

- Use Zone Inspections for Early Problem Detection
- Demand Reliability Readiness from Equipment Builders
- Add Oil Circulation to Gear and Bearing Sumps for Greater Reliability
- Using ‘Unscheduled’ Oil Analysis for Early Predictive Maintenance
- A New Look at Criticality Analysis for Machinery Lubrication
- How to Optimize the State of Lubrication
- Hazards of Changing Lubricant Brands
- Why You Should Inspect Bearing Grease Discharge
- The Hidden Dangers of Lubricant Starvation
- Don’t Ignore Viscosity Index when Selecting a Lubricant
- Linking Enhanced Reliability to the State of Lubrication
- The Business Case for Lubrication Excellence
- The Optimum Reference State
- Justifying the Cost of Excluding a Gram of Dirt
- Grease Dry-out
- Setting Limits and Targets for Effective Oil Analysis
- Lubricant Consolidation
- The Power of the Patch
- A Well-Constructed Oil Analysis Report
- Increasing Demands Bring Advancements in Oil Filtration
- Noria is Recharged and Ready for Growth
- Strategies to Extend Drain Intervals and Reduce Lubricant Consumption
- What’s Hot? Current Trends in Lubrication and Oil Analysis
- Ban the Can: Sealable, Reusable Oil Containers are Smarter Options
- Looking Through the Eyes of Onsite Contaminant Monitor
- The Rationale for Using Magnetic Particle Collectors
- Virgin Particles and Weak Signals: Finding Meaning in Wear Debris
- Oil Flushing Tips to Address the Fish Bowl Effect
- Strategies to Achieve and Sustain Dry Oil
- When a Filter is Not a Filter
- These Additives Don’t Exist
- Performing Lubrication in a Recessionary Environment
- Oil Clotting and the Adrenaline Effect
- How Water Causes Bearing Failure
- Intervention is Key to Machine Life Extension
- Performing a Failure Scene Investigation
- Ten Hot Lubrication Trends
- Six Questions Every Lube Tech Should Be Able to Answer Correctly
- Ten Things You Probably Didn’t Know About Air Contamination
- The Consequences of Periodically Forgetting
- Four Lethal Diesel Engine Oil Contaminants
- Filter Flow Rate — the Silent Opportunity
- The Daily One-minute Inspection
- Tribology is a Behavioral Science
- The Enduring Grease vs. Oil Debate
- A Call for Innovators and Entrepreneurs, (Republished in ML-Japan, January 2007)
- A Conversation with Dad — Pioneer, Educator and Mentor in Fluid Contamination Control, (Republished in ML-Japan, November 2006)
- In Search of a Root Cause
- 12-Step Program for Recovering Addicts of Lubrication Neglect
- Evolution of Maintenance Man

- How to Give Your Machine a Physical
- Filter Economy — Insider Tips on Managing the Costs of Lubrication Filtration
- Receive a Contamination Control Transfusion in Three Days
- Lubricant Quality and the Chain of Custody
- Flushing and the Voice Within Your Oil
- Flushing Strategy Rationalization
- Navigating the Maze of Flushing Tactics
- When to Perform a Flush
- Lubrication Genesis
- Lubrication Excellence 2004 — It's All About Learning
- How Grease Kills
- How Your Motives Influence Motor Oil Selection — Have You Heard About the New GF-4 Motor Oils?
- Headspace Management — Are You in On This Best-Kept Secret?
- The Difference Between Good Lubrication and Good Lubricants
- Should New Lubricant Deliveries be Tested
- Ask Your OEM to Accessorize New Equipment for Lubrication Excellence
- Wanted: Lubrication Management Professionals
- Aren't Machines Supposed to Wear Out?
- New Lubrication Commandments: Conserve Energy, Protect the Environment
- Proactive Maintenance's Unruly Cousin
- Lubrication UFOs
- Demystifying Sludge and Varnish
- From Whence Dirt Comes
- The Perfect Storm . . . Are You Secretly Waiting?
- At Last, A Lubrication Magazine for Maintenance Professionals

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Fitch, J.C. "Maximizing Lubrication Program Investments – Compounding Your Returns," Machinery Lubrication magazine, Jan.-Feb. 2005.

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Fitch, J.C., "Implementing oil and lubrication best practices," Plant Engineering and Maintenance, December 2003.

Gebarin, S. and J. C. Fitch, "Determining Proper Oil and Filter Change Intervals: Can Onboard Automotive Sensors Help?" Practicing Oil Analysis magazine, November-December 2003.

Fitch, J.C., "Execute Lubrication," Asphalt Contractor magazine, April 2003.

Fitch, J.C., "Deploying the Invisible Filter," Fluid Power Journal, September/October 2003.

Fitch, J. C. "Effective Lube Oil Management," Pages 20-25, Power Magazine (Platts), October 2003.

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Fitch, J. C., "Scoring the Condition-Based Oil Change Decision," Machinery Lubrication magazine, May-June 2001.

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Fitch, J. C. and I. T. Hong, "Model of a Fuzzy Logic Expert System For Real-Time Condition Control of A Hydraulic System," The Condition Monitoring Journal and 3rd International Conference, London, U.K., October 1990.

Blok, P. and J. C. Fitch, "Concept and Application of a Portable Contaminant Monitor for Hydraulic Systems," 9th Aachener Conference on Fluid Power, March 1990, West Germany.

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Fitch, J. C., "Fluid Conditioning of Aviation Hydraulic Fluids," Proceedings, Commercial Aircraft and Helicopter Panel, SAE Committee A-6, Aerospace Fluid Power and Control Technologies, April 1987.

Fitch, J. C., "Systems and Methods for Real-Time Condition Monitoring of Mechanical Machinery," SAE Paper 861308, International Off-Highway and Powerplant Congress and Exposition. Additionally, this paper was selected for and republished in the 1986 SAE TRANSACTIONS.

Fitch, J. C., "Quantifying the Contaminant Tolerance of Hydraulic Systems Using the 'Contaminant Life Index,'" National Conference On Fluid Power Transactions, 1986.

Fitch, J. C., "Theory, Design, and Performance Characteristics of a Direct-Reading Portable Solid Contaminant Analyzer," SAE Paper 860738. 1986 Earthmoving Industry Conference. Additionally, this paper was selected for and republished in the 1986 SAE TRANSACTIONS.

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Fitch, J. C., "Safety Considerations in Fluid Power Products — Motivation Aspects," The BFPR Journal, April 1979.

Fitch, J. C., "The Heritage of Fluid Power," The BFPR Journal, January 1979.

INVITED LECTURESHIPS AND CONFERENCE PRESENTATIONS (update)

- *NOTE: due the large number of conference presentations, this listing was discontinued in 2019*
- Congreso Mexicano de Confiabilidad 2019, Lima, Peru
- IDCON Reliability Conference, September, 2019, Raleigh, NC
- OilDoc 2019, Rosenheim, Germany, January, 2019
- Spectro Scientific Annual Sales Meeting, Orlando, FL, Oct., 2018

- Congreso Mexicano de Confiabilidad 2018, Monterrey, MX
- Chevron Reliability Maintenance Conference, Atlanta, GA, Oct. 2017
- Congreso Mexicano de Confiabilidad 2017, Monterrey, MX
- Ingredion North American Management Reliability Meeting, Quebec, Canada, Aug. 2017
- TriFluLub Conference and Exhibition (keynote address), Lima, Peru, Oct. 2016
- TOTAL Lubricants National Sales Meeting (keynote address), Phoenix, AZ, Nov. 2016
- LubMat Conference and Exhibition, Bilbao, Spain, 2016
- World Maintenance Congress (keynote address), Cartagena, Columbia, June 2015
- Oil Doc Conference and Exhibition, Munich, Germany, 2011, 2013, 2015
- Congreso Mexicano de Confiabilidad 2013, Monterrey, Mexico, October, 2013
- Reliable Plant Asia (keynote address), Kuala Lumpur, Malaysia, December, 2012
- AIMAN Congress (keynote address), Florence, Italy, November, 2012
- LubMat Conference and Exhibition, Bilbao, Spain, June, 2012
- Congreso Mexicano de Confiabilidad 2011, Leon, Mexico, October 2011
- EPRI (PUG), Portland, Ore., August 2011
- EPRI (GAPAC Users Group), Pittsburg, Pa., August 2010
- International Paper Lubrication Workshop, August 2010
- Brazilian Maintenance and Reliability Conference (ABRAMAN), Sao Paulo, June 2010 (Keynote Address)
- Goodyear Lubrication and Reliability Meeting, Lawton, Okla., April 2010
- Vibration Institute, Wisconsin, March 2009
- EPRI (NMAC Lubrication Workshop), August 2008, San Antonio, Texas, NMAC
- EPRI (Circuit Breaker Reliability Meeting), August 2008
- ASIATrib Conference, Kanazawa, Japan – Keynote Address, October 2006
- Chevron-Texaco Sludge and Varnish Symposium, Phoenix, Ariz., July 2006
- Lubrication Excellence 2006, Columbus, Ohio – Keynote Address, May 2006
- ASTM Lubricant Oxidation Symposium, Norfolk, Va., December 2005
- Water Environment Federation Conference (WEFTEC), October 2005, Washington, D.C.
- STLE Conference, Workshop on Condition Monitoring, Las Vegas, Nev., May 15, 2005
- 34th A&M TurboMachinery Symposium, September 2005, Houston, Texas
- ASTM Oxidation and Testing of Turbine Oils Symposium, D02 Meeting, Norfolk, Va., December 2005
- EPRI Turbine Generator Users Group Annual Meeting, St. Pete, Fla., January 2005
- EPRI Predictive Maintenance Users Group Annual Meeting, St. Pete, Fla., June 2004
- TAPPI Annual Conference, Atlanta, Ga., May 2004
- Nuclear Regulatory Inspectors (NRC) Annual Meeting, Atlanta, Ga., May 2004
- Rio Tinto Asset Management and Reliability Conference, Denver, Colo., September 2003
- EPRI/NMAC Lubrication and Bearing Workshop, Mystic, Conn., June 2003
- IDCON, Predictive Maintenance Conference, Raleigh, N.C., October 2002
- ACSIM 2002 Conference, Cairns, Australia, Keynote address, September 2002
- Caterpillar, SOS Dealer Conference, Peoria, Ill., September 2002
- EPRI, Predictive Maintenance Users Group, Myrtle Beach, S.C., April 2002
- FOMIS Outage Control Conference, Scientech, Clearwater, Fla., August 2002
- STLE Central Illinois Section Meeting, March 2002
- World-Wide Contamination Control Conference — Caterpillar, Peoria, Ill., Keynote Speaker, March 2002
- EPRI Lubrication and Bearing Workshop, Durham, N.C., January 2002
- International Paper Annual Maintenance Conference, Shreveport, La., July 2001
- ExxonMobil Lubrication Conference, Atlanta, Ga., February 2001
- Practicing Oil Analysis, International Conference & Exhibition, Tulsa, Okla., October 2000
- CSI, Emerson Electric, Reliability Week Conference, Atlanta, Ga., October 2000
- International Standards Organization, Plenary Presentation, TC108/SC5, Nanjing, China, August 2000
- Mobil Oil Lubrication Conference, Boston, Mass., July 2000
- International Paper Maintenance Conference, Atlanta, Ga., June 2000
- Institute of Nuclear Power Operations, Conference, July 2000
- WearCheck International Annual Meeting, France, July 2000
- Exxon Lubrication Conference, New Orleans, La., May 2000
- ASTM Hydraulic Failure Symposium, Lake Tahoe, Calif., December 1999
- Practicing Oil Analysis, International Conference & Exhibition, Tulsa, Okla., October 1999
- EXXON Lubrication Conference, Orlando, Fla., June 1999
- EXXON Advance Lubrication Training Symposium, Houston, Texas, June 1999

- International Conference on Condition Monitoring, Swansea, Wales, April 1999
- STLE Condition Monitoring Seminar, Swansea, Wales, April 1999
- Oklahoma Predictive Maintenance Users Group, Stillwater (OSU), Okla., January 1999
- EXXON Lubrication Conference, Las Vegas, Nev., October 1997
- EXXON Lubrication Conference, Lake Tahoe, Calif., June 1998
- EXXON Lubrication Conference, New Orleans, La., March 1998
- EXXON Lubrication Conference, Richmond, Va., October 1998
- EXXON Lubrication Conference, Minocqua, Wis., September 1997
- Technology Showcase, Joint Oil Analysis Program U.S. D.O.D., Mobile, Ala., May 1998
- ENTERACT '98, Cincinnati, Ohio, May 1998
- Maintenance 2000, World Mining Conference, Tucson, Ariz., April 1998
- Predictive and Preventive Maintenance Conference, Indianapolis, Ind., November 1998
- CSI Reliability Week, Nashville, Tenn., October 1998
- Oil Analysis I and II, Predict Engineering, Johannesburg, South Africa, June 1998
- Mobil Oil Lubrication Conference, Maine, May 1998
- DMSI Predictive Maintenance Conference, Vancouver, B.C., May 1998
- EXXON, Lubrication Conference, Maine, June 1997
- DMSI Predictive Maintenance Conference, May 1997
- Enteract '97, Cincinnati, Ohio, April 1997
- Locomotive Maintenance Officers Association, Winter Meeting, Orlando, Fla., February 1995
- Tribology Society Of India, Principal Speaker, Bombay and New Delhi, September 1995
- JOAP Condition Monitoring International Conference, Pensacola, Fla., November 1994
- Predictive Maintenance National Conference, Atlanta, Ga., November 1994
- Courses on Oil Analysis, Johannesburg, Durban, Cape Town, South Africa, October 1994, November 1995
- International Conference On Condition Monitoring, Swansea, Wales, UK, March 1994
- Symposium On Proactive Maintenance, Riyadh, Saudi Arabia, December 1993
- Enteract '93, Cincinnati, Ohio, September 1993
- 4th International Conference On Profitable Condition Monitoring, Stratford-Upon-Avon, UK, December 1992 (Speaker, Session Chairman, Member of Organizing Committee)
- 1992 Predictive Maintenance Indaba, Johannesburg, South Africa, September 1992 (Keynote Speaker)
- Sixteenth Annual Meeting And Conference, Vibration Institute, Williamsburg, Va., June 1992
- Predictive/Preventive Maintenance Technology, National Conference, Cincinnati, Ohio, September 1989
- International Off-Highway And Powerplant Congress And Exposition, Milwaukee, Wis., September 1989
- Japan Automotive Parts Industry Association (Japia) Conference, Tokyo, Japan, August 1989
- Nato/Econosto Lecture On Contamination Control Technologies, Rotterdam, Netherlands, March 1989
- Joint International Fluid Power Applications Conference & National Conference On Fluid Power, Chicago, Ill., Oct. 1988
- National Sae A-6 Aerospace Fluid Power And Control Technologies Conference, Destin, Fla., April 1987
- International Off-Highway And Power Plant Congress, Milwaukee, Wis., September 1986
- National Congress On Fluid Power, Detroit, Mich., May 1986
- National Earthmoving Industry Congress, Peoria, Ill., April 1986

PERSONAL

Born November 18, 1954

Married, four children

Eagle Scout