

MEDHAT KHALIL, Ph.D., CFPAI, CFPHS

**Senior Academic & Professional Education Leader | Fluid Power & Motion Control
Expert | Researcher | Author | Engineering Consultant**

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EXECUTIVE PROFILE

Senior academic, engineering, and professional-education leader with more than two decades of leadership in fluid power education at the Milwaukee School of Engineering (MSOE), complemented by extensive experience in university teaching, industrial engineering, applied research, technical consulting, system design, modeling and simulation, and expert-witness engagements.

Currently serves as Program Director of Fluid Power Education within MSOE's Applied Technology Center, with responsibility spanning strategic planning, professional education, curriculum development, industry engagement, research development, budgeting, laboratory development, international partnerships, and program growth.

Internationally recognized specialist in fluid power, hydraulic systems, motion control, system dynamics, mechatronics, energy transmission, and Matlab-Simulink modeling. Author of an extensive technical book series in hydraulic systems and components, contributor to refereed journals and international engineering conferences, and developer of educational software and advanced fluid-power training systems.

Recipient of the **2021 International Fluid Power Society Hall of Fame Award** and the **2012 Otto Maha Pioneer in Fluid Power Award**. Experienced international educator who has developed and delivered technical education for professionals in the United States, Canada, India, Mexico, Saudi Arabia, and the United Arab Emirates.

AREAS OF LEADERSHIP & EXPERTISE

- Senior academic and professional education leadership.
- Strategic planning and program development.
- Fluid power and motion control.
- Mechanical engineering education and applied research.
- Hydraulic system design and optimization.
- System dynamics and control.
- Modeling and simulation.
- Matlab-Simulink applications.
- Mechatronics and energy transmission.
- Industrial consulting.
- Expert-witness technical analysis.

- Curriculum and laboratory development.
- Professional training and workforce development.
- Technical publishing and authorship.
- International technical education.
- Industry-academic partnerships.
- Research program development.
- Budget and operational management.

PROFESSIONAL EXPERIENCE

MILWAUKEE SCHOOL OF ENGINEERING

Center for Professional Education — Milwaukee, Wisconsin

Program Manager of Fluid Power Education - July 2005–Present

Provide strategic, academic, technical, and operational leadership for professional fluid power and motion-control education.

Strategic & Academic Leadership

- Define departmental vision, mission, strategic direction, and short- and long-term goals.
- Lead initiatives designed to maintain MSOE's leadership position in fluid power and motion-control professional education.
- Identify emerging technical training needs within industry and translate them into relevant professional-development programs.
- Develop, manage, and teach technical courses ranging from fundamental to advanced levels for engineers and industry professionals.
- Develop course curricula, manuals, presentations, laboratory exercises, and hands-on learning programs.
- Establish methods for course and instructor evaluation to continuously improve educational quality.
- Participate in accreditation activities for professional-development programs.
- Represent the institution at industry events, educational conferences, technical meetings, and trade shows.

Research & Technical Development

- Participate in industry-sponsored research through the MSOE Fluid Power Institute.
- Design and develop advanced fluid-power training stands and instructional systems.
- Develop educational and engineering software for fluid-power applications.
- Apply modeling and simulation techniques to hydraulic and dynamic-system design.
- Support industry projects involving hydraulic system design, analysis, energy efficiency, and troubleshooting.

Management & Operations

- Establish and manage the department's annual budget.
- Monitor expenditures and financial performance to support positive departmental cash flow.

- Coordinate internal and external resources required to deliver professional seminars and technical programs.
- Report departmental activities and performance to Applied Research leadership.
- Maintain customer and operational databases supporting professional education activities.
- Monitor competitors, market pricing, course content, and educational quality.

Industry Engagement & International Development

- Develop and maintain long-term relationships with industrial clients.
- Establish marketing initiatives supporting program participation and revenue.
- Build partnerships with professional-development organizations to extend educational services internationally.
- Develop and deliver customized technical programs for industry professionals worldwide.

Adjunct Associate Professor – Mechanical Engineering Department

- Develop and teach graduate curriculum for Fluid Power Certificate Degree.

CAE INC.

Power Systems Control and Simulation Department — Montreal, Quebec, Canada

Power Plants Full-Scale Simulator Software Developer - May 2003–June 2005

- Developed software for full-scale power-plant simulation systems.
- Applied engineering modeling, simulation, controls, and dynamic-system analysis to industrial simulator development.

CONCORDIA UNIVERSITY

Department of Mechanical and Industrial Engineering — Montreal, Quebec, Canada

Adjunct Assistant Professor - May 2003–June 2005

Research Assistant, Part-Time Faculty & Ph.D. Researcher - January 2001–May 2003

- Work on PHD thesis performing experimental and analytical research involving axial piston pumps, hydraulic control, vibration, and dynamic systems.
- Contributed to university teaching and research activities within the Faculty of Engineering and Computer Science.

YFHE CO. MANNESMANN REXROTH REPRESENTATIVE

Technical Office & Training Manager Cairo, Egypt - June 1996–December 2000

- Manage technical office supporting system design and technical support for industrial applications involving hydraulic and motion-control technologies.
 - Develop and teach technical training courses related to Rexroth' fluid-power technology for engineering professionals.
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MILITARY TECHNICAL COLLEGE

Mechanical Engineering Department — Cairo, Egypt

Lecturer - June 1985–June 1996

- Teaching mechanical-engineering subjects and contributed to engineering education and technical development.
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EDUCATION

Post-Doctoral Industrial Research Fellowship

CAE Inc., Power Systems Control and Simulation Department

Montreal, Quebec, Canada | 2003–2005.

Ph.D., Mechanical Engineering

Concordia University

Montreal, Quebec, Canada | 2003.

Thesis: *Performance Investigation of Swash Plate Axial Piston Pumps with Conical Cylinder Block.*

Master of Mechanical Engineering

Cairo University

Cairo, Egypt | 1989.

Thesis: *Theoretical and Experimental Investigation of Performance of Four Nozzle Hydraulic Servo-Valve.*

Bachelor of Engineering, Mechanical Engineering

Military Technical College

Cairo, Egypt | 1983.

Minor: Automotive Engineering.

PROFESSIONAL CERTIFICATIONS & AFFILIATIONS

- **Certified Fluid Power Hydraulic Specialist (CFPHS)** - International Fluid Power Society.
- **Certified Fluid Power Accredited Instructor (CFPAI)** – IFPS.
- Member - Center for Compact and Efficient Fluid Power Engineering Research Center.
- Listed Fluid Power Consultant - National Fluid Power Association.
- Member and Instructor - American Society of Mechanical Engineers.
- Professional Instructor - North American Die Casting Association.
- Chair of Education Program associated with CONEX-EXPO / International Fluid Power Exposition.

AWARDS, HONORS & RESEARCH FUNDING

- **2021 — International Fluid Power Society Hall of Fame**
- Recognized for distinguished contributions to the fluid-power profession.
- **2013 — MAHA Funding, \$200,000**
- Funding from Milwaukee School of Engineering for development of four basic fluid-power trainers.
- **2012 — Otto Maha Pioneer in Fluid Power Award**
- Recognition for contributions and innovation in the fluid-power field.
- **2010 — MAHA Funding, \$336,000**
- Funding supporting duplication and further development of the Universal Fluid Power Trainer prototype.
- **2009 — CCEFP/NSF Funding, \$120,000**
- Design and development of the **Universal Fluid Power Trainer**.
- **2003 — NSERC Post-Doctoral Industrial Research Fellowship**
- Natural Sciences and Engineering Research Council of Canada.
- **2001 — First Prize, Student Design Paper Competition**
- International Conference on Multidisciplinary Design in Engineering, Concordia University.

TECHNICAL BOOKS

Author of an extensive professional reference series covering hydraulic systems, components, applications, safety, maintenance, troubleshooting, modeling, simulation, and mobile-system design.

Hydraulic Systems Series

1. **Hydraulic Systems, Volume 1: Introduction to Hyd. for Industry Professionals** - 2016.
2. **Hydraulic Systems, Volume 2: Electro-Hydraulic Components and Systems** - 2017.
3. **Hydraulic Systems, Volume 3: Hydraulic Fluids and Contamination Control** - 2019.
4. **Hydraulic Systems, Volume 4: Hydraulic Fluids Conditioning** - 2022.
5. **Hydraulic Systems, Volume 5: Safety and Maintenance** - 2022.
6. **Hydraulic Systems, Volume 6: Troubleshooting and Failure Analysis** - 2022.
7. **Hydraulic Systems, Volume 7: Modeling and Simulations for Application Eng.** - 2020.
8. **Hydraulic Systems, Volume 8: Advanced Designs for Mobile Applications** - 2025.

Hydraulic Components Series

1. **Hydraulic Components, Volume A: Hydraulic Sealing Elements** - 2018
2. **Hydraulic Components, Volume B: Hydraulic Filters** - 2023.
3. **Hydraulic Components, Volume C: Hydraulic Transmission Lines** - 2023.

PATENT & INTELLECTUAL PROPERTY

- **Patent: Double Swash Plate Pump with Valve Ring Concept**
Pending Patent: US 20140308139 A1.
- **Software Copyright: Med-Hyd**
Software for editing, designing, and simulating hydraulic control systems.
Registered February 14, 1996.
- **Software Copyright: Hydraulic Component Sizing Calculator**
U.S. Library of Congress Registration TX-6-520-967 | 2006.

EXPERT-WITNESS EXPERIENCE

- **CASE-1:** Engaged as an expert witness for defendants in a United States District Court trade-secret matter involving an allegedly misappropriated actuator design. Prepared and issued an expert technical report.
- **CASE-2:** Engaged for a plaintiff in a case involving the death of a sweeper driver and alleged machine-design deficiencies. Conducted technical analysis of the machine-system design and accident conditions and prepared a technical report. The matter was subsequently settled.

SELECTED ENGINEERING CONSULTING & DESIGN PROJECTS

- Modeling and simulation of a hydro-pneumatic compressor for an energy-storage project for **General Compression**.
- Modeling and simulation of the **X-Pump** for Ocean Pacific Technology.
- Design of a fluid test-stand for **Rohmax**.
- Modeling, simulation, and design optimization of the **Smart Flow Valve**, developed to protect hydraulic systems from catastrophic line failure.
- Design and development of the **Universal Fluid Power Trainer**.
- Design of multiple hydraulic power units for industrial applications.

LABORATORY DEVELOPMENT

Contributed to the specification, design, development, and commissioning of research and professional-training laboratories for multiple institutions, including:

- Milwaukee School of Engineering - Fluid Power Training Laboratory.
- Concordia University - Fluid Power Research Laboratory.
- Egyptian Iron & Steel Co. - Hydraulic Training Center.
- Cairo University - Fluid Power Research Laboratory.
- Developed Industries Institute - Hydraulic & Pneumatic Laboratories.
- Civil Aviation Authorization, Egypt - Fluid Power Training Laboratory.
- Port Training Institute, Alexandria - Fluid Power Training Laboratory.

INTERNATIONAL TECHNICAL EDUCATION

Developed and delivered professional technical education for engineers and industry specialists. Training topics have included fluid power, hydraulic-system design, electro-hydraulics, modeling and simulation, energy efficiency, maintenance, troubleshooting, system control, and related engineering disciplines. Courses were delivered across multiple countries, including:

- United States
- Canada
- India
- Mexico
- Saudi Arabia
- United Arab Emirates

SELECTED KEYNOTE PRESENTATIONS

- **Future Trends in Fluid Power Design and Education**
Annual Meeting of Fluid Power Society
Bengaluru, India | June 19–20, 2026
- **The Human and the Energy**
Sustainable Energy and Environmental Solution Conference
King Khaled University, Saudi Arabia | December 8–9, 2025
- **Energy Saving Roadmap for Hydraulic System Design**
MTC Scientific Conference
Military Technical College, Cairo, Egypt | May 20–23, 2024

SELECTED PROFESSIONAL WORKSHOPS & WEBINARS

- Matlab-Simulink for Industrial Applications — Concordia University
- Overview of Industrial Pneumatics — NFPA
- Energy Saving Strategies for Hydraulic Systems — NFPA
- Overview of Hydraulic Systems — Penton Publications / NFPA
- Hydro-Mechanical vs. Electro-Mechanical Solutions — IFPS
- Hydraulic Pump Modeling for Application Engineers — IFPS

REFEREED JOURNAL PUBLICATIONS

1. M. Khalil, "**Hydraulic Pumps Static Characteristics Lumped Modeling for Application Engineers**", submitted to the *International Journal of Fluid Power*, 2016.
2. M.K. Bahr Khalil and D. Lopper, "**Hydraulic System Protection against Catastrophic Line Failure using Local Safety Valve**," *International Journal of Fluid Power*, Vol. 9, No. 2, pp. 35–46, 2008.
3. M.K. Bahr Khalil and S. John, "**IESHYD010V01 — Hydraulic Components Sizing Calculator**," *International Journal of Fluid Power*, Vol. 8, No. 3, pp. 65–67, 2007.

4. M.K. Bahr Khalil, J. Svoboda and R.B. Bhat, "**Modeling of Swash Plate Axial Piston Pumps with Conical Cylinder Blocks**," *Journal of Mechanical Design, ASME Transactions*, Vol. 126, pp. 196–200, 2004.
5. M.K. Bahr Khalil, J. Svoboda and R.B. Bhat, "**Dynamic Loads on the Drive Shaft Bearings of Swash Plate Axial Piston Pumps with Conical Cylinder Blocks**," *CSME Transactions*, Vol. 27, No. 4, pp. 309–318, 2004.
6. M.K. Bahr, J. Svoboda and R.B. Bhat, "**Vibration Analysis of Constant Power Regulated Swash Plate Axial Piston Pumps**," *Journal of Sound and Vibration*, Vol. 259, No. 5, pp. 1225–1236, 2003.
7. M.K. Bahr Khalil, V. Yurkevich, J. Svoboda and R.B. Bhat, "**Implementation of Single Feedback Control Loop for Constant Power Regulated Swash Plate Axial Piston Pumps**," *International Journal of Fluid Power*, Vol. 3, No. 3, pp. 27–36, 2002.
8. M.K. Bahr, "**Geometrical Analysis of Four-Nozzle Pintle Hydraulic Servovalves**," *Engineering Research Bulletin*, Vol. 2, pp. 102–115, 1991.

SELECTED CONFERENCE PROCEEDINGS

- **On the Modeling of Hydraulic Pumps for Application Engineers** — National Conference on Fluid Power / International Fluid Power Exhibition.
- **Design Process of an Electro-Hydraulic Cylinder Position Feedback Control System** — National Conference on Fluid Power.
- **Interactive Analysis of Closed Loop Hydraulic Control System** — International Conference on Aerospace Science & Aviation Technology.
- **Estimated versus Calculated Viscous Friction Coefficient in Spool Valve Modeling** — National Conference on Fluid Power.
- **Innovative Tool for Custom Course Building and Delivery** — World Conference on Continuing Engineering Education.
- **Controlling Rolling Mills Operating Conditions Using Variable Displacement Pump and Electro-Hydraulic Pressure Compensator** — International Conference on Applied Mechanics and Mechanical Engineering.
- **Experimental Investigation on Swash Plate Axial Piston Pumps with Conical Cylinder Blocks Using Fuzzy Logic Control** — ASME International Mechanical Engineering Congress and Exposition.
- **Dynamic Loads on the Drive Shaft Bearings of Swash Plate Axial Piston Pumps with Conical Cylinder Blocks** — CSME Forum.
- **Response of Constant Power Regulated Swash Plate Axial Piston Pumps to Harmonic and Random Inputs** — International Conference on Multidisciplinary Design in Engineering; **First Prize, Student Paper Competition**.
- **Fuzzy Logic Control of Constant Power Regulated Swash Plate Axial Piston Pumps** — ASME International Mechanical Engineering Congress and Exposition.
- **On the Dynamics of Swash Plate Axial Piston Pumps with Conical Cylinder Blocks** — International Symposium on Fluid Control Measurement and Visualization.
- **Effect of Port Plate Silencing Grooves on Performance of Swash Plate Axial Piston Pumps** — Mechanical Design and Production Congress.

TECHNICAL & SOFTWARE SKILLS

- Matlab-Simulink.
- Automation Studio.
- Visual Basic.
- Microsoft Office.
- Hydraulic-system design.
- Fluid-power modeling and simulation.
- Dynamic-system analysis.
- Hydraulic-component sizing.
- Electro-hydraulic control.
- Instructional software development.
- Animated technical-training modules.
- Customized course-delivery software.

PRESENTATION & EDUCATIONAL SKILLS

- International professional instruction.
- Executive and technical presentations.
- Engineering curriculum development.
- Hands-on laboratory instruction.
- Customized corporate training.
- Technical course development.
- Educational software development.
- Cross-cultural professional communication.

INFORMATIVE WEBSITES

- [Professional Courses](#)
- [Textbooks](#)
- [Universal Fluid Power Trainers.](#)
- [IFPS-Hall of Fame](#)
- [Online Industrial Training Academy](#)