

**Thomas J. Labus - Professor
Mechanical Engineering Department
Milwaukee School of Engineering**

EXPERIENCE

Mr. Labus has over forty years of experience in the areas of fluid mechanics, high-pressure engineering, actuation/control systems, hydraulics, pneumatics, rotary and linear reciprocating seals, materials evaluation, and mechanical design and analysis. This includes over seven years in engineering project management with emphasis on new product development, strategic planning, technology forecasting, and market analysis. Product design experience includes high volume applications such as automotive components, metal stampings, die and investment castings, molded elastomeric and plastic items, and conventional machined metal components.

Presently, Mr. Labus holds an appointment as a Professor of Mechanical Engineering at the Milwaukee School of Engineering (MSOE). Courses taught include strength of materials, fluid mechanics, fluid power systems design, thermodynamics, heat transfer, finite element analysis, and control systems design. Research/development areas include abrasive water jet machining, fluid power system/component modeling and simulation, instrumentation techniques in fluid flow including video imaging, laser doppler anemometry, and x-ray densitometry.

He has been instrumental in developing a fluid power option at MSOE in the mechanical engineering technology program, and in developing long-term industrial partnerships with companies such as Caterpillar and John Deere in the field of electro-hydraulics and advanced fluid power technologies. These programs include research and development and education and training. He also teaches in the Masters of Engineering program at MSOE in the area of mechanical engineering and fluid power.

Professor Labus is active in the Fluid Power Institute of Applied Technology Center at MSOE that focuses on research, development, testing and evaluation in the fluid power industry. He has participated in over forty-five (45) projects ranging from valve design for under water applications, development of a water jet tail clip cutter, development of a simulation program for a hydraulic system on a concrete construction buggy, design review of an articulated medical operating table, to experimental and analytical investigation of flow forces in hydraulic spool valves.

He is active professionally in reviewing papers for the ASME Journal of Dynamic Systems and Controls, and has organized several conferences for the Water Jet Technology in 1993 and 1995. He is the vice-president of the Fluid Power Educational Foundation that supports fluid power education at 2 and 4 year technical colleges/universities.

Prior to joining MSOE in September, 1991, he was as Associate Professor of

Engineering Science at the University of Wisconsin-Parkside from September, 1984 through May, 1991. Courses taught include thermodynamics, heat transfer, fluid mechanics, statics, strength of materials, engineering economics, engineering graphics, machine design, and applied statistics. Research areas include fluid jet technology as related to flexible manufacturing systems for industrial applications, and in advanced excavation/breakage techniques for mining, tunneling, and construction applications. Basic research in the area of fluid jet technology includes modeling and experimental work in the area of abrasive mixing, and fracture mechanics due to pulsed jet impact. Other areas of interest include computer-aided design for fluid, mechanical, and thermal systems. Consulting activities include expert testimony as related to failure analysis of fluid power components, design of automation systems using combined electronic, pneumatic and mechanical components, design of a leakage sensor for hydraulic cylinder seals, water jet integration with single arm and gantry style of robots for industrial uses, and the effects of high pressure processes on fluid properties.

Prior to joining UW-Parkside, Mr. Labus was Chief Engineer for Hydro-Line Mfg. Co., Rockford, Illinois from November, 1981 to February, 1984. In this capacity he was responsible for product design, and research and development as related to a line of hydraulic/pneumatic cylinders. Significant accomplishments included the design, test, and manufacturing support of a new line of agricultural cylinders in a four-month period, resulting in \$2.5 million annual sales. A computerized order entry system was upgraded to aid in inventory control and to provide a base for computer-generated bill-of-materials. New product development activities included a novel mechanical switch to sense end-of-stroke, new seals and sealing systems for abrasive service, and a light weight, aluminum pneumatic cylinder for high-volume competitively priced applications. Administrative duties included budget and capital equipment expenditure preparation, project management, and supervision of a staff of twenty-one professional and direct-labor employees.

Before joining Hydro-Line, Mr. Labus served as Director of R&D and Engineering Manager for EG&G Sealol, Chicago, Illinois, from September, 1977 to November, 1981. He was responsible for product design, research and development, and quality control activities as related to mechanical seals for fluid handling applications. A computer-aided design system was developed to optimize the design and manufacture of compression springs. This system included graphics, and established a base for computer accessible bills-of-materials. New product development activities included the introduction of a low-cost carbon face material, a springless water pump seal design, an evaluation test method to screen potential new face/seal materials, and a low-cost bellows seal utilizing stamping technology to control costs. Administrative responsibilities included budget preparation, program direction, staffing, capital planning and expenditure for a staff of eighteen professional and direct-labor employees.

Prior to EG&G Sealol, Mr. Labus served as Senior Research Engineer with IIT Research Institute, Chicago, Illinois, from September, 1971 to September, 1977. At

IITRI he was responsible for the overall development and management of the High-Pressure Technology research activity. Technical interests included the development and application of water jets to primary material removal for construction, mining and quarry operations. Hydraulic systems development for high-density power units, valve performance testing, fatigue studies on hydraulic cylinders and other pressure vessels, and hydrostatic test and evaluation were other areas of activity. Management duties included budget, staff, and program responsibilities, and marketing areas included customer contact, proposal preparation, and new technologies/market analysis.

Before IITRI, Mr. Labus served as a Graduate Research and Teaching Assistant at the University of Illinois, Urbana, Illinois, from February, 1970 to September, 1971. There he taught courses in fluid mechanics, strength of materials, and presented numerous lectures on various fluid power applications. Research areas during this time included noise generation in fluid power systems and mathematical turbulence studies.

Prior to the research at the University of Illinois, Mr. Labus served as a Project Engineer with the Sundstrand Corporation, Aviation Division, Rockford, Illinois, from June, 1968 to February, 1970. His activities centered on the design and development of aircraft appendage actuation systems. This work included experience in hydraulic devices, ball-screw actuators, controls and fluidics. His experience also included work in the test and development of hot-gas hydraulic power units used in missile control systems.

EDUCATION

B.S., Aeronautical Engineering, Purdue University, 1968

M.S., Theoretical and Applied Mechanics, University of Illinois, 1971

Additional graduate work at Northern Illinois University in Mathematics; Illinois Institute of Technology in Mechanics; and the University of Wisconsin-Milwaukee in Mechanical Engineering with an emphasis on high-pressure fluid jet systems.

PROFESSIONAL AFFILIATIONS

American Society of Mechanical Engineers

Water Jet Technology Association-Chairman of the Board of Directors, 1995-1997,
member since 1985, and board member 1987-1997

Vice-President of the Fluid Power Educational Foundation

PATENTS

"System for Pumping Fluids at Constant Pressure", US Patent No. 4,373,864, February 15, 1983

PUBLICATIONS

1."Coal Mining Using High Pressure Water Jets", with M.M. Singh and L.A. Finlayson,

US Bureau of Mines, under contract H0111789, IITRI Report D6062, October, 1973

2. "Photoelastic Study of Water Jet Impact", with I.M. Daniel and R.E. Rowlands, Proc. Second Int. Sym. on Jet Cutting Technology, Cambridge, England, April 2-4, 1974
3. "Field Testing of Water Jets for Coal Breakage", with M.M. Singh and L.A. Finlayson, Proc. of Second Int. Sym. on Jet Cutting Technology, Cambridge, England, April 2-4, 1974
4. "Water Table Use in Studies of Pressure Waves in Fluid Power Systems", with C.F. Holt and J.M. Robertson, T&AM Report No.339, University of Illinois at Urbana-Champaign, April, 1972
5. "High Pressure Water Jetting, An Emerging Technology", with M.M. Singh, Proc. of 30th National Conference on Fluid Power, Philadelphia, Penn., September, 1974
6. "Design of a Hydraulic Jet Coal Miner", with M.M. Singh, L.A. Finlayson, and W.M. Silks, US Bureau of Mines, under contract H0133119, IITRI Report D6088, Dec., 1973
7. "Water Jet Tests to Establish a Specific Energy Curve for Rocks", with M.M. Singh, US Dept. of Transportation, Federal Railroad Administration, Report No. FRA-ORD-D74-53, IITRI Report D6091, Aug., 1975
8. "Programmable Servo System for Hydraulic Testing of Composite Laminate Cylinders", with W.C. Cole, Proc. Second Nat. Fluid Power Systems and Controls Conf., Madison, Wis., May, 21-23, 1975
9. "Steam Generator Cleaning Using High Pressure Water Jets", Knolls Atomic Power Laboratory, under P.O. No. NPD74-0255-ATO, IITRI Report No. D6104, March, 1975
10. "Energy Requirements for Rock Penetration by Water Jets", Proc. Third Int. Sym. on Jet Cutting Technology, Chicago, Illinois, May 11-18, 1976
11. "A Hydraulic Coal Mining Machine for Room and Pillar Applications", Proc. Third. Int. Sym. on Jet Cutting Technology Chicago, Illinois, May 11-18, 1976
12. "Runway Grooving Using High Pressure Water Jets", with M.S. Khan, Dept. of Transportation, Federal Aviation Admin., under contract No. N68335-75-M-1669, IITRI Report No. D6112, Jan., 1976
13. "An Experimental Investigation of an Underwater High Pressure Water Jet Metal Cutting Tool", with J.A. Hilaris, Naval Training Equipment Center, under contract No. N61339-75-6-0028, IITRI Report No. D6103, Jan., 1976

14. "Development of a High Density Hydraulic Power Unit for Active Control Wind Tunnel Models", with J.A. Hilaris, under NASA contract no. NAS1-13809, IITRI Report No. D6107, March 1977
15. "Hypergolic Fluid Jet Mine Neutralization", with J.A. Tulis, J.N. Keith, and W.K. Sumida, US Army Mobility Equipment Research and Development Center, under contract No. DAAK02-75-C-0020, IITRI Report No. C6327, Nov., 1975
16. "High Pressure Water Jet Applications in Drilling Operations", Proc. of 6th AIRAPT Int. High Pressure Conf., Paper No. B-14, University of Colorado, Boulder, Colorado, July 25-29, 1977
17. "Development of a Compact Hydraulic Power Unit for Wind Tunnel Models", with J.A. Hilaris, Proc. 33rd Nat. Conf. on Fluid Power, Chicago, Illinois, Oct. 25-27, 1977
18. "Marine Applications of High Pressure Water Jets", ASTM STP No. 664, Erosion: Prevention and Useful Applications", American Society of Testing and Materials, Philadelphia, Penn., Feb., 1979
19. "Applications of Water Jet Technology to Shipbuilding", Proc. of REAPS Technical Sym., IIT Research Institute, New Orleans, Louisiana, June 21-22, 1977
20. "Hypergolic Fluid Jet Destruction of Land Mines", with J.A. Tulis, W.K. Sumida, J.N. Keith and D.C. Heberlein, Proc. of 9th Sym. on Explosives and Pyrotechnics, Philadelphia, Penn., Sept., 1976
21. "Cutting and Drilling of Composites Using High Pressure Water Jets", Proc. 4th Int. Sym. on Jet Cutting Technology, Paper No. G2, Canterbury, England, April 12-14, 1978
22. "Highway Maintenance Applications of Jet Cutting Technology", with J.A. Hilaris, Proc. 4th Int. Sym. on Jet Cutting Technology, Paper No. G1, Canterbury, England, April 12-14, 1978
23. "A Study of High Pressure Water Jets for Highway Surface Maintenance", with J.A. Hilaris, National Science Foundation, under Grant No. ISP-76-12230, IITRI Report No. D6124, April, 1978
24. "A Comparison of Pulsed Jets Versus Mechanical Breakers", Proc. of 6th Int. Sym. on Jet Cutting Technology, Paper No. F1, Guildford, England, April 6-8, 1982
25. "The Influence of Rubbing Materials and Operating Conditions on the Power Dissipated by Mechanical Seals", Lubrication Engineering, Vol. 37, No. 7, Pg. 387-394, July, 1981

26. "A Comparative Evaluation of Mechanical Seals for Automotive Air Conditioning Compressors", SAE Paper No. 820076, Feb., 1982
27. "Recommended Research, Development, Test and Evaluation Plan for Improved Concrete Cutting", with A.S. Kubo, J.E. Backofen, H.N. Ebersole, R.K. Moats, M.R. Reilly, and A.D. Wingfield, The BDM Corp. Report No. BDM/W-81-782-TR, Nov., 1981
28. "Water Jet Cutting of Oil Shale", with D.Chazin and C.Young, Science Applications Inc., Report No. 1-451-06-110-00, April, 1980
29. "Material Excavation Using Rotating Water Jets", Proc. of 7th Int. Sym. on Jet Cutting Technology, Paper No. P3, Ottawa, Canada, June 26-28, 1984
30. "Fluid Jet Technology for Industrial Applications", with R.Pilarski, Proc. of SCTE Conf. on Nontraditional Machining, American Society for Metals, Cincinnati, Ohio, Dec. 2-3, 1985
31. "Fluid Jet Machining of High-Performance Materials", Proc. Eastern Manufacturing Technology Conf., National Machine Tool Builders Assoc., Springfield, Mass., Nov. 10-12, 1987
32. "Cleaning and Deburring Using Fluid Jets", presented at the Investment Casting Institute Automation Seminar, Milwaukee, Wis., Sept. 12-14, 1988
33. "Plant Design and Operational Considerations for Fluid Jet Systems", SME Paper No. MS88-134, Automated Waterjet Cutting Conf., Detroit, Michigan, May 10-11, 1988. Also published in the bulletin of Advanced Machining Technology, by Advanced Machining Technology & Development Association, No. 24, 1990-7, Tokyo, Japan, Sept., 1990
34. "Factors Influencing the Abrasive Mixing Process", with K. Neusen, D. Alberts, and T. Gores, Proceedings of 5th American Water Jet Conference, Toronto, Canada, August 29-31, 1989
35. "Distribution of Mass in a Three-Phase Abrasive Waterjet Using Scanning X-Ray Densitometry", with K. Neusen, D.G. Alberts, and T.J. Gores, Proceedings of Tenth Int. Sym. on Jet Cutting Technology, BHRA Fluid Engineering, Amsterdam, Holland, Oct 31-Nov 2, 1990.
36. "Factors Influencing the Particle Size Distribution in an Abrasive Waterjet", with K. Neusen, D. Alberts, and T.Gores, ASME Journal of Engineering for Industry, Vol. 113, No. 4, pg 402-411, November, 1991.
37. "Pulsed Fluid Jet Technology", Proc. of First Asian Conference on Recent Advances

in Jetting Technology, CI-Premier, Singapore, May 7-8, 1991.

38. "Hole Piercing in Thin Metals Using Water Jets", with K. Neusen, Proceedings of 6th American Water Jet Conference, Paper No. 36, August 24-27, 1991, Houston, Texas.
39. FLUID JET TECHNOLOGY, FUNDAMENTAL AND APPLICATIONS, 4th ed, editor and contributor, published by the Water Jet Technology Association, ISBN 1-880342-01-4, 1999.
40. "Integration of Modeling and Simulation in the Design of Hydraulic Systems", Proc. of 1996 Nat. Design Engineering Conference, Reed. Exhibition Co., March, 1996
41. "Simulation of a High Pressure Pulsed Jet Intensifier", with M.M. Garity, ASME Pressure Vessels and Piping Conference, PVP-Vol. 335, July, 1996.
42. "Electrohydraulics in the Undergraduate Curriculum", with J. Ficken and J. Lumkes, Proc. of 2000 American Control Conference, Chicago, Illinois, June, 2000.
43. "Purdue/MSOE/Caterpillar Strategic Partnership", with G. Krutz, M. Francheck, T. Maciejewski, P. Moots, T. Bray, D. Lenner, and T. Wanke, 1998 ASAE International Annual Meeting, Orlando, Florida, July, 1998.
44. "An Off-Road Hydraulic Competition Vehicle", with P. Waseilewski, 2002 IFPE/SAE Off-Highway Congress, March 19-23, 2002, Las Vegas, NV.
45. "High Pressure Pumps", Cleaner Times, March 2002, Vol. 14, No. 3, pg. 60-66.
46. "*The Dynamics of Liquid Spring Suspensions*" at the SAE Commercial Vehicle Congress, in Chicago, October, 2004; co-authored with D. Delorenzis of Liquid Spring Technologies.
47. "*Combing Computer Analysis and Physical Testing in a Finite Element Analysis Course*", with W.E. Howard and V.C. Prantil, Proceedings of the 2004 American Society for Engineering Education conference

Expert Witness Experience
Thomas J. Labus

Date	Case	Type/Subject	Function	Discovery	Report	Deposition	Testify
2009	Active	Patent Infringement	Expert Consultant	YES	YES		
2007	Hydro-Gear Limited US Patents No. 7,006,199 B1 6,964,280 B1 6,888,595 B1 6,782,797 B1 6,968,687 B1 6,719,005 B1 Partnership vs. Parker-Hannifin Corporation	Patent Infringement/ (Pump/motors in turf equipment)	Expert Consultant	YES	NO	NO	NO Case settled out of court
2006	J. Kacala vs. Vac-Con Inc.	Product Liability/ (High Pressure Water Blasting Equipment)	Expert Witness	YES	YES	NO	NO Settled out of court
2004	DonJon Marine vs Bollinger Marine and Huber Inc. vs Moog Inc.	Product Liability/ (Hydraulic Cartridge Valves)	Expert Consultant	YES	YES	NO	NO
2006	J. Garcia vs. N. American Insurance	Product Liability/ (Mechanical Spin Baskets)	Expert Consultant	YES	YES	NO	NO
2001	Andalex Resources vs. D.A. Stuart vs. DBT America Inc.	Product Liability/ (Crushing Equipment)	Expert Consultant	YES	YES	NO	NO
1998	Electro Hyd. Ltd US Patent No. 5,605.178	Patent Infringement/ (Electro-	Expert Witness	YES	YES	YES	YES in England

	vs. Husco Int.	hydraulic valves)					
1996	Tecumseh vs. Unipat, Hydro-Thoma & C.H. Thoma	Patent Infringement/ (Slipper bearings in hydraulic pumps)	Expert Consultant	YES	YES	NO	NO
1989	Kennecott Corp. vs. Kyocera Int.	Patent Infringement/ (Ceramic materials)	Witness in fact	YES	NO	YES	YES

Note: Bold indicates the party that I represented