

Professional Profile

Mr. Muhlbauer is an internationally recognized authority on pipeline risk management. In this field, he is an author, lecturer, consultant, and software developer. Techniques developed by Mr. Muhlbauer are in use by the largest pipeline operators in the U.S. and in pipeline operations in many other countries. Mr. Muhlbauer is an advisor to private industry, government agencies, and academia, as well as a frequently invited speaker at industry conferences worldwide. Mr. Muhlbauer also has an extensive background in pipeline design, operations, and maintenance, having held technical and management positions in a pipeline operating company for over 13 years prior to becoming a full time pipeline risk management consultant

Work History

Pipeline Risk Management, 1986-present

- Developed a new approach to comprehensive pipeline risk assessment while performing field analysis and data collection for Dow Chemical cross-country pipelines at 12 sites worldwide, encompassing over 40 different products transported.
- Presented and published this methodology at numerous technical conferences, in trade journals, and in two technical books, both published by Gulf Publishing Company, Houston, TX.
- Designed and developed computer software to support the collection and analysis of data for pipeline risk management.
- Industry advisor for US DOT-sponsored study of pipeline risk management. Trainer for DOT federal and state pipeline auditors pipeline risk management.
- Expert witness testimony and report preparations for court proceedings.
- Consulting projects for numerous pipeline operators in the U.S. and in over ten foreign countries.
- Consultations to municipalities and other government agencies regarding possible impacts arising from pipeline projects.

As owner and principal of WKM Consultancy, Mr. Muhlbauer presently advises and consults internationally, specializing in pipeline risk management, pipeline quality management, regulatory compliance, and technical aspects of pipeline designs and operations.

Pipeline Design, Operations, and Maintenance, 1982-1994, Dow Chemical Company

- Extensive, direct experience in the design, operation, maintenance, and management of pipeline systems, encompassing construction, field operations, control center operations, and testing of new technology.

- Performed technical audits of pipeline facilities worldwide. Re-organized and re-staffed two departments to improve operational efficiency. Most recent management positions at Dow included:
 - Direct supervision of a pipeline control center (staff of 13) which provided 24 hr/Day monitoring and control of a 9-system (3000 mile) pipeline network; and
 - Area manager responsible for field operations of a 1200-mile pipeline network (staff of 34 people and an annual budget of approximately \$12 million).

Total Quality Management, 1990-1992, Dow Chemical Company

- Certified Quality Engineer (CQE) by American Society for Quality Control (ASQC).
- Designed and implemented Total Quality Management processes for Dow's pipeline and storage operations department of 180 people in two states.
- Designed and conducted training for supervisors and employees.

Instructor/Trainer, 1984-present, Dow Chemical Company and WKM Consultancy

Designed, developed, and instructed numerous courses in:

- Pipeline Risk Assessment; Pipeline Risk Management
- Total Quality Management; Statistical Quality Control; Statistical Process Control
- Data Collection and the Use of Measurements
- Community College Courses: Land Surveying Theory and Techniques; Industrial Safety and Loss Prevention; Spreadsheets (computer software course)

Designed and conducted workshops on Pipeline Risk Management for operators and government agencies in the U.S., Canada, Indonesia, Mexico, Malaysia, Colombia, Bolivia, and Trinidad, as well as international audiences from the pipeline industry.

Professional Society Volunteer Assignments, 1987-present

Initial chairman of *American Society of Civil Engineers* technical committee "Pipeline Risk Management".

Past chairman of *American Society of Civil Engineers (ASCE)* technical committee, "Pipeline Crossings", developing international conferences and 'manual of practice'.

Past chairman of program committee for ASCE pipeline technical conference on pipeline engineering.

Past committee chairman in *National Society of Professional Engineers* and previously active in *American Society for Quality Control*.

Books, Publications, and Product Development

- Pipeline Risk Management Manual, 1992, Gulf Publishing Company, Houston, TX.
- Pipeline Risk Management Manual, 2nd Edition, 1996, Gulf Publishing Company, Houston, TX.

- Pipeline Risk Management Manual, 3rd Edition, 2004, Gulf Publishing Company, Houston, TX.
- Pipeline Risk Controller, commercial software package, 1994, 1997.
- PipeCalc version 4.0, commercial software package, 1995.
- Pipe Line Rules of Thumb CD, commercial software package, 1998 & 2002.
- Various custom software applications.
- Numerous journal and technical conference articles and presentations.

Education

Graduated Summa Cum Laude from University of Missouri, Bachelor of Science,
Civil/Environmental Engineering, Dec 1981.

Post-graduate and continuing education in areas of Business Administration (University of
Houston at Clear Lake), Total Quality Management, and Engineering.

Pipeline Design, Construction, Operations, and Maintenance

Supplement to work history of resume for W. Kent Muhlbauer, PE

Pipeline Design and Construction, 1982-1990, Dow Pipeline Company

During this period, Mr. Muhlbauer held a variety of positions at Dow Chemical's Pipeline Division in Texas. As an operations engineer for a pipeline district field office, Mr. Muhlbauer was responsible for the technical aspects of 800 miles of cross-country pipelines (transporting hazardous liquids and gases) and a fresh water reservoir system. As project engineer and project manager, he was responsible for estimation, design, construction, and cost control for numerous projects including:

- Compressor station design, hot tap of 30" high pressure natural gas line, associated piping and metering;
- Hot tap and valving for numerous new natural gas connections;
- 15 mile, high pressure ethylene line repair, recommission, and decommission;
- In-service lowerings of numerous high pressure propylene, ethylene, LPG, and natural gas pipelines;
- Refurbishment of styrene/benzene pipelines through a congested process plant;
- Onshore water/wastewater recovery system design and installation for an offshore pipeline in natural gas service;
- Design and installation of horizontal directionally drilled water crossing in an environmentally sensitive area;
- Design and construction of 7+ miles of new natural gas pipeline in urban areas around Pittsburg, CA, including dehydration and metering stations;
- Numerous new pipeline connections and major maintenance projects in many product services;
- Preparation of numerous pipeline technical guidelines, procedures, and operating manuals for all aspects of pipeline operations; and
- Conducting computer modeling and research in pipeline technology, including leak detection, drag-reducers, infrared imaging, AC-induced currents, leak dispersion modeling, underground explosive effects, risk assessment, expert systems, and satellite communications for SCADA.

Pipeline Operations and Maintenance, 1990-1994, Dow Chemical Company

In several management positions, Mr. Muhlbauer was responsible for various aspects of pipeline system operations and maintenance for Dow Chemical's Pipeline Division. Key assignments during this period included:

- Management of a pipeline control center overseeing operations of a 3,000 mile / 9 system pipeline network handling numerous products and two large fresh water storage and delivery

systems. Direct responsibility for 13 employees and an annual operating budget of approximately \$4 million. Supervised all staffing, logistical, and hardware/software changes required to combine two working control centers into a single center.

- Management of pipeline field office with staff of 35 and annual operating budget of approximately \$12 million. Responsible for operations and maintenance of 1,200 miles of pipeline in southern Louisiana. Supervised the reduction in manpower and cost-cutting measures to streamline this operation.
- Designed and implemented Total Quality Management processes for a department of 180 people. Developed and conducted training programs for supervisors and employees.
- Prepared and participated in numerous start-up audits, safety audits, and project reviews.

Independent Pipeline Consultant, 1994-Present, WKM Consultancy

As an independent consultant, Mr. Muhlbauer has been a primary investigator and consultant in numerous pipeline technical projects for over 50 clients. Clients include major pipeline operators in the U.S. and overseas, consulting engineering companies; academicians; pipeline regulatory agencies; attorneys engaged in pipeline issues; and insurance companies. Larger projects include the following (in some cases, sponsoring company names have been omitted at their request):

- Risk assessment study and report for ~4,000 km, large diameter natural gas pipeline across China.
- Preparation of integrity management plan (IMP) for ethylene and propylene pipelines in Louisiana, including dispersion calculations, hazard zone, and risk assessment model.
- Comparative assessment and report on competing pipeline risk assessment methodologies for gathering systems in Oklahoma and Texas and refined products transportation in the NE (*Sunoco*)
- Preparation of various risk reports and analyses documents for regulatory approval process of on-and offshore pipeline project proposed between Canada and U.S. in Pacific Northwest (*Williams Pipeline, GSX Pipeline*).
- Development of risk assessment methodology for tank farms and pumps stations for major pipeline operating company.
- Risk assessment study and failure investigation on special plastic pipe installations for major urban gas distribution systems in NE U.S.
- Pilot risk assessment of 200 mile system and subsequent expansion to cover 5,400 mile large diameter hazardous liquid pipeline system (*Colonial Pipeline Company*);
- Development of risk management and MAOP determinations for hazardous liquid and gas pipeline systems countrywide in Bolivia (*Transredes*);
- Pre-installation risk assessment study of a new large diameter, high-pressure offshore pipeline in Taiwan.
- Risk assessment consultations and field investigation of a major pipeline in Republic of Georgia involving conversion of portions of an old Soviet pipeline system.
- Risk management training for gas distribution system operators in Colombia, SA.

- Pipeline system risk evaluation for proposed hazardous liquid pipeline in Michigan, as part of preparations for *Public Services Commission* hearings;
- Under direction of US regulatory agencies (EPA, DOT, and DOJ), produce consulting reports on pipeline technical issues and risk management for conversion of crude oil pipeline to gasoline service, in Texas (*Longhorn Pipeline Partners*);
- Conducting pipeline risk management training sessions for all regional offices of National Association of Pipeline State Regulators (NAPSR), under contract for *Department of Transportation, Office of Pipeline Safety*;
- Risk assessment study and report for City of San Diego water department including all transmission pipelines, pump stations, reservoirs, and treatment plants.
- Identification of high consequence areas and preparation of integrity management plan for Louisiana hydrocarbon complex.
- Risk assessment and management report for proposed butadiene pipeline through congested urban area in south Texas.
- System safety and integrity evaluation study for purchasers of a crude oil pipeline system in Texas (*Howell Petroleum*);
- Conduct risk assessment analysis for major terminals and HVL pipelines in Mexico (*PEMEX*);
- Development of risk assessment and risk management systems for a major city gas distribution system (*GASCO Honolulu*)
- Evaluation and performance estimation report on SCADA system leak detection capabilities for crude oil system in Texas (*Howell Petroleum*);
- Design and cost estimation for new pipeline risk management software suite of tools.
- Serve on technical advisory committee for Canadian pipeline software and technology company (*Baseline Technologies*)
- Development of procedures manuals and training materials for refinery and terminal operations (*Broken Hill Properties, Australia*);
- Create software programs for purchase order management and regulatory compliance ‘tickler’ for natural gas transmission company in Texas.
- Evaluation of operations and maintenance procedures for hydrogen pipeline operated in south Texas (*Basis Petroleum*);
- Evaluation of pipeline safety systems and regulatory compliance for chemical plant in Louisiana
- Consultant for technical software acquisitions to publishing company specializing in the oil and gas industry (*Gulf Publishing Company*);
- Create software for refinery in Montana to track progress towards regulatory compliance of operations and maintenance procedure manuals.
- Various reports and consultations with attorneys representing pipeline companies; parties injured by pipelines; and municipalities concerned with pipeline issues.

Expert Witness Testimony and Services in Support of Legal Proceedings

Mr Muhlbauer has been involved in legal matters involving pipelines since the 1980's. As an impartial consultant, he has performed requested services for parties seeking damages from pipelines and from government agencies negotiating with pipeline companies; as well as for pipeline companies themselves. A partial listing of such services is shown below.

- Key author of portions (chapters 5, 6, & 9) of the Environment Assessment Report prepared in matter of United States District Court Western District of Texas, Austin Division, “Ethel Spiller, et al. Plaintiffs, v. Robert M. Walker, et al Defendants Civil no. A-98-CA-255-SS”, a settlement agreement involving plaintiffs and U.S. Environmental Protection Agency and U.S. Department of Transportation concerning Longhorn Partners Pipeline conversion of service of pipeline in Texas, October 2001. Written declaration was also prepared for this case.
- Written declaration and direct testimony on behalf of Wolverine Pipeline Company before Michigan Public Service Commission in matter “Application of Wolverine Pipe Line Company for Authority to Construct, Operate and Maintain a Pipeline System in Jackson, Ingham, and Clinton Counties, Michigan Case No. U – 12334”, June 2000.
- Written report and oral deposition on behalf of Colonial Pipeline Company in matter of “United States v. Colonial Pipeline Company; Civil Action No. 1:00-CV-3142 (US District Court, N.D. Georgia)”, April 2002.
- Written and oral testimony before the Canadian National Energy Board (NEB) on behalf of GSX Pipeline (Williams Gas Pipeline), Joint Review Panel Commission Hearing Order GH-4-2001; GSX Canada Pipeline Project; Application to construct and operate a new natural gas pipeline and related facilities (in U.S. and Canada); hearing held in Sidney, British Columbia/Sidney, March 2003
- Consultations to attorneys on behalf of parties injured by El Paso natural gas pipeline in south Texas.
- Consultations to Town of North Andover, MA in matter of proposed new natural gas pipeline (Maritimes Northeast) through town limits.
- Consultations to attorneys in matter of Olympic pipeline accident in Bellingham, WA.
- Consultations and preparation of preliminary report at request of insurance agency in matter of insurance claims settlement involving a pipeline rupture in California.

Presentations and Training Programs Prepared and Conducted

Supplement to work history of resume for W. Kent Muhlbauer, PE

Multi-day workshops and courses

- 'Pipeline Risk Management Workshop", 1.5 days, Clarion Technical Conferences, Houston, September, 2003.
- 'Pipeline Risk Management Workshop", 1.5 days, Clarion Technical Conferences, Houston, February, 2003.
- 'Pipeline Risk Management and Integrity Planning Workshop *Preparing you for filing your formal Risk Management Plan*", 2-day workshop sponsored by Mustang Engineering, October 16-17, 2001, Houston, Texas
- ' 11 day workshop on Pipeline Risk Assessment' , & Training Manual, sponsored by *Petroleum*, May 1994, Indonesia
- ' 7 day workshop on Pipeline Risk Assessment, & Training Manual, sponsored by *Exxon*, May 1998, Bucaramanga, Colombia
- ' Pipeline Risk Management: Modeling for Risk Assessment and Resource Allocation-(1 day workshop)' , & Training Manual sponsored by *8th International Pipeline Pigging Conference--Pipeline & Gas Industry magazine* (Gulf Publishing co), Feb 1996, Houston, TX.
- ' Pipeline Risk Mgmt Workshop (2 days)' , & Training Manual, sponsored by *Exxon*, Inc Kingwood, TX for delegation of Russian pipeline professionals, Nov 1996, Houston, TX.
- ' Pipeline Risk Management: Modeling for Risk Assessment and Resource Allocation-(1 day workshop)' , & Training Manual, sponsored by *Pipeline Reliability Conference and Exhibition--Pipeline & Gas Industry magazine* (Gulf Publishing co), Nov 1996, Houston, TX.
- ' Pipeline Risk Management: Modeling for Risk Assessment and Resource Allocation-(1 day workshop)' , & Training Manual, sponsored by *Pipeline Week 1997 International Conference*, Sep 1997, Houston
- ' 11 day workshop on Pipeline Risk Management' , & Training Manual, sponsored by *The National Gas Company of Trinidad and Tobago Ltd*, Oct 1997, Republic of Trinidad and Tobago, WI
- ' 2 day workshop on Pipeline Risk Management", & Conference Proceedings, sponsored by *Pipeline Pigging Conference*, Feb 1998, Houston, TX.
- ' Pipeline Risk Management 2 Day Course' , & Training Manual, sponsored by *The Pipeline Pigging Conference*, Jun 1998, Kuala Lumpur, Malaysia.
- ' 2 day workshop on Pipeline Risk Management", & Training Manual, sponsored by *2nd International Pipe Line Week Conference*, Oct 1998, Houston, TX.

- ' ' Pipeline Risk Management 2 Day Course' ' , & Training Manual, sponsored by *Chrydige Pipeline Inc*, Oct 1999, Duluth, MN
- ' ' 4 day workshop on Pipeline Risk Management & Training Manual, sponsored by *Transredes Pipeline Company*, Nov 2000, Santa Cruz, Bolivia.
- ' ' Safety and Loss Prevention' ' , sponsored by Brazosport Community College, Aug 1989, Lake Jackson , TX.
- ' ' Land Surveying' ' , sponsored by Brazosport Community College Aug 1990, Lake Jackson , TX.
- ' ' Computer Applications Spreadsheets' ' , sponsored by Brazosport Community College, Jan 1992, Lake Jackson , TX.

Other Training Sessions

- ' ' Statistical Process/Quality Control workshops and presentations for employees sponsored by Dow Chemical, 90-91, Freeport, TX
- ' ' Gas Distribution Engineering Course Pipeline Risk Management Session”, sponsored by *IGT (Inst. Gas Technology)*, Jul 1996, Chicago, IL.
- ' ' Pipeline Risk Assessment Methodologies' ' , sponsored by *DOE OPS (Office Pipeline Safety)*, Jun 1997, Washington DC.
- ' ' Fundamentals of Pipeline Risk Assessment' ' , sponsored by *ARUC (National Association of Regulatory Utility Commissioners)*, Jun 1997, East Lansing, MI
- ' ' Fundamentals of Pipeline Risk Assessment' ' , sponsored by *ARPSR (National Association of Regulatory Utility Commissioners)-SW*, Aug 1997, San Antonio, TX
- ' ' Fundamentals of Pipeline Risk Assessment' ' , sponsored by *ARPSR (National Association of Regulatory Utility Commissioners)-Eastern*, Aug 1997, Portsmouth, NH
- ' ' Fundamentals of Pipeline Risk Assessment' ' , sponsored by *ARPSR (National Association of Regulatory Utility Commissioners)-Central*, Sep 1997, Omaha, NE
- ' ' Fundamentals of Pipeline Risk Assessment' ' , sponsored by *ARPSR (National Association of Regulatory Utility Commissioners)-Western*, Sep 1997, Seattle, WA
- ' ' Fundamentals of Pipeline Risk Assessment' ' , & Conference Proceedings, sponsored by *ARPSR (National Association of Regulatory Utility Commissioners)-Southern*, Oct 1997, AK
- ' ' Pipeline Risk Assessment for Hazardous Liquids' ' , sponsored by *American Petroleum Institute (API)* , May 1998.
- ' ' Risk Assessment for Pipeline Surface Facilities' ' , sponsored by *Williams Energy*, Oct 2000, Tulsa, OK.

Conference Presentations and Journal Publications

- ' ' Key Note Address: Pipeline Risk Management' ' , published in Conference Proceedings, by API Workshop, Sep 2001, Houston
- ' 'Scheduling Integrity Re-verifications”, published in *Pipeline Pigging, Rehabilitation, and Repair* Conference Proceedings, by *Pipes and Pipelines International*, January 2002, Houston

- ' ' The Move to Formal Risk Management' ' , published in Trade Journal Article *Elby Control Magazine*, Aug 2001, Austin, TX
- ' ' Lessons Learned in Pipeline Risk Management' ' , published in Conference Proceedings, by Minerals Mgmt Service; C-Core, Nov 1999, Anchorage, AL
- ' ' A Proactive Approach to Pipeline Risk Assessment' ' , published in Trade Journal Article, by *Pipeline Industry* magazine (Gulf Publishing Company), Jul 1992, Houston, TX
- ' ' Economic Considerations for Pipe Line Risk Management' ' , published in Trade Journal Article, by *Pipeline Industry* magazine (Gulf Publishing Company), Feb 1994, Houston, TX
- ' ' Pipeline Risk Management: A Resource Allocation Model' ' , published in Trade Journal Article, by Hart' *Pipeline Digest*, Feb 1996, Houston
- ' ' RIPS Identifies Pipeline Risks' ' , published in Conference Proceedings, by 3rd International Conference on Pipeline Pigging and Inspection Technology: *Pipe Line Industry* magazine (Gulf Publishing Company), Feb 1991, Houston
- ' ' RIPS Identifies Pipe Risks' ' , published in Conference Proceedings, by Pipeline Risk Assessment, Rehabilitation and Repair: *Pipeline Industry* magazine (Gulf Publishing Company), May 1991, Houston
- ' ' Risk Assessment, Rehabilitation and Repair Conference' ' , published in *Conf* Proceedings, by *Pipes and Pipelines International*, May 1992, Houston
- ' ' The Economics of Risk Management' ' , published in Conference Proceedings, by 3rd International Conference on Pipeline Risk Assessment, Rehabilitation and Repair: *Pipeline Industry* magazine (Gulf Publishing Company), Sep 1993, Houston
- ' ' Pipeline Risk Management and Operating Discipline' ' , published in Conference Proceedings, by *7th Annual International Pipeline Monitoring and Rehabilitation Seminar: Systems Integrity*, Inc, Feb 1995, Houston
- ' ' Risk Analysis The Methodologies and Their Effects' ' , published in Conference Proceedings, by *Natural Gas in the Americas II: The Emerging Giant* (IGT (Institute of Gas Technology)), May 1995, Caracas, Venezuela
- ' ' Pipeline Risk Management A Resource Allocation Model' ' , published in Conference Proceedings, by 5th International Conference on Pipeline Reliability--*Pipeline & Gas Industry* magazine (Gulf Publishing Company), Sep 1995, Houston
- ' ' Pipeline Risk Management Programs' ' , published in *Conf* Proceedings, by *Gas Industry Risk Management*, IGT (Institute of Gas Technology), Nov 1995, New Orleans, LA
- ' ' Pipeline Risk Management presentation at NACE Gulf Coast Corrosion Control Seminar' ' , published in Conference Proceedings, by NACE (National Association Corrosion Engineers), Feb 1996, Houston
- ' ' Pipeline Risk Assessment Seminar' ' , published in Conference Proceedings *AP Pipeline Conference*, Apr 1996, Dallas
- ' ' Pipeline Risk Assessment and Risk Management' ' , published in Conference Proceedings, by International Pipeline Conference: ASME (American Society of Mechanical Engineers), Jun 1996, Calgary, Alberta, Canada

- ' ' Risk Assessment and Resource Allocation in System Maintenance' ' , published in Conference Proceedings, by *Emergency Response Planning: IGT (Inst. Gas Technology)*, Jun 1996, Washington, DC
- ' ' Pipeline Risk Modeling Exploring the Controversy' ' , published in Conference Proceedings, by Pipeline Reliability Conference and Exhibition--*Pipeline & Gas Industry* magazine (Gulf Publishing Company), Nov 1996, Houston
- ' ' Pipeline Risk Management: A Resource Allocation Model' ' , published in Conference Proceedings, by 9th Annual International Pipeline Monitoring and Rehabilitation Seminar: Hart' *Pipeline Digest*, Feb 1997, Houston
- ' ' Managing Pipeline Risks' ' , published in Conference Proceedings, by IGT (Institute of Gas Technology), Jun 1997, Washington, DC
- ' ' Picking the Right Pipeline Risk Management Approach' ' , published in Conference Proceedings, by *Pipeline Week 1997 International Conference*, Sep 1997, Houston
- ' ' Picking the Right Pipeline Risk Management Approach' ' , published in Conference Proceedings, by *22nd Annual Gulf Coast Corrosion Control Seminar: NACE (National Association of Corrosion Engineers)*, Feb 1998, Houston, TX.
- ' ' Lessons Learned in Pipeline Risk Management' ' , published in Conference Proceedings, by *International Pipe Line Week Conference*, Oct 1998, Houston
- ' ' Qualitative Risk Assessment as a Basis for Pipeline Integrity Maintenance Planning' ' , published in Conference Proceedings, by *Offshore Pipeline Risk Assessment and Management*, Nov 1998, Clear Lake, TX
- ' ' Pipeline Risk Assessment and Risk Management' ' , published in Conference Proceedings, by American Society of Civil Engineers (ASCE) Specialty Technical Conference, Jun 1992, Seattle, WA.
- ' ' Economics of Pipeline Risk Management' ' , published in Conference Proceedings, by ASCE Pipeline Crossings Specialty Conference, Jun 1995, Denver, CO