Kiefner

Kiefner and Associates, Inc.

PRESERVING THE WORLD AND ITS ASSETS

for over 35 years

Kiefner

Message From Our
President

Trae J. Miller III

President & Chief Engineer

Kiefner and Associates, Inc.

A Message from our President and Chief Engineer

I am filled with gratitude and pride as we celebrate our 35th year in service. Leading the iconic Kiefner organization into my sixth year is a privilege. As I reflect on our journey, I am inspired by the remarkable progress we have made together. Kiefner's contributions are woven into the fabric of our industry—cited thousands of times in peer-reviewed journals, shared at major industry conferences, referenced in consensus standards, and relied upon by the U.S. DOT's PHMSA website. These milestones represent our hard work and the trust and collaboration of partners like you.

At Kiefner, we are fortunate to have some of the most brilliant minds in the industry on our team, constantly pushing the envelope to develop innovative solutions tailored to your needs. We are proud to offer tools that predict the grade of pipe and provide the probability of those predictions. We are advancing toward a commercial version of KAPA that will integrate many of our in-house tools into a seamless solution. As we enter 2025, we also celebrate our first year under new ownership, making us even more agile and efficient in delivering the quality and service you expect.

As we begin this new year, I want to take a moment to express what has truly driven our success for 35 years: you—our valued customers. You are at the heart of everything we do. We are committed to being a trusted partner, working side-by-side with you to find collaborative solutions to address your challenges and improve asset integrity. Together, we are reducing emissions and contributing to the fight against global climate change.

At the end of this brochure, you will find a one-page chart outlining most of our services for quick reference. We hope you find it helpful. More importantly, I encourage you to explore the full range of services we offer—some long-established, others newly developed—and consider how we can continue to be your partner in preserving the world and its assets.

I look forward to seeing many of you soon. Until then, please know that we remain deeply committed to your success.

Sincerely,
Trae

LinkedIn: Trae J. Miller III

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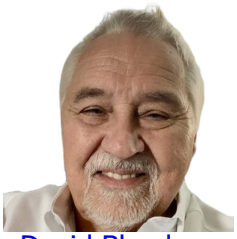
Value - Kiefner can deliver

A Few of Our Experts

Dyke Hicks
Director of Operations



David Bloedorn
Project Manager

Michiel Brongers
Principal Engineer

Craig Chaney
Technical Authority

Alex Distel
Engineer II

Zhicao Feng
Senior Principal Engineer

Brian Hart
Technical Authority

Larry Lilly
Technical Authority

Zahra Lotfian
Senior Engineer II

Tristan MacLeod
Engineer II

Benny Mumme
Technical Authority

Paul Sinclair
Technical Authority

Lucy Smart
Senior Engineer II

Rick Sugden
Principal Engineer

Leslie Ward
Senior Principal Engineer

Benjamin Wright
Engineer II

Integrity and Service you can count on

Geohazards and Structural Analysis

Navigate the Complex Terrain with Confidence

At Kiefner and Associates, Inc., we specialize in providing comprehensive geohazard and structural analysis services designed to ensure the safety and integrity of pipelines. Our expert team utilizes the latest technology and innovative methodologies to deliver reliable solutions tailored to the unique challenges of your pipeline infrastructure.

Our Services Include:

1. Geohazard Identification and Risk Assessment

- Identification of potential geohazards along pipeline routes.
- Assessment of risks posed by landslides, floods, earthquakes, and other geological events.

2. Structural Analysis

- Advanced modeling to evaluate the structural integrity of pipelines under various stress conditions, including geohazards.
- Customized strategies to enhance pipeline resilience against potential failures.

3. Mitigation Strategy Development

- Design and implementation of effective mitigation measures.
- Continuous monitoring solutions to manage and mitigate risks effectively.

4. Compliance and Regulatory Support

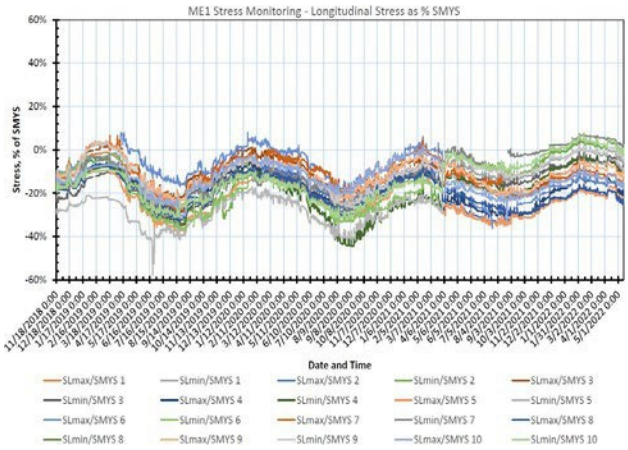
- Ensuring all geohazard and structural analysis activities comply with industry regulations and standards.
- Assistance with regulatory filings and documentation to support project approvals.

Contact: info@Kiefner.com

Real-Time Stress and Strain Monitoring

Strain can be directly measured.

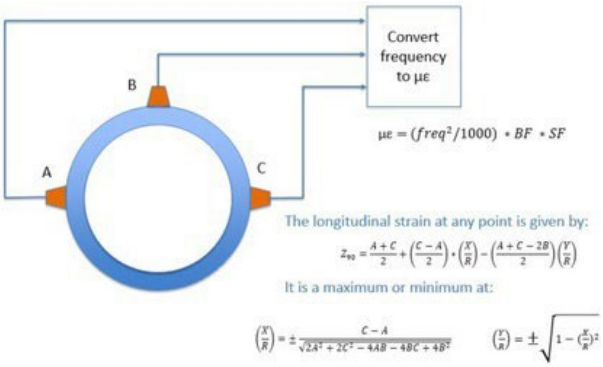
Using vibrating wire strain gauges mounted directly to the pipeline, we have a data collection system that can transmit the strain values back to a client interfacing dashboard at predefined intervals to alert of ground movement from seismic events or subsidence – often due to longwall mining.



Stress % v. SMYS

Development - The Kiefner Approach

By measuring strain at three locations around the pipe as shown in the System Setup figure, Kiefner can derive the stress in the pipe at any point in time. With reasonable assumptions from the installation season and geography, residual stress values can be considered.



System Setup

Method for Determining Acceptable Stress Levels

- Early on in the project, we work to calculate the minimum distance between sensors using a beam model approach with known pipe properties.
- Kiefner then works with your operations and engineering teams to evaluate historical data so that threshold alarms can be set.

Real-Time Dashboard

Don't be surprised when something physically changes your system. With our real-time dashboard, we can automate e-mails when certain thresholds are met.

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Blasting and Construction Vibrations near Existing Pipelines

Blasting/Vibrations can damage pipelines.

Blasting and construction activity near existing pipelines is a common occurrence. It can result from new construction or expansion of existing facilities, such as mines and quarries. Pipeline operators need to ensure that such activities do not compromise the integrity of their pipelines. Unfortunately, the answer is not as simple as maintaining a specific distance from the pipeline. Kiefner has developed processes to determine the appropriate response for a pipeline operator when blasting or construction vibrations are to occur near existing pipelines.

Blasting near the ROW

Method for Determining Acceptable Vibration Levels

- Evaluate local geological factors.
- Determine the blast's energy and resulting velocity and frequency of the vibrations.
- Perform an integrity analysis of the pipeline.
- Determine maximum acceptable stress on the pipeline.
- Calculate an acceptable vibration level and safe operating distance from the vibration source.

Strain Measurements

Development - The Kiefner Approach

This indirect measurement approach to determine acceptable stress based on vibration levels was developed from an analysis of previous research. Direct measurements of particle velocity in the soil were compared with pipeline strains during blasting. Data from multiple testing projects and industry blasting were analyzed to validate this method.

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Corrosion and Cathodic Protection

Don't let your assets deteriorate!

Reduced wall thickness from corrosion can lead to leaks and increased costs. Corrosion comes in many forms, and you need an expert to help determine the type of corrosion and the best way to prevent your asset from deteriorating. Kiefner's team of experts can help you with the identification of:

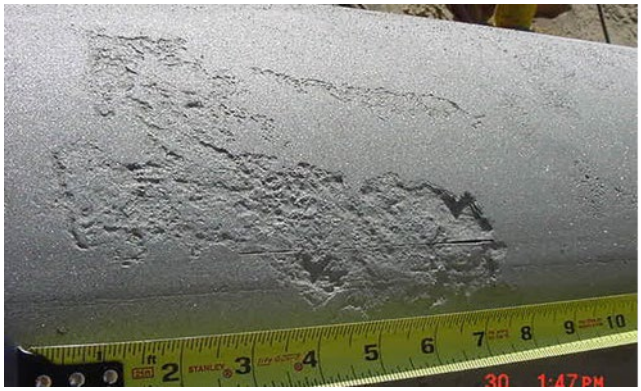
- Selective Seam Weld Corrosion (SSWC)
- Stress Corrosion Cracking (SCC)
- Graphitic Corrosion
- Galvanic Corrosion
- Other forms of Corrosion

Our depth of knowledge goes beyond just carbon steel and includes brass, aluminum, stainless, and other alloys.

Cathodic Protection (CP) and Coatings

A good CP system connected with a coating system is the most effective way to prevent corrosion. We can help you with:

- Rectifier sizing
- Annual survey review and planning
- Close Interval Surveys (CIS)
- Coating selection and analysis



Corrosion Services

- Corrosion Control
- Training
- AC Mitigation / AC Interference
- Coating Selection and Evaluation
- Lab Testing
- Internal and External Corrosion
- Corrosion Undercoating

Did you know?

Kiefner has a NACE CP Level 2 and Level 4 on staff for all your corrosion needs.

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AC Mitigation

At Kiefner and Associates, Inc., we specialize in providing AC Mitigation assessment, conceptual design commissioning, and monitoring solutions to ensure the integrity and safety of pipelines near alternating current (AC) power sources. Our services protect the physical structure of pipelines and the operational safety of the systems, thereby extending their lifespan and ensuring regulatory compliance. Kiefner can also support the installation of systems.

Services Offered

- **Site Assessment -** Detailed analysis of the pipeline's proximity to AC sources and potential risks
- **Conceptual Design -** Custom mitigation designs to effectively reduce AC interference
- **Commission and Monitoring -** Ongoing oversight and maintenance to ensure continued protection
- **Compliance and Safety Checks -** Ensuring all mitigation efforts meet industry standards and regulatory requirements
- **AC Mitigation Design -** AC current density and ground resistance calculation, ground size and length, solid-state decoupler numbers, and interval
- **AC Construction -** Separation distance between pipe and ground, solid state decoupler connection, and AC coupon test station installation
- **AC Inspection and Commissioning -** Field testing, data analysis, and AC mitigation effectiveness evaluation

Benefits of AC Mitigation

- **Prevent Corrosion** - Protects pipelines from AC-induced corrosion, reducing repair costs, and extending the infrastructure's life
- **Enhance Safety** - Mitigates risk of electric shock to personnel and the public
- **Compliance Assurance** - Helps comply with national and international safety standards, avoiding legal and regulatory issues
- **System Reliability** - Improves the reliability of pipeline operations by preventing AC-related failures

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Custom Algorithms

Built from Necessity

Kiefner has developed many customized tools for many of our customers. These tools range from VBA-coded Excel® based spreadsheets to complex web-based applications. Our solutions are created to solve a problem in the marketplace. The following is a non-inclusive list of a few of our tools:

- **KAPA™** - Kiefner and Associates Pipeline Analysis (Free as Always)
- **Pipelife™** - Our tool to predict remaining life from fatigue.
- **Rainflow™** - Our tool combines cyclical pressure cycles into manageable curves to minimize the number of cycles for fatigue analysis.
- **CorroSure™** - Our tool to compare one or more ILI runs for validation from the same or different vendors, handling interaction rules, or other ILI critical questions.
- **LaserSure™ -** A program to validate and compare NDE field data to an ILI run.
- **5-7-9™** - A tool that performs API-579 Level II analysis. Calculates fracture toughness and compares various other methods with the solutions.
- **Surface Loading** - Our improvements to the old CEPA solution can evaluate the load of pipes under roads and traversed by various pieces of equipment.
- **Wall Thickness Calculator -** A statistical tool that can estimate your pipe's most likely wall thickness based on a certain input criterion.
- **PipeProps™** - Our statistical approach to helping our clients with missing data estimates the most likely pipe grade based on certain key inputs.

Did You Know?

Soon, many of our solutions can be subscribed to online at: https://www.kiefner.com/tools.

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Kiefner and Associates Pipe Assessment (KAPA™)

Kiefner and Associates Pipe Assessment (KAPA™) is specialized software developed by Kiefner and Associates, Inc., to estimate the failure pressure of pipelines affected by defects such as corrosion or cracks.

Key Features

- **Blunt Metal-Loss Defect Assessment** utilizes three primary methods:
  - **ASME B31G Method:** Recognized as Level 1 a in the ASME B31G-1991 (Reaffirmed 2004) standard.
  - **Modified B31G Method (0.85-dL Method):** Known as Level 1 b in the standard.
  - **Effective Area Method:** Defined as Level 2 in the ASME B31G-1991 (Reaffirmed 2004) standard.
- **Crack-Like Defect Assessment** employs the modified log-secant formula, enhancing the original NG-17 equation to precisely evaluate crack-like defects.

Regulatory Compliance

KAPA™ aligns with federal regulations, specifically Paragraphs 192.485(c) and 195.587, referencing procedures in the ASME/ANSI B31G standard and AGA Pipeline Research Committee Project.

Accessibility

KAPA™ is freely available for download, reflecting Kiefner's commitment to making publicly funded research tools accessible to the industry.

Training Opportunity

Kiefner offers a comprehensive KAPA™ Workshop for pipeline personnel involved in field corrosion measurements or in-line inspection (ILI) analysis. This workshop covers:

- Historical development and theoretical foundations of ASME B31G.
- Validation through full-scale burst tests.
- Hands-on demonstration of the KAPA™ spreadsheet tool.

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Expert Witness

Litigation is never fun

Unfortunately, we live in litigious times. While litigation is never fun, having the right expert to help you navigate the paperwork and assist with deposition, testimony, trial preparation, and production is crucial.

While we cannot guarantee any particular outcome for your matter nor can we guarantee that our findings will support your point of view, we can guarantee that we will act truthfully, directly, and objectively.

Our independent and direct approach has helped many clients understand their issues and can eliminate the need to go to trial or help with settlement discussions.

Just need a root cause failure analysis?
Please see our dedicated page on Root Cause Failure Analysis.

A Team of Experts

Kiefner has PhDs, attorneys, scientists, and many technical professionals committed to ensuring the paramount safety, welfare, and environment.

Within our vast areas of competence, we can assist our clients with:

- Preliminary Case Evaluation
- Documentation Review
- Daubert / Frye Motions
- Motions to Compel
- Deposition
- Trial Testimony
- Discovery requests
- Field Inspection and Oversight

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Baseline ILI Data Review

Baseline In-Line Inspection (ILI) Data Review Services are designed to provide pipeline operators with a comprehensive analysis of inspection data. We aim to identify potential threats to pipeline integrity before they become critical issues. We ensure your pipelines operate safely and efficiently by leveraging our extensive expertise and advanced analytical techniques.

What We Offer

- **Detailed Data Analysis** - Review ILI data to detect, identify, and assess anomalies.
- **Historical Data Comparison** - Comparison of baseline and historical data to track changes and identify trends.
- **Report Generation** - Detailed reports providing insights and actionable recommendations.
- **Anomaly Assessment** - Prioritizes identified anomalies based on risk and potential impact.
- **Consultation and Support** - Expert advice to help you make informed decisions about pipeline maintenance and operations.

Key Benefits

- **Enhanced Safety** - Early detection of potential issues to prevent failures and accidents.
- **Cost Efficiency** - Helps avoid costly repairs and downtime by addressing issues proactively.
- **Regulatory Compliance** - Ensures that your operations meet all relevant regulatory standards.
- **Long-Term Reliability** - Maintains the integrity and extends the lifespan of pipeline assets.
- **Peace of Mind** - Confidence in the safety and efficiency of your pipeline operations through expert analysis.

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In-line Inspection (ILI) Validation using Kiefner's patented LaserSure™

Why Use LaserSure™?

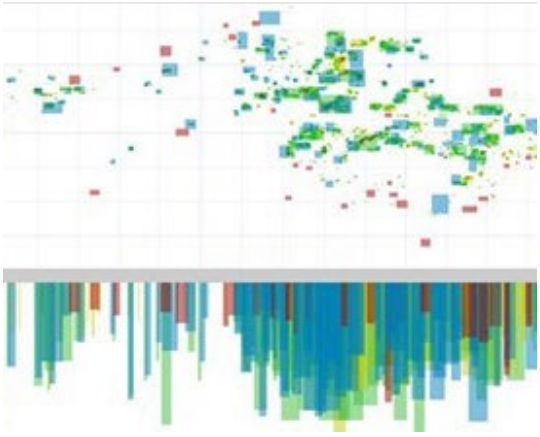
The correlation of MFL-based ILI predictions with locations of actual metal loss can be complicated when a high concentration of metal loss features is present or complex shapes of metal loss are encountered. Both are known to introduce locating and sizing errors due to the physics of magnetic flux leakage. As a result, distance-based correlation may prevent the determination of true ILI performance. The patented LaserSure ™ process was developed to employ pattern matching, aligning ILI features with the actual metal loss measured from the laser to improve the accuracy and reliability of correlations.

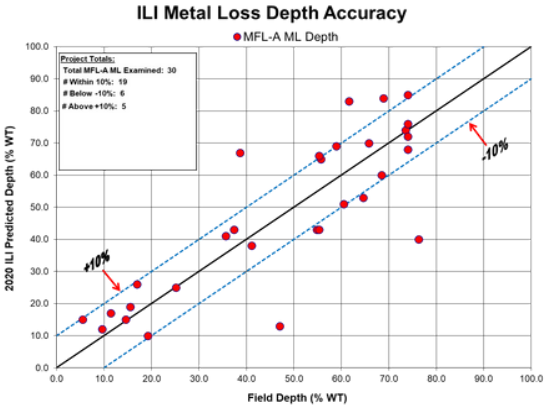
LaserSure™ can efficiently match many individual boxes and clusters to obtain depth and burst pressure correlated data. Extracting the data from LaserSure ™ allows for the creation of unity charts, which can indicate the presence of a depth bias in the ILI depending on the average results. In the bottom graph, the mean for the depth error population is -6.2%wt, indicating a tendency for the ILI to undercall actual depths. If errors are normally distributed, they are assumed to be measurement errors. However, a calibration for the ILI data can be determined if the data demonstrates a bias, as in the example provided.

Pattern Matching Technique

The LaserSure™ software evaluates raw laser data to determine and record the two-dimensional metal loss (axial and circumferential) to a specified wall thickness threshold boundary.

ILI features (positions, depths, lengths, and widths) are also imported into the LaserSure ™ software. In the top image, patterns are overlaid and spatially matched. The example provided visually represents an overlay of the ILI data with the laser data.





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Materials Testing Laboratory

State-of-the-Art Materials Testing

Our materials testing facility has all the tools necessary to perform detailed metallurgical examination and testing of most materials. We perform tensile, SEM, Charpy, hardness, Knoop/Vickers micro-hardness, and metallographic services with our state-of-the-art 3-D 2000x Keyence microscope – to name a few.

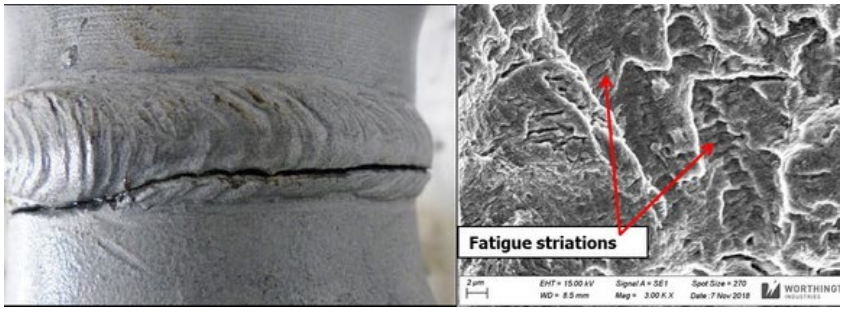
Destructive Testing

Not just for pipes

Kiefner has evaluated many materials and energy equipment for the failure modes. We have evaluated plastics, stainless steel, carbon steel, Inconel, Hastelloy-C, aluminum, and many other materials.

Ball Valve Analysis

We have also performed failure mode analysis on complete assemblies, such as pumps, valves, instrumentation, and others.



Girth Weld Crack with Fatigue Striations

Please visit our dedicated Corrosion and Cathodic Protection for more information.

Corrosion and CP

Our lab has a dedicated section for corrosion services.

We perform electrochemical testing using the linear polarization resistance (LPR) technique to measure selective seam weld corrosion susceptibility in the field and the lab.

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Regulatory Analysis and Support

Industry Experts

Our professionals are experts in regulatory compliance under the NGA and 49 CFR Parts 192, 193, and 195. We stand ready to assist our clients with:

- System analysis for jurisdictional impact
- Application of regulatory codes
- Audit support
- IMP auditing and authoring
- O&M manual auditing and authoring
- Emergency Response program authoring and auditing
- High Consequence Area evaluation
- Class Location program evaluation and assistance
- FERC 7B, 7C, and 3C applications.

Do you have a MEGA problem?

We'd like to think we are cheaper than PHMSA fines! The new "Mega Rule" can be complex and difficult to navigate. Kiefner can provide you with simple answers to complex questions or audit your programs for compliance.

We offer practical services for gas and hazardous liquid pipes:

- MAOP reconfirmation
- MAOP establishment for Type "C" pipelines
- TVC record evaluation
- Laboratory testing and analysis algorithms of in-situ field testing
- Integrity management
- Regulated gas gathering applicability and compliance

Missing data or too much data?

Not sure how to analyze the data you have or where to start? Kiefner can help you!

Contact: info@Kiefner.com

Pipeline Permitting and Siting

Pipeline permitting and siting services assist clients throughout the complex regulatory landscape associated with pipeline construction and operation. Our services are tailored to ensure that your pipeline projects meet all federal, state, and local regulations efficiently and on schedule.

Services Provided

- **Route Selection** - We use geographic and environmental data to determine the most feasible and compliant pipeline routes.
- **Environmental Impact Assessments** - Conduct thorough evaluations to assess the potential environmental impact of proposed pipeline projects.
- **Permit Acquisition** - Handle all aspects of permit applications, including preparation, submission, and follow-up to secure necessary approvals.
- **Regulatory Compliance** - Ensure all aspects of the pipeline project comply with relevant environmental and safety regulations.
- **Stakeholder Engagement** - Coordinate with governmental bodies, environmental groups, and the public to facilitate a smooth permitting process.
- **Documentation and Reporting** - We provide detailed documentation and reports required for regulatory approvals and ongoing compliance.

Key Benefits

- **Regulatory Expertise** - In-depth knowledge of the regulatory requirements to streamline the permitting process.
- **Risk Reduction** - Minimizing project delays and financial risks associated with non-compliance.
- **Environmental Stewardship** - Ensure projects are designed and implemented with consideration for environmental sustainability.
- **Public Relations** - Manage stakeholder communications to support project approval and community acceptance.
- **Project Efficiency** - Accelerate project timelines through expert management of the siting and permitting process.

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Pre-Audits New Construction

Pre-audits new construction services are designed to ensure that your new pipeline construction projects adhere to the highest quality and compliance standards before regulatory audits. Our expert team works closely with clients to identify and mitigate potential issues, ensuring a smooth audit process and successful project completion.

Services Provided

- **Regulatory Compliance Checks -** Ensure all aspects of the construction project comply with current industry regulations and standards.
- **Documentation Review -** Detailed scrutiny of project documentation, plans, and compliance paperwork.
- **Construction Site Inspections -** On-site inspections ensure that construction practices and progress meet predefined standards and specifications.
- **Risk Assessment-** Identify and evaluate potential construction and operational activities risks.
- **Quality Assurance -** Oversee quality control measures to prevent future compliance issues and enhance project integrity.

Key Benefits

- **Reduced Risk of Non-Compliance –** Proactively identify and resolve potential non-compliance issues before they escalate.
- **Enhanced Quality -** Ensure that construction meets all expected quality standards, reducing the need for costly future corrections.
- **Streamlined Audit Process -** Facilitate a smoother, quicker audit process with fewer complications.
- **Cost Efficiency -** Prevention of delays and cost overruns associated with compliance failures and subsequent rework.
- **Peace of Mind -** Confidence in the knowledge that the project is prepared for regulatory reviews and audits.

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Owner Engineer

Kiefner and Associates, Inc. offers Owner's Engineering services to support clients throughout the lifecycle of their pipeline projects. Acting as your technical advisor, we ensure that all aspects of your project are executed to the highest standards, from initial planning to construction and operation. Our team serves as an extension of your own, providing expertise and oversight to safeguard your interests.

Services Provided

- **Project Feasibility and Planning -** Assistance with project scope definition, feasibility studies, and initial planning to set a solid foundation for success.
- **Design Review -** Detailed review of design plans to ensure they meet all technical requirements and optimize operational efficiency.
- **Contractor Oversight -** Manage and monitor contractors and subcontractors to ensure project specifications and standards compliance.
- **Regulatory Compliance -** Guidance through the regulatory landscape to ensure all project components are compliant with local, state, and federal regulations.
- **Risk Management -** Identify potential risks and implement mitigation strategies to protect your project timeline and budget**.**
- **Quality Assurance -** Ensure high-quality standards are maintained in every aspect of the project to prevent costly delays and rework.

Key Benefits

- **Technical Expertise -** Access to specialized knowledge and experience in pipeline engineering and construction.
- **Objective Oversight -** Independent review and oversight to ensure the best outcomes for your project.
- **Cost Savings -** Strategic planning and efficient project management resulting in significant cost savings.
- **Risk Reduction -** Proactive risk management that minimizes the likelihood of project overruns and technical challenges.
- **Peace of Mind -** Confidence that your project is managed by experts committed to your best interests.

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Renewable Energy Services

Hydrogen and Carbon Dioxide Capture Pipelines

- Greenfield
- Conversion of Service
- New Construction
- Geotechnical and FEA studies
- Surface Loading
- Feasibility and Code Compliance
- Hydrogen (H_2) Services

Solar Parks and Wind Farms

- Evaluate local geological factors
- Power and ETAP studies
- Wind turbine and blade inspection

Over 30 years of Energy …

We pride ourselves on years of working with pipeline designs, codes, and regulators. Our 30+ years have taught us that no two projects are alike, and getting the details right at the feasibility portion of these projects is critical to success and profitability.

We have worked in solar parks, concentrated solar plants, and wind farms. We can support high-end engineering and permitting activities right down to state-of-the-art non-destructive examination of items like masts, gearboxes, nacelle structures, and actuators, to name a few.

If you have a failure, we can provide a detailed failure analysis to prevent future recurrence. Let us know how we can assist you.

Contact: info@Kiefner.com

Risk Analysis

Your reputation matters

There are no two pipeline systems, and, consequently, there are no two risk analyses, either. Each operator must assess the unique aspects of geography, population, environment, age, history, and other factors within their acceptable level of risk tolerance to maintain the reputation sought.

Kiefner can help keep you manage your reputation by offering:

- Qualitative and Quantitative Risk Assessments
- Risk Tolerance Studies
- Heat Maps
- Failure Modes and Effects Criticality Assessment (FMECA)
- PSM Support
- Risk Based Inspection (RBI)

29 CFR 1910.119 – Process Safety Management (PSM)

OSHA is just one agency that regulates PSM facilities. Due to expanding safety and environmental regulations, these facilities continue to receive heightened scrutiny.

Whether you have a PSM facility or not, Kiefner can help you with best practices within your safety/risk program:

- Employee Participation
- Process Safety Information
- Process Hazard Analysis, including HAZOP Facilitation
- Operating Procedures
- Training
- Contractor Management
- Pre-Startup Safety Review and Construction Compliance
- Mechanical Integrity Document Review
- Management of Change
- Incident Investigation
- Compliance Audit

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Root Cause Failure Analysis

Accidents Happen

Kiefner maintains a dedicated team of scientists, engineers, attorneys, and certified safety professionals to assist operators in investigating, analyzing, and discovering the root cause of failure mechanisms or root cause failure analyses.

One size does not fit all. Which model is right for you?

Let Kiefner assist you with designing an investigation plan and managing the process when the unthinkable happens.

Kiefner's standard approach follows the ABS model. However, we know many methods of reaching the root cause(s) and helping eliminate future reoccurrence.

- Ishikawa (Fishbone) Diagrams
- ABS Model
- 5-Why Analysis/Fault Tree Analysis
- Swiss Cheese Model
- Scatter Diagrams
- FMEA/FMECA
- Cause and Effect
- Pareto Analysis

Need an Expert Witness?
Please see our dedicated page on Expert Witnesses or call us directly.

The evidence is all around you

Don't miss out on getting the best results by waiting. Call Kiefner as soon as you have an accident, so your evidence is not lost or overlooked.

People Evidence
- Interviews
- Emails
- Media

Physical Evidence
- Analysis of Failures
- Photographs
- Site Investigation and Preservation

Operational Evidence
- Procedures, SCADA/DCS Reports
- Engineering
- Best Practices

Contact: info@Kiefner.com

Kiefner PipeProps™

Confidently Verify Pipeline Material Grade for 49 CFR 192 Compliance

The Challenge: For pipelines without traceable, verifiable, and complete (TVC) records, 49 CFR § 192.607 requires material verification testing whenever the pipeline is exposed. When records are incomplete, in-situ nondestructive testing is necessary. However, uncertain in-situ testing results create compliance challenges. How can you be sure about your pipe grade?

The Kiefner Solution: PipeProps ™ combines **Artificial Intelligence (AI) and advanced statistical analysis** to confidently identify your pipeline segment's API 5L grade from in-ditch material testing data. We go beyond raw measurements, providing the certainty you need for regulatory compliance.

How it Works:

- **Leveraging Cutting-Edge Technology:** We analyze in-situ data – including yield strength, ultimate tensile strength (from tools like MMT, Plastometrex, and Frontics), chemical composition, OD, and wall thickness.
- **AI-Powered Analysis:** Our proprietary AI workflow provides superior accuracy.
- **Uncertainty Quantification:** The PipeProps ™ Analyzer performs thousands of simulations, incorporating measurement uncertainties, to provide a confident pipe grade identification.
- **Unrivaled Expertise:** Our analysis is backed by Kiefner's 35-year database of destructive and non-destructive lab testing with samples from the 1920s to today.

Two Service Options to Meet Your Needs:

1. **Advanced Analysis**: Provide us with your in-situ data, and we will deliver a comprehensive PipeProps™ report.
2. **Turn-Key Solution:** Our technicians will perform the in-situ measurements using leading tools (MMT, Plastometrex, and Frontics) and deliver the complete PipeProps ™ analysis.

The Benefits:

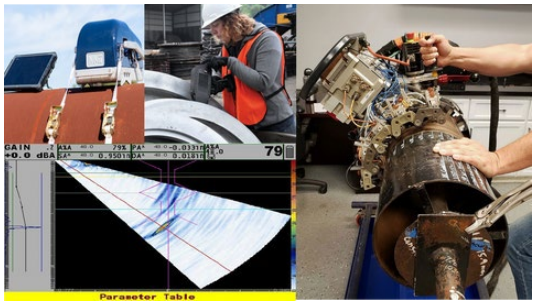
- **Confident Compliance:** Meet the stringent material verification requirements of 49 CFR 192.607 and 192.624 with robust, data-driven results.
- **Streamlined Process**: Simplify your compliance efforts with our expert analysis and support.
- **Defensible Results:** Our rigorous statistical methodology provides a solid foundation for establishing a 95% confidence level in your pipeline segment's properties as part of MAOP reconfirmation.

Stop Guessing, Start Knowing. Contact Kiefner today to learn how PipeProps ™ can give you confidence in your material verification process.

Contact: info@Kiefner.com

Non-Destructive Examination (NDE)

We provide comprehensive non-destructive examination (NDE) services to ensure the integrity, safety, and reliability of pipeline systems. Using advanced, non-invasive techniques, our experts perform precise inspections to identify defects and irregularities in pipeline materials and components without disrupting their operation or integrity.



Key Benefits:

- **Early Defect Detection** - Identify potential problems before they lead to system failures, ensuring continuous operation and safety.
- **Cost-Effective Maintenance** - Reduce maintenance costs by targeting specific areas in need of repair rather than conducting broad, unnecessary repairs.
- **Extended Equipment Lifespan** - Help extend the lifespan of assets by ensuring they are maintained in optimal condition.
- **Compliance and Documentation** - Support compliance with industry standards and providing comprehensive documentation for audit and regulation purposes.
- **Customized Solution** - Tailored inspection services based on the specific needs and conditions of each project.

Services Provided:

- **Ultrasonic Testing (UT) -** High-frequency sound waves to detect flaws, measure thickness, and assess corrosion.
- **Radiographic Testing (RT) -** X-ray or gamma-ray imaging to view internal structures and detect hidden flaws.
- **Magnetic Particle Inspection (MPI) -** Magnetic fields and ferrous particles to reveal surface and near-surface defects.
- **Liquid Penetrant Inspection (LPI) -** Dye penetration technique for detecting surface-breaking defects in non-porous materials.
- **Visual Inspection (VI) -** Direct and remote visual assessments to evaluate external conditions and compliance with standards.

For advanced NDE Services, click here

Contact: info@Kiefner.com

Evaluation of Dead Legs

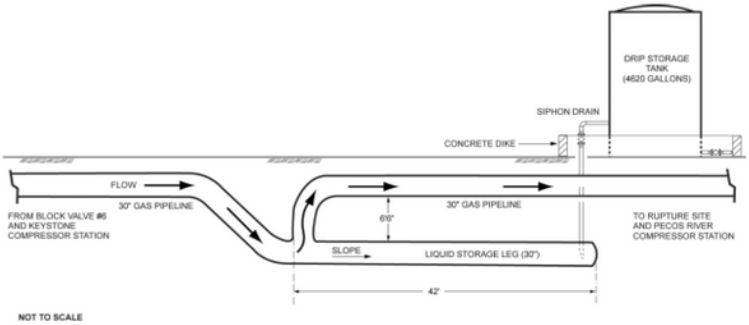
Dead legs (DLs) in piping systems pose a high risk for internal corrosion due to their stagnant or low-flow condition, which could be susceptible to extremely high (>50mil per year) corrosion growth rates due to microbiologically influenced corrosion (MIC). Dead legs include pipes without an outlet, or sections that are normally valved shut. Low points in dead legs are particularly susceptible to internal corrosion. Due to recent failures, there is a growing interest in providing more guidance on what integrity management programs should include to address the internal corrosion threat to dead legs.

Kiefner offers valuable insights into the relative risk of the dead legs in your integrity management program. Leveraging our expertise in corrosion, materials, integrity programs, and corrosion management, we provide the following services:

- Conduct a gap analysis of your current DL program.
- Develop a risk-informed DL integrity program from the ground up.
- Optimize your existing DL program using data-driven approaches.
- Provide dead leg inventory, mapping, and effective inspection techniques along with dead leg management plans.

From NACE 201–913290 Paper

Mechanical dead leg with 6-O'clock position trough type corrosion. From AMPP C 2023-19041 Paper.



Example of Drip in a pipeline system.
Figure is from the NTSB/PAR-03/01 PB2003-9165501 report Washington

Does your company's dead leg program include drips?

Contact: info@Kiefner.com

Welding Engineering Services

A Team of Experts

Kiefner and Associates, Inc. has a dedicated team of experienced welding professionals with extensive knowledge of consensus standards from groups like CWB, ASME, API, and AWS, to name a few.

We Handle a Variety of Materials

- Carbon Steel
- Stainless Steel
- Aluminum
- Hastelloy
- Inconel
- Low Alloy Steels

A Wide Array of Services

- Authoring welding procedures
- Qualifying welders and new procedures
- Auditing weld procedures and welding programs for code compliance
- Welder procedure and qualification testing
- Welding engineering consulting
- Authoring O&M procedures for welding services
- Weld joint design and consumable selection
- API 1104 in-service welding analysis and procedure qualification

Contact: info@Kiefner.com

Welding Procedures

We offer specialized welding procedure services to ensure the highest quality and safety standards in welding operations. Our services include developing, qualifying, and documenting welding procedures tailored to meet the specific needs of our client's projects, ensuring compliance with industry standards, and enhancing the integrity of welded structures.

Services Provided

- **Welding Procedure Development** – Craft detailed welding procedures that meet project specifications and regulatory requirements.
- **Welding Procedure Qualification** – Conduct tests to ensure that proposed welding techniques can produce desired welds.
- **Welder Qualification Testing** - Certify welders to ensure they are proficient in executing the developed welding procedures under the project conditions.
- **Documentation and Certifications** - Provide comprehensive documentation and certifications that support compliance with industry standards.
- **Technical Support and Consultation** - Offer ongoing support and expert advice to address welding-related challenges during project execution.

Key Benefits

- **Quality Assurance** – Ensure all welding activities are performed to the highest quality standards, reducing the risk of structural failures.
- **Compliance with Standards** - Help meet all relevant industry standards, such as API, ASTM, and ASME, ensuring regulatory compliance.
- **Enhanced Safety** - Minimize the likelihood of safety issues related to improper welding techniques.
- **Cost Efficiency** - Prevent costly rework and delays by ensuring welding is done right the first time.
- **Customized Solutions** - Welding procedures and support are tailored to each project's specific materials, conditions, and requirements.

Contact: info@Kiefner.com

Hydrostatic Testing of Storage Tanks

What are the Qualifications?

Reconstruction and major repairs to aboveground petroleum product storage tanks require a full hydrostatic test before continued service. Performing this test can be costly, time-consuming, and often logistically challenging.

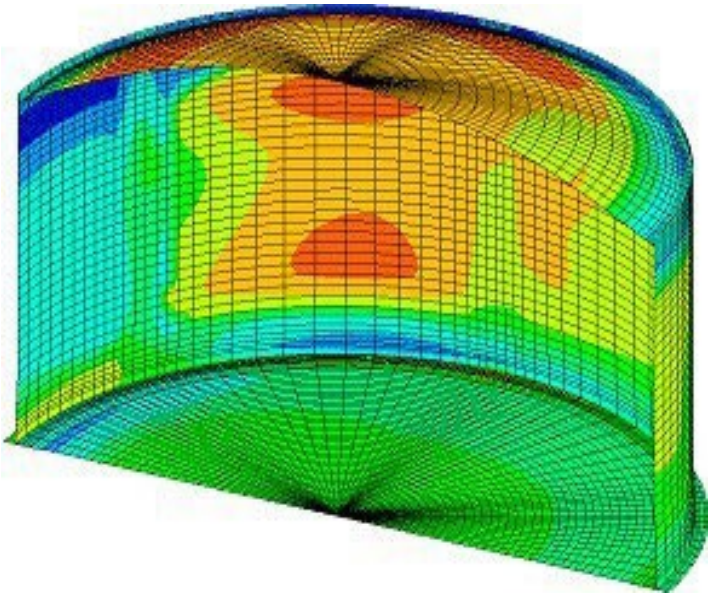
Recognizing this, Section 12.3 of API 653 allows for exemptions to the hydrostatic test when certain criteria are met. One of these criteria is to perform a fitness-for-service (FFS) assessment per API 579-1/ASME FFS-1.

Kiefner Expertise

Kiefner provides this expertise, including rigorous Level III assessments utilizing proprietary FEA software. Just a few of the assessments Kiefner performs are:

- Wall Thinning (Parts 4, 5, and 6)
- Brittle Fracture, Crack-Like Flaw (Parts 3 and 9)
- Distortion, Out of Roundness (Part 8)

Hydrotest Exemption - Kiefner routinely performs this service for several US and Canadian operators, allowing for significant cost reductions and the safe continued operation of your storage tanks.



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Damage Mechanisms and Fitness-for-Service

Understanding damage mechanisms and failure modes is critical to performing an integrity assessment. Fitness-for-Service (FFS) methodologies in API 579 depend on proficient knowledge of the damage mechanisms found in Recommended Practice API RP 571. API 579 FFS uses this data to assess the suitability of engineering equipment containing a flaw, given its geometry and loading conditions. API 579 evaluates the susceptibility to ductile and/or brittle failure and can be used to estimate the remaining life of time-dependent threats.

Kiefner's team brings expertise in metallurgy, welding, corrosion, stress analysis, fitness-for-service, remaining life, and operations. We have materials testing laboratory facilities and use software tools such as 5-7-9™ and PipeProps™ to support our analyses.

Metallography

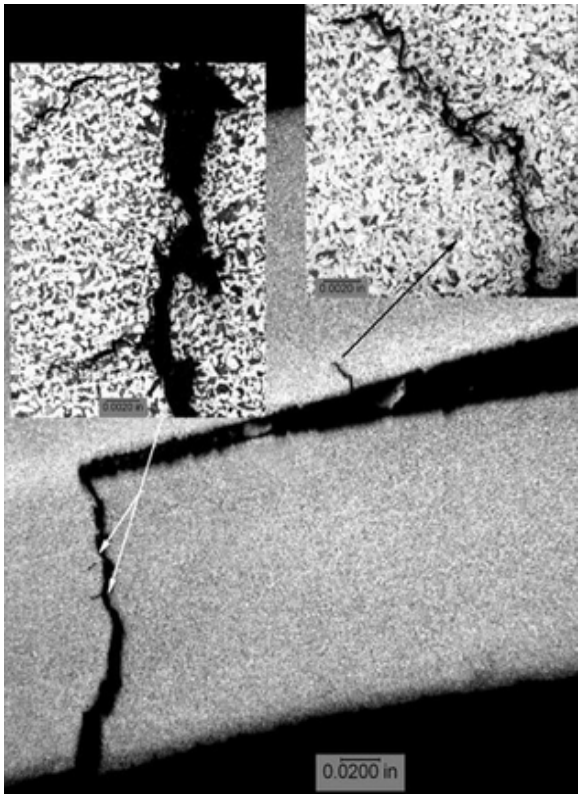
- Optical 3-D Microscopy
- Scanning Electron Microscopy
- Energy Dispersive X-Ray Spectroscopy

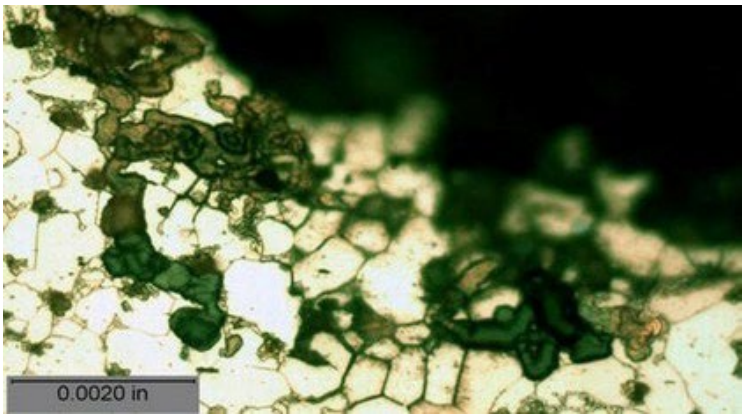
Chemistry

- Fourier Transform Infrared Spectroscopy
- X-Ray Diffraction

Corrosion

- Microbial and Chemical Product Analysis





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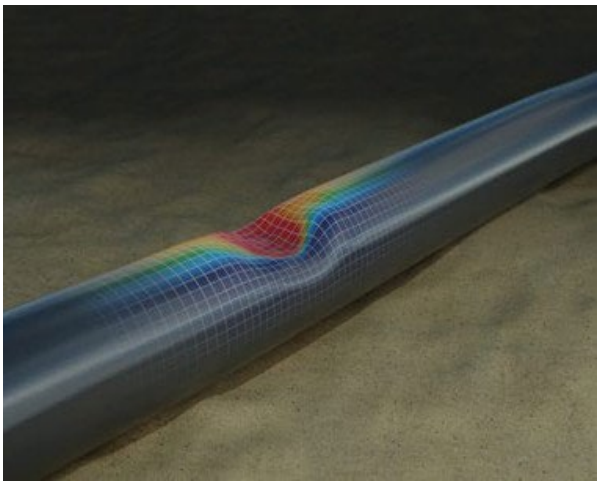
Engineering Critical Assessment (ECA) Services



Engineering critical assessment (ECA) is a specialized methodology that evaluates the fitness-for-service (FFS) of pipeline defects using fracture mechanic principles. It focuses on three primary factors:

- Material Properties
- Flaw Characteristics
- Applied Stresses

By analyzing these elements, ECA aids in maintenance planning, inspection prioritization, and extending the lifespan of pipeline systems.

Key Components of ECA

- **Flaw Acceptance and Analysis:** Determine the maximum tolerable flaw size for specific materials under various construction and operating conditions.
- **Applicable Standards:** Conduct analyses in line with globally recognized standards, such as API 1104, API 579, CSA Z662, and BS 7910.
- **Failure Mechanisms Addressed:** Includes brittle fracture, ductile instability, plastic collapse, mechanical damage, and fatigue growth.

Applications of ECA

- **Strategic Planning:** Assist in selecting welding procedures and inspection techniques during the design phase.
- **Defect Management:** Evaluate known defects that are unacceptable by fabrication codes.
- **Failure Analysis:** Identify reasons for not meeting toughness requirements of fabrication codes.
- **In-Service Flaw Decisions:** Assess existing flaws to determine necessary actions, such as repairs or continued safe operation.

Kiefner's Expertise

We offer comprehensive ECA services, including:

- Calculation of welding defect acceptance criteria as per API 1104 Annex A.
- Comprehensive ductile tearing assessments.
- Detailed interpretation of J-R test results.

Our multidisciplinary team provides in-depth stress analysis, flaw characterization, and material property assessment to ensure pipeline integrity.

Contact: info@Kiefner.com

Hydrotest Plans

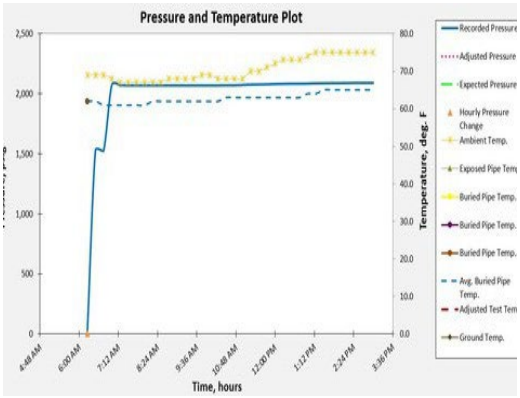
Kiefner and Associates, Inc. specializes in developing and implementing comprehensive **hydrotest plans** to ensure pipeline systems' structural integrity and safety. Our hydro testing services are designed to validate pipes' strength and leak tightness by subjecting them to pressures higher than their operational levels. This critical assessment helps confirm the pipeline's ability to operate safely under maximum allowable operating pressure (MAOP).

Services Provided

- **Test Plan Development -** Create customized hydrotest plans based on pipeline specifications, environmental conditions, and regulatory requirements.
- **Pressure Testing -** Conduct controlled pressure tests to identify weaknesses and potential leak points in the pipeline infrastructure.
- **Data Analysis -** Detailed analysis of test data to assess the pipeline's condition and identify necessary repairs or upgrades.
- **Compliance Assurance -** Ensure all testing procedures and documentation meet industry standards and regulatory requirements.
- **Safety and Environmental Management -** Implement safety protocols to protect personnel and minimize environmental impact during testing.

Key Benefits

- **Integrity Verification -** Confirms the structural integrity and leak tightness of pipeline systems.
- **Regulatory Compliance** - Helps meet stringent industry regulations and standards for pipeline safety.
- **Preventative Maintenance** - Identifies potential issues before they become costly or hazardous.



- **Long-Term Reliability** - Enhances the reliability and longevity of pipeline operations.
- **Documentation and Reporting** - Provides thorough documentation for regulatory compliance and future reference.

Contact: info@Kiefner.com

Kiefner Technical Trainings

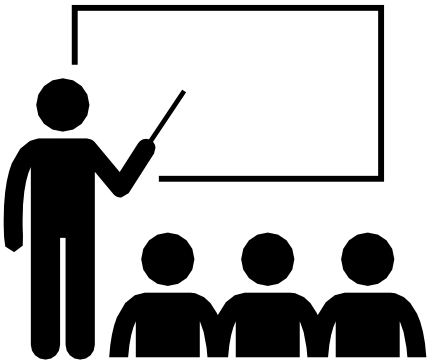
For 35 years, Kiefner and Associates, Inc.'s staff has presented fundamental and accepted strategies for maintaining safe pipelines. Kiefner is pleased to announce its development of a structured series of webinars to provide training on fundamental pipeline integrity concepts and methods. These courses cover a wide range of topics specific to the pipeline industry that have been designed and scheduled to provide continuity and integration.

In developing these courses, Kiefner has focused on techniques to effectively transfer knowledge to students through interactive content and discussion. Students can expect to be called upon to provide input, ask questions, and answer content-related questions. Given the depth and breadth of the course content, students will need to focus on the webinar. Kiefner wants the courses to be valuable to all students.

Who Should Attend?

The material in these courses provides the fundamental concepts of the effects of defects and imperfections on pipelines and methods for preventing, assessing, and mitigating them. The intended audience is pipeline company engineers who are new or have only a few years of experience in integrity management. An introduction to pipeline defects, cathodic protection, defect assessment, in-line inspection, pipeline repair, and hydrostatic testing are some topics presented in this workshop. More in-depth programs on these topics will be available in future workshops. Sessions can be taken individually; however, registering for all sessions provides a price reduction and the benefit of comprehensive pipeline integrity training.

Contacts and Additional Info



Contact us at info@kiefner.com for more info including details on:

- Private workshops for your company
- Discounts for large groups
- Any other questions

A certificate for the appropriate Professional Development Hours (PDH) will be given.

Contact: info@Kiefner.com

Kiefner Intellectual Property

DID YOU KNOW?

Kiefner holds the U.S. Patent on Pattern Matching. Don't get fooled by using an unauthorized company to perform your work when we are the experts and developed the technique!

(12) **United States Patent**
Fingerhut et al.

(10) **Patent No.: US 8,788,219 B2**
(45) **Date of Patent: Jul. 22, 2014**

(54) **METHOD OF DETERMINING AN EDGE OF AN ANOMALY, METHOD OF DETERMINING INTERACTION, METHOD OF ALIGNING, COMPUTER PROGRAM PRODUCT, AND DATA CARRIER**

(75) Inventors: **Martin Fingerhut**, League City, TX (US); **Deli Yu**, Edmonton (CA)

(73) Assignee: **Röntgen Technische Dienst B.V.**, Rotterdam (NL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1046 days.

(21) Appl. No.: **12/778,081**

(22) Filed: **May 11, 2010**

(65) **Prior Publication Data**

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(51) **Int. Cl.**
G01B 5/28 (2006.01)

(52) **U.S. Cl.**
USPC **702/38**; 138/103

(58) **Field of Classification Search**
USPC 702/38
See application file for complete search history.

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(Continued)

Primary Examiner — Sujoy Kundu
Assistant Examiner — Alvaro Fortich
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(57) **ABSTRACT**

Method of determining an edge of a first anomaly in a wall of a pipeline from a first set of data elements representing measurements of the wall of the pipeline. An element of the first set comprises a first coordinate, a second coordinate, and a parameter being indicative for the presence and/or severity of the first anomaly a position along the wall indicated by the first and second coordinate. The method comprises determining a data element that is associated with a maximum in the severity of the first anomaly; evaluating a value of the parameter by comparing with a predetermined threshold; determining an initial edge data element for which the parameter has reached the threshold; determining a next edge data element; determining further edge data elements; and determining the edge of the first anomaly by combining the first and second coordinates of the determined edge data elements.

39 Claims, 4 Drawing Sheets

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Compliance	Operations	Design Support	Technology	Risk	Engineering
Codes & Standards	IMP Review	Material Selection	Kiefner Software	HAZID/HAZOP	Structural Integrity - FEA
Regulatory	Asset Maintenance & Repairs	Corrosion Control Documents (CCDs)	Hydrostatic Testing	Failure Modes, Effects, & Criticality Analysis (FMECA)	Corrosion & Erosion AC Mitigation
Technical Due Diligence	Root Cause Failure Analysis	Integrity Operating Windows (IOWs)	Pipeline Strain Monitoring	Layers of Protection Analysis	Welding Engineering
Company Standards	Commissioning & Start-Up	Fracture Control Plan	Corrosion Analysis	Probability of Exceedence	Remaining Life
Best Practices	Life Extension	Constructability Reviews	Metallography	Risk Register	Flow Assurance
Mandatory Reports	ILI Analysis	Design Verification	Material Property Testing	QA/QC	Fitness-for-Service
Inspection & Test Plans	Material Testing Reports	Design for Inspection	Advanced Modeling	Process Safety Management	Inspection Intervals
Audits	Upset Conditions	Stress Analysis	Data Analytics	Project Risk	Owners Engineer

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