50 YEARS OF INNOVATION Since 1973

allied engineers
PIPELINE INTEGRITY

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PIPELINE INTEGRITY

50 YEARS OF INNOVATION Since 1973

TURNKEY PIPELINE INTEGRITY MANAGEMENT SOLUTIONS

Welcome to Allied Engineers

Allied Engineers (AE) provides a wide spectrum of specialised asset integrity tools under one umbrella, ranging from complete turnkey threat assessment programs to customized integrity validation studies. AE has conducted successful pipeline integrity programs for 1,000+ pipelines for various clients spanning thousands of kilometres.

AE provides answers to the below questions for the Asset Owner:

- Can the pipeline remain in service?
- Can I increase the throughput of the pipeline?
- Is my pipeline Fit-for-Service?
- What is the safest pressure to operate my pipeline?
- What is the remaining life of my pipeline? How to increase it?
- Prioritization of pipelines in a large network for health assessment?
- Are immediate or scheduled repairs required and where?
- What type of repairs?
- When should I do my next inspection and use which technology?

AE Partners

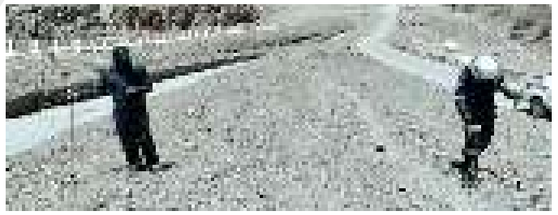
NDT Global · Clock Spring · NRI · pureHM a xylem brand · C-FER Technologies · FTI-INTL

AE Vision

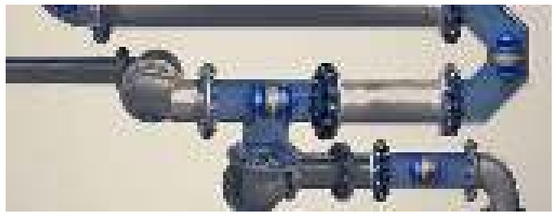
At Allied Engineers, our ultimate vision is to introduce and implement the latest pipeline & asset integrity management techniques for safe, efficient and cost-effective long-term operations.

AE continues to aspire towards a long-term vision, through its pioneering spirit and innovations that explores opportunities and higher standards, and will add value to global organizations in the energy sector.

Turnkey Pipeline Integrity Programs

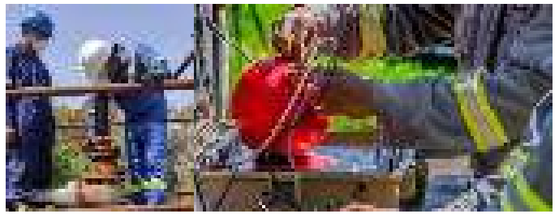


Spectrum XLI for Cathodic Protection and Coating Surveys



In-Line Inspection for Non-Piggable pipelines

Permanent Composite Sleeve Repair - Clock Spring NRI



SmartBall™ for Liquid Leak Detection

Advanced NDT Inspection

Direct Assessment (ECDA, ICDA and SCCDA)

In-Line Inspection for Piggable pipelines

Refinery / Plant Furnace Heater Inspection - FTIS™

Total Pipeline Integrity Management Solutions Software (T-PIMS)

Gas Leak Detection for Gas pipelines

Certified Pipeline Integrity Training Programs

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PIPELINE INTEGRITY

A History of Excellence

Allied Engineers (AE) was established in 1973, with a vision to innovate with the highest standards of excellence in the Petroleum and Energy sectors. Prior to establishing AE, the company's founder, Mr. Subhash Khera, a qualified Petroleum Engineer, honed his skills with the industry leading Oil & Natural Gas Corporation (ONGC), India for several years followed by an enriching stint with Hudson Bay Oil & Gas, Canada in the 1960s.

Ashish Khera, the founder's son, is also a Petroleum Engineering graduate from University of Alberta, Canada who plays a pivotal role in managing the AE engineering team and taking AE to new heights for providing pipeline integrity solutions. He is an APEGA certified Professional Engineer from Alberta, Canada and recognized as an SME and instructor in the field of Pipeline Integrity and Direct Assessment (ECDA, ICDA and SCCDA).

The inception of AE led to specialized services and products being offered for the energy sector in India. Over the past 50 years, the Company has excelled in executing customized consulting assignments besides supplying proven solutions to their global clients in India, Canada, USA, Kingdom of Saudi Arabia, Kuwait, UAE, Czech Republic and more.

The successful implementation of latest technologies accessed through partnerships with globally renowned pipeline integrity Subject Matter Experts (SME's), has been the hallmark of the company's dynamism and growth. AE continues to maintain its leadership reputation within the industry supported by its team of NACE and ASME certified specialists, instructors, engineers and technicians working tirelessly towards achieving the highest levels of pipeline integrity deliverables.

www.alliedengineer.com

AE Partners

The goal has been to provide complete custom designed integrity management services. This inorganic growth is achieved by forming alliances with specialized technology providers (world leaders in their respective fields) to provide the client with a "*Turnkey Integrity Solution under one umbrella*".

PureHM, Canada: PureHM's proprietary Spectrum XLI technology conducts up to ten (10) different above ground surveys in a single pass of the pipeline to provide best-in-class results along with a state-of-the-art software to view the encrypted results.

The SmartBall™ in-line inspection tool can detect the minutest leaks (up to 110 ml/min) in both pig-gable and non-piggable pipelines.

Quest Integrity, USA: At the forefront of using high technology solutions for Asset Integrity Manage-ment in the refining, chemical, pipeline, syngas and power industries.

Specialist for inspecting ***Non-Piggable / Challenging*** pipelines and fired heater coils 360 degrees with intelligent pigging.

C-FER Technologies, Canada: An advanced engineering company operating as a subsidiary of the Alberta Innovates, Government of Alberta, Canada. The Pipeline Division of C-FER specializes in developing solutions related to the design, assessment, construction and integrity manage-ment for both onshore and offshore pipelines. Leaders with their PIRAMID™ pipeline probabilistic risk assessment software.

NDT Global, Germany: Global leaders for inspecting pipelines using instrumented intelligent pigging tools and providing Inline Inspection (ILI):

- Ultrasonic Metal Loss Inspection
- Ultrasonic Crack Detection
- Ultrasonic Geometry for Dent/ Gouge Assessment
- Acoustic Resonance Technology (ART) – Sub-millimeter accuracy wall thickness measurements in both Gas and Liquid pipelines

Clock Spring NRI, USA: The world leaders in "permanent" repair of pipelines using composite sleeves - guaranteeing **50+ years** of repair service! Clock Spring NRI is an engineered repair service for permanent reinforcement of corrosion defects associated with high pressure transmission pipe lines and pipeline frameworks. It is applicable on defects like general corrosion, pitting corrosion, dents, gouges, leaks, bend repairs, weld defects etc.

FTI-INTL, UAE: Flow Technology International™ (FTI) is a leading Non-Destructive Testing, materials-corrosion engineering and industrial services company.

FTI is highly experienced in providing advanced non-destructive testing and conventional non-destructive testing to identify problem areas and recommend solutions.

AE Testimonials

We are excited about this partnership with Allied Engineers.

This project demonstrates how pipeline companies can integrate PIRAMID's advanced quantitative risk assessments into their current GIS framework to provide a seamless integrity management tool.

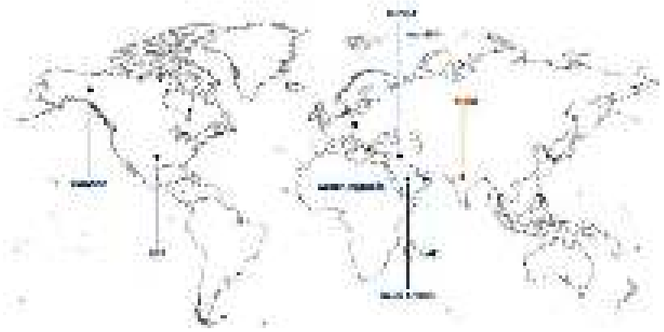
Chance Wright
PIRAMID Product Manager
C-FER Technologies (2021)

Since 2005 for the Kuwait Oil Company 'Total Pipeline Integrity Management Services (TPIMS)' contract, Allied Engineers have provided integrity management services. Allied conducted code compliant specialized pipeline integrity studies for the non-piggable pipelines, where they were responsible for all aspects of the program that is from field data collection to final presentation of report to client.

William Garrow
General Manager
Tuboscope Pipeline Services (2010)

Allied Engineers provides ExMag with ongoing SCC Modelling and reporting services for our clientele in the North American pipeline market.

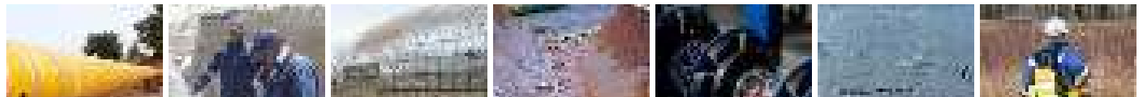
Alisdair Leeson
President
ExMag Pipeline Integrity (2011)



GLOBAL PRESENCE

AE Clients in India

AE Global Clients



Clock Spring	Direct Examination	ECDA	ICDA	ILI	SCCDA	XLI
50+ Pipelines	DEx	488 Pipelines	307 Pipelines	53 Pipelines	238 Pipelines	369 Pipelines
350+ Repairs	1,600+ sites	4,578 KM	2,725 KM	6,619 KM	10,260 KM	4,300 KM

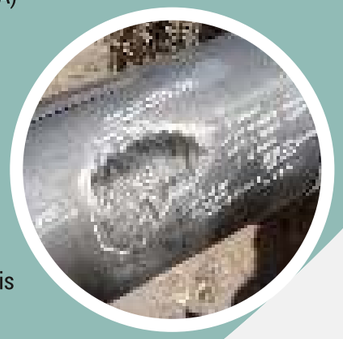
AE Services

Turnkey Pipeline Integrity Programs

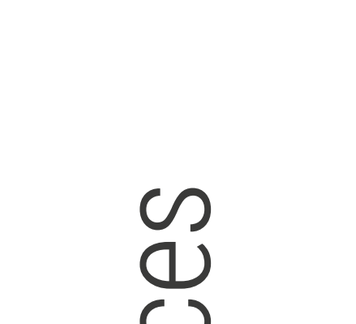
Our experts develop and implement "turnkey" pipeline integrity programs. These address immediate maintenance requirements and satisfy the client's long- term objectives for their asset, with a Fitness for Service (FFS) assurance.

AE creates and continually enhances integrity programs that are manageable, cost effective and fully regulatory code compliant. These are developed exclusively by AE in close co-operation with the client and include:

- Direct Assessment (ECDA, ICDA and SCCDA)
- Fitness for Service (FFS)
- In-line Inspection (ILI)
- Corrosion Management Systems (CMS)
- Root Cause Analysis (RCA)
- Threat Analysis as per ASME B31.8S
- Corrosion Audits
- Class Upgrades & Coating Integrity Analysis
- Determining Safest Operating Pressure
- Repair Strategy for increasing life of the asset



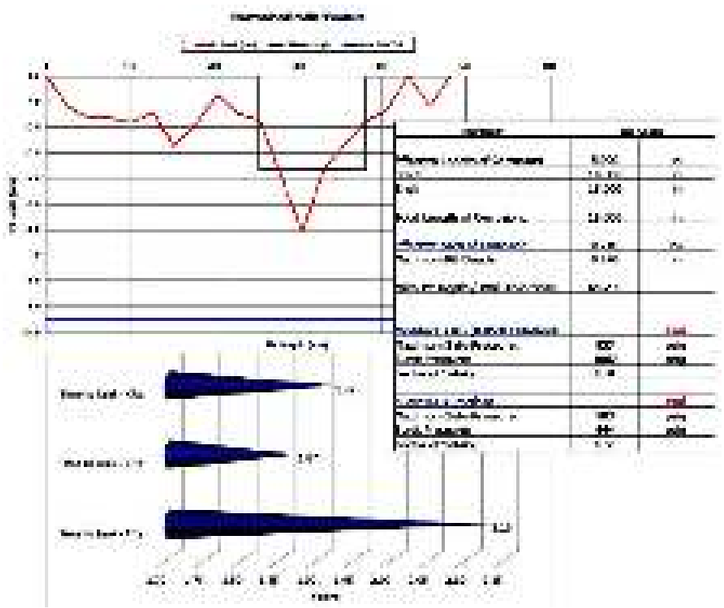
Customized programs for cross-country pipelines, distribution networks (City Gas Distribution - CGD), facilities and gathering centres, downhole assessment of tubulars and various other hydrocarbon assets are developed by AE, that **predict their remaining life with a "go forward" plan.**



Fitness for Service (FFS) Analysis

Providing a pipeline's Fitness for Service, the safest operating pressure or a customised "pipeline management" plan for increasing the life of a pipeline.

Includes, repair strategies along with other practical operations and maintenance strategies or application of fracture mechanics and engineering principles to assess defects.



Direct Assessment

(ECDA, ICDA and SCCDA)

AE has inspected 1,000+ pipelines globally by:

- **External Corrosion Direct Assessment (ECDA),**
- **Internal Corrosion Direct Assessment (ICDA)**
- **Stress Corrosion Cracking Direct Assessment (SCCDA)**

ECDA
488 Pipelines
4,578 KM

ICDA
307 Pipelines
2,725 KM

SCCDA
238 Pipelines
10,260 KM

AE have been industry leaders in performing several successful ECDA, SCCDA, ICDA (dry gas, wet gas, liquid petroleum, multiphase products and water lines) for our global clients in India, Middle East, Europe and North America.

Allied Engineers has published over 30 papers and journals on DA and is recognized as an expert on ECDA, ICDA and SCCDA.

Benefits of AE's Direct Assessment Program :

- **Proactive** - Predict where corrosion may occur in the future
- **Non-Intrusive** - No product flow interruption
- **Root cause** for corrosion mechanism = Why is it there?
- **Mitigation** plan for corrosion = **How to manage it?**
- Determines **Remaining Life** and **Safest Pressure** of asset
- **'What-if' scenarios** to optimize production with existing threats
- Prioritize remedial integrity activities and **repair strategies**
- **Complimentary** to ILI and Hydrotesting for integrity validation

Environmental Modelling

With more than 10,000 km of SCC assessment experience by utilizing our proprietary environmental modelling techniques, AE provides customized environmental modelling solutions to clients.

AE utilizes the environmental modelling data along with on-site Soil Augers assessment to perform SCCDA assessments.

ICDA
Flow Modelling

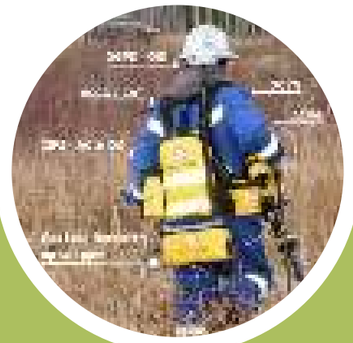
ICDA Sites

Spectrum XLI for Integrated Cathodic Protection (CP) and Coating Surveys

In 2017, AE introduced the eXternal Line Inspection (XLI) in collaboration with PureHM, in the Eastern Hemisphere to provide “most authentic” CP and Coating survey results which are not limited to surveyor’s subjectivity.

AE has already performed XLI surveys in excess of 4,000+ Kms and have trained several certified teams for meeting the Client demands for XLI.

The XLI equipment collects encrypted data with raw waveforms similar to an ILI or a Hydrotest assessment.



Performing eXternal Line Inspection (XLI) with simultaneous, continuous and encrypted “All in One” surveys, XLI collects up to ten (10) data sets by walking ONLY ONCE over the complete pipeline right of way.

- Differential Global Positioning System / Geographic Information System (DGPS/GIS)
- Close Interval Potential Survey - DC (CIPS-DC)
- Close Interval Potential Survey - AC (CIPS-AC)
- Direct Current Voltage Gradient (DCVG)
- Alternating Current Voltage Gradient (ACVG)
- Alternating Current-Current Attenuation / Current Attenuation Test (ACCA/CAT)
- Depth of Cover, Elevation, Pipeline Profile
- Gas Leak Detection (GLD) for Gas pipelines
- Continuous Soil Resistivity (Optional)
- Pipe Wall Assessment (PWA) using the Large Standoff Magnetometry (LSM) method (optional)

Several technical papers and journals have been published by AE clients, showcasing success of XLI systems:

Title	Event / Journal	Operator
Complete Integrity Assessment of a **non-piggable multi-diameter** cross country pipeline in a **network** shared by multiple electrically continuous parallel pipelines	ASME IOGPC	
Utilization of high resolution integrated indirect inspection survey technology as part of the direct assessment (DA) methodology of **ageing non-CP** pipeline network	ASME IOGPC	
Definite advantages of utilizing integrated indirect inspection technology to survey a **newly laid 3LPE coated** cross country pipeline	ASME IOGPC	
ECDA – Indirect inspection through **combined on ground** survey of pipeline and its **benefits**	NACE CORCON	
Integrated survey for cathodic protection and coating during ECDA of 4-inch **condensate** pipeline	NACE CORCON	
Utilization of **advanced CP survey** methodology for pipeline integrity assessment	NACE CORCON	
Process optimization and efficiency: Above ground pipeline survey using **integrated** indirect inspection technology	Chemical Engineering World	

pureHM
a xylem brand

Performing eXternal Line Inspection (XLI) with simultaneous, continuous and encrypted “All in One”, surveys:

XLI collects up to ten (10) data sets by walking ONLY ONCE over the complete pipeline ROW

In-Line Inspection for Piggable Pipelines

AE along with NDT Global exclusively offers the most accurate Ultrasonic Inline Inspection for metal loss and crack detection (UM, UC, UCC) on onshore and offshore trunk pipelines in India.

AE has performed 50+ ILI inspection programs for the pipeline owners in India.

- **Ultrasonic In-Line Inspection**

Detection of corrosion features with a “direct wall thickness measurement” for anomaly diameter and depth sizing of 5 mm (0.2 in) reaching a probability of detection level (POD) of > 90% for **pitting corrosion.**

- **Ultrasonic Crack Detection In-Line Inspection**

Crack inspection robots use 45° shear wave, a methodology employed industry-wide. Due to a so-called corner reflection produced by this method, minor cracks anywhere from approximately 1 mm (0.04 in) onwards give strong reflections for analysis.

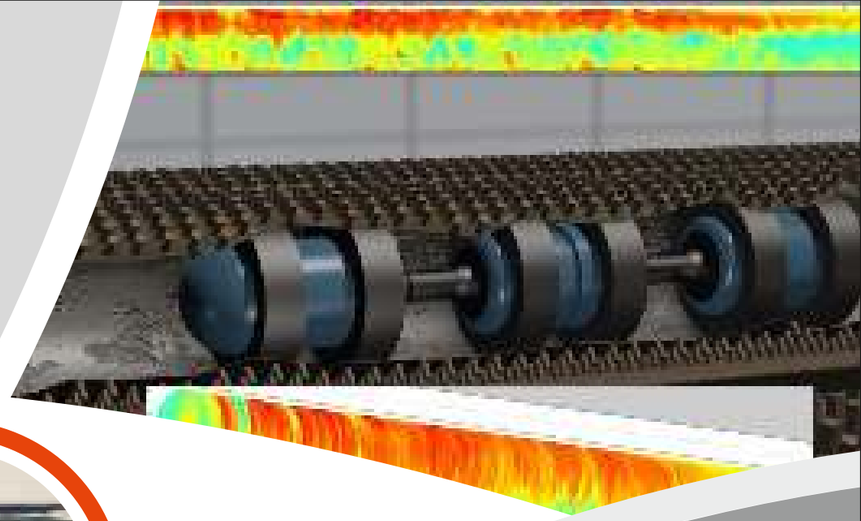
Ultrasonic crack inspection enables early detection and sizing of cracks and crack-like irregularities.

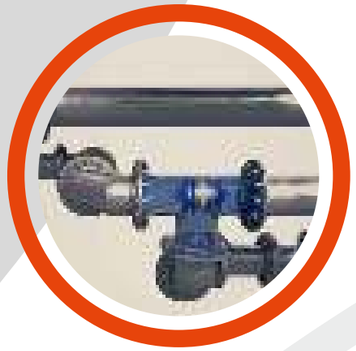
Such accurate information allows operators to take necessary measures to help avoid pipeline failures.

- **Gas Pipeline ILI by ART Scan™**

The ART Scan™ internal pipeline inspection solution performs “**direct wall-thickness**” **measurements in high-pressure gas pipelines**, giving the operator a more accurate depth measurement and providing them with the information required to carry out their integrity assessments with greater levels of confidence.

NDT Global





In-Line Inspection for Non-Piggable / Challenging Pipelines using InVista™

Non-Piggable or **“Difficult to inspect”** pipeline ILI by utilizing InVista™ - **Ultrasonic In-line Inspection tool**. Effective pipeline integrity management can be problematic for large number of pipelines that were not designed for in-line inspection (tradition-ally non-piggable pipelines).

AE understands the complexities involved with this **challenging segment** and offers a comprehensive pipeline integrity management solution – **the InVista™ ultrasonic (UT) in-line inspection tool [from 2” to 48” diameter].** Lightweight and compact, the InVista™ tool can be launched by hand and is ideal for space-constrained environments.

AE has performed India’s first City Gas non-piggable pipeline ILI

FTIS™
is an intelligent pig that quickly and accurately inspects the convection and radiant coil sections of fired heaters

Furnace Heaters Inspection using FTIS™

AE in collaboration with Quest Integrity provides the industry leading solutions for inspection of **furnace heaters / process heaters** inside plants using Ultrasonic Intelligent Pigging Tool – FTIS™.

FTIS™ is an intelligent pig that quickly and accurately inspects the convection and radiant coil sections of fired heaters per API Recommended Practice 573 and provides fitness-for-service as per API579.

FTIS™ detects and measures existing damage mechanisms such as internal or external corrosion, erosion and pitting, along with deformation such as bulging, swelling and ovality in serpentine or arbor coils. These damage mechanisms are quickly identified and quantified in an immediate inspection report.

Quest Integrity

Permanent Composite Sleeve Repair using Clock Spring NRI

- **Pipelines**

The Clock Spring composite repair sleeve and reinforcement system is uniquely designed for high-pressure transmission pipelines as a permanent repair solution.

It is applicable on defects like general corrosion, pitting corrosion, bend repairs, weld defects, SCC, crack-line defects, geohazards, wrinkles and now for internal corrosion monitoring with continuous real time wall loss measurement.

It is the most tested, investigated, and documented composite repair solution ever developed with over 1,000,000 installations in more than 75 countries in practically every environment for more than three decades.

- **Complex Geometry and Plants**

Since the merger of CSNRI and the team being part of the ASME PCC-2 committee, other repairs offered by CSNRI include complex geometries (valves, tees, bends, reducers, pilferage taps), tank farms, plants, refineries, vessels, terminals.

- **For new construction/ projects stage**

Pipe Sock™ and Pipe Support™ are patented technologies to resolve crevice corrosion and protect metal to metal contact locations, ideal for terminals, plants, refineries, new pipeline construction.

ScarGuard® and Casing Spacer are extremely robust solutions protecting the pipe and girth welds from line pulling, micro-tunneling, HDD, thrust boring etc. They provide excellent abrasion resistance for protected coatings of trenchless pipeline installation.

CLOCK SPRING NRI

Total Pipeline Integrity Management Solutions (T-PIMS) Software

AE's Total Pipeline Integrity Management Solutions (T-PIMS) is a comprehensive software created by AE in collaboration with our IT partners Unistal Systems Pvt Ltd.

T-PIMS provides the complete "lifecycle" of the pipelines - from birth (design stage), manufacturing in mill, procurement, laying and construction, commissioning, operation, maintenance, probabilistic risk management, integrity assessments and finally up to the life extension or redundancy of the pipeline.

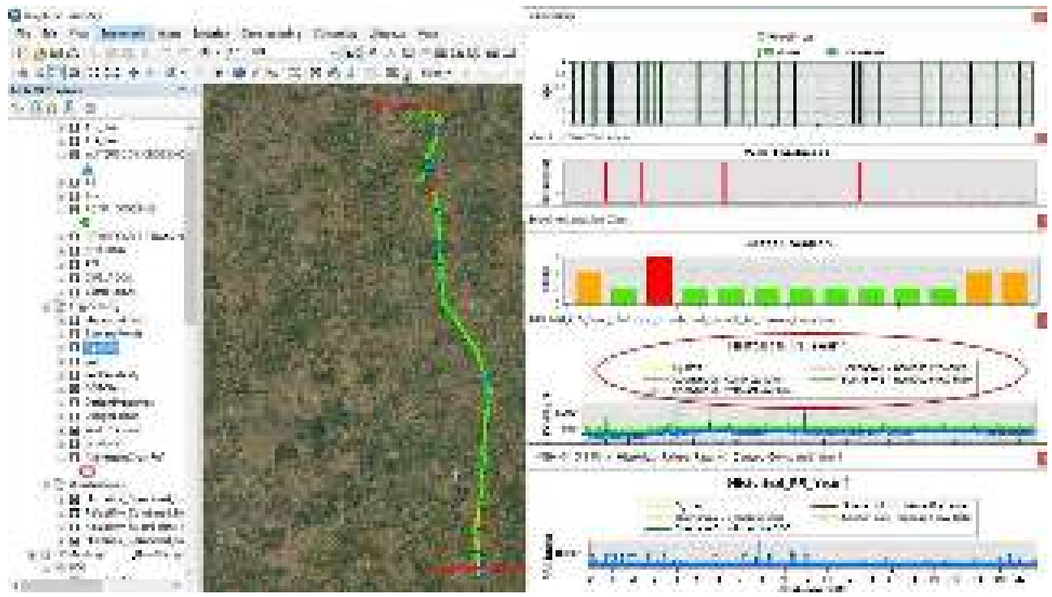
T-PIMS software utilizes PIRAMID™ (in association with C-FER Technologies) to evaluate pipeline probabilistic risk factors while managing defects and communicating risk results to stakeholders.

C-FER Technologies

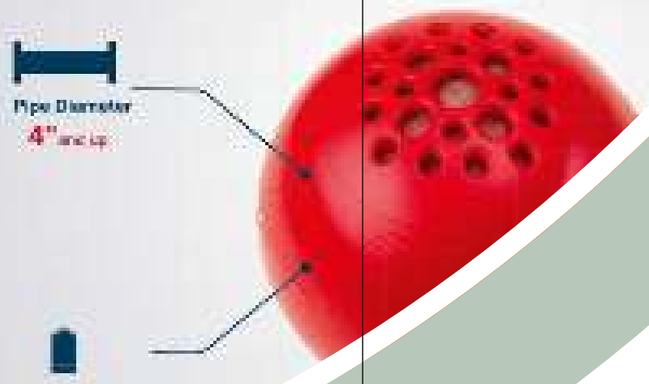
Total Pipeline Integrity Management Solutions (T-PIMS) is a comprehensive software to track the lifecycle of a pipeline

Major modules include:

- Design, Engineering and Construction Module in "real-time"
- Operations and Maintenance Module
- Integrity Module



SmartBall®



Leak Detection by SmartBall™ ILI

Confirmation of containment surveys are an important part of an integrity program because they can accurately detect pinhole leaks that are undetectable with ILI tools and would generally fall well-below the detection threshold.

These pinhole leaks represent a significant risk for operators and can cause major environmental damage before they are detected, and are a preliminary indicator that the pipeline is compromised and may fail.

Confirmation of containment also allows the pipeline owner to confirm ILI results in between ILI's by ensuring none of the identified defects have become 100% through the wall.

The sensitivity of SmartBall™'s acoustic sensor complements existing leak detection systems which cannot detect smaller leaks; SmartBall™ is typically 1,000 times as sensitive as these systems and can detect product losses as small as 110 ml per minute. The use of the SmartBall™ system allows operators to reduce the likelihood that a leak will go unnoticed over time.

pureHM
a xylem brand

Gas Leak Detection above ground survey

AE has surveyed non-intrusively 100's of pipelines for "live" gas leak detection and found ongoing gas leaks at several locations.

This is performed non-intrusively through AE's trained surveyors and encrypted leak detection data along with location is provided to the clients immediately.

AE Pipeline Integrity Training

Allied Engineers have certified AMPP (NACE) and ASME Instructors providing training on pipeline integrity related courses globally:

- Pipeline Corrosion Integrity Management (PCIM)
- Direct Assessment (DA)
- Internal Corrosion for Pipelines
- Pipeline Corrosion Field Assessment Techniques (P-CFAT)
- ASME's course on B31.8S for Managing Integrity of Gas Pipeline Systems
- Customized training courses and in-field camps are also conducted for various associations and pipeline owners, relating to pipeline integrity.

AMPP The Global Leaders in Materials Protection and Performance
NACE INTERNATIONAL
ASME
AMPCA