



ATMOS
INTERNATIONAL



Atmos Leak and Theft Detection Suite

Guaranteed continuous
improvement for your
leak detection program
(API 1175)



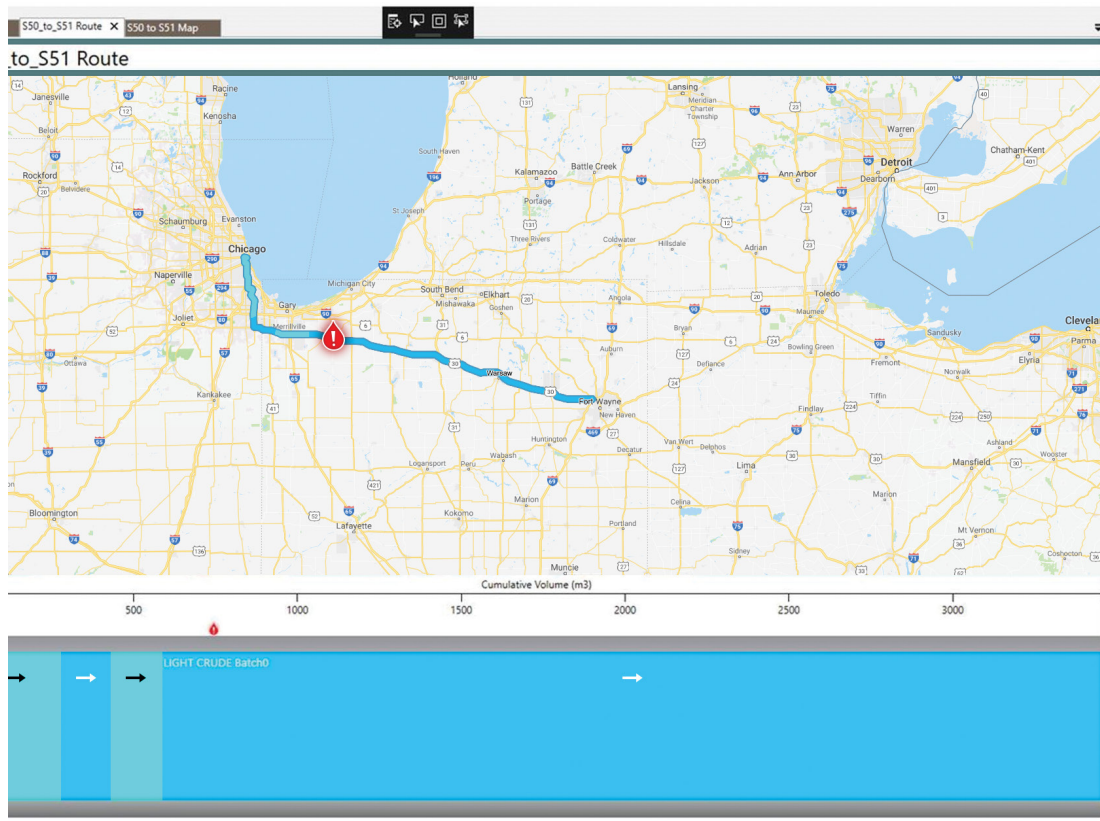
Pipelines are at more risk than ever; only the best leak detection is acceptable

Today, the corporate culture of pipeline operators is attuned to social responsibility and embodies a firm commitment to effective leak and theft detection.

From the oilfields to the refineries and on to the distribution centers, all pipelines transporting hazardous liquids endure greater scrutiny from regulators. The risk of catastrophic spills has increased as pipeline networks continue to grow around the world, with more chances for leaks and product thefts.

Effective leak and theft detection technologies are more essential now than ever before.

Operators understand that every pipeline behaves differently and no single technology is the best solution to detect all leaks and thefts. The standard measurement instrumentation on some pipelines may be inadequate for effective leak detection. The variables that affect the performance of leak or theft detection systems include the configuration of the pipeline, topology, telecommunication, instrumentation, and hydraulic modes of operation.



Flexible and easy to configure, the Atmos GUI/HMI has comprehensive maps that zoom to scale and report the estimated leak location in real time.



Solutions and services for effective leak and theft detection on onshore and offshore pipelines

A technology that is the best at leak detection on one pipeline may not be the optimum solution on another. That is why Atmos International (Atmos) offers a complete range of software and hardware solutions to assure the best technology or combination of technologies to optimize sensitivity, detection speed, reliability, and accuracy in all operating conditions, regardless of the specific pipeline where the system is applied.

Atmos offers unique software and hardware solutions to facilitate faster detection and greater accuracy in the location of small leaks and thefts, including the most deployed pipeline leak detection system (LDS) in the world, Atmos Pipe, and the international award-winning nonintrusive pressure sensor, Halo, which makes leak detection possible anywhere without cutting or drilling on the pipeline.

Cross-pollination of select features from each technology drives continuous evolution toward our ultimate objective: to detect every drop spilled from any pipeline in the energy, aviation, chemical, water, and mining industries.

Atmos Leak and Theft Detection Suite

Atmos Pipe - Statistical Corrected Volume Balance leak detection system

Atmos Pipe has powered up again. Maintaining its signature high reliability, the one true statistical volume balance system now achieves location accuracy similar to that of negative pressure wave technology, when used with its Fast Scanning option.

Atmos Pipe automatically identifies operational changes, assuring detection of leaks during transient operations. Data validation algorithms and filtering optimize data quality, minimizing false leak alarms. Machine learning compensates for flow measurement errors, to deliver even more reliable and sensitive leak detection.

Atmos Pipe packs additional functionality for supreme reliability and greater detection speed:

- Draining and filling module
- Override function
 - Open Platform Communications (OPC) Quality
 - OPC Values - Continuous or time-based options
- Additional operational status exploiting artificial intelligence
- Improved LDS algorithms
- Advanced leak location algorithms
- Improved redundancy
 - Multiple OPC Data access (DA)
 - OPC unified access (UA) sources
 - Standardized query language (SQL) replication
 - Hot and cold LDS standby
 - Backup control room synchronization
- Enhanced System Management Tool screens (PDF viewer to access project documentation and seamless integration with all Atmos products)

Atmos Test Service

Rerun historical leak data to confirm LDS performance or train controllers. Use Test Service in a high-speed mode to replay months of data in minutes or in real time for operator training sessions.

Live Leak Test

Superimpose a leak signature on the live incoming pipeline data to verify the performance of the live leak detection system.



Atmos SIM – Accurate model-based leak detection from the most precise transient model

The unique Maximum Likelihood State Estimator uses available flow and pressure data to provide a highly accurate calculation of the hydraulic and compositional properties of the product in a pipeline network in real time. The Tuning Assistant always keeps the model as close to reality as possible.

Atmos SIM uses the proven statistical algorithms from Atmos Pipe to minimize false alarms and overcome the limitations of other Real-Time Transient Models (RTTM) in maintaining maximum sensitivity and the shortest detection time in transient conditions.

Atmos SIM is especially suitable for situations where it is not feasible to install intermediate flow meters and pressure sensors, such as subsea pipelines.

Atmos Wave – Rarefaction pressure wave leak detection system

Atmos Wave uses the pressure data from the rarefaction wave caused by a leak to quickly detect and accurately locate that leak and estimate how much fluid was spilled. Three comprehensive algorithms filter out the noise and present the analog pressure data in a detailed 3-D map. This unique holistic analysis of the combined pressure data from both the inlet and outlet optimizes the differentiation of true leak/theft events from the pressure changes caused by transient operations.

Atmos Wave has been rigorously tested on a wide variety of pipelines, including liquid, gas and multiphase.

Extensive performance evaluation and field trials have proven that Atmos Wave consistently differentiates leak/theft pressure changes from pressure changes caused by transients. Atmos Wave detected more leaks than the competitors' systems, as demonstrated in the rigorous, international field evaluations that the Pipeline Research Council International (PRCI)* conducted on a crude oil pipeline.

Atmos Wave Flow – Complementary technologies to optimize leak detection

Atmos Wave Flow combines the high reliability and accuracy of the mass balance (flow) elements with the proven sensitivity and accuracy of the negative pressure (wave) techniques to achieve the highest sensitivity and location accuracy, fastest detection time, and minimal false leak alarms.

Additional Atmos Wave Flow options for other leak detection methods

Pressure distribution analysis (PDA)

This method compares modeled pressure decay along the line against the actual readings from pressure sensors distributed along the pipeline. If a leak occurs, the model displays the deviations from the expected output. The method requires a minimum of three sensors for leak detection and leak location.

Dynamic model analysis (DMA)

Pattern recognition detects the onset of a leak, which can often be identified as a rise in inlet flow as outlet flow, inlet pressure, and outlet pressure potentially drop. DMA works at SCADA sampling rates, analyzing data over short spans. This means flow meter drift does not affect leak detection sensitivity.

Atmos Rupture Detector – Assures the confidence to act fast if a rupture occurs

Atmos Rupture Detector uses a combination of PDA, DMA, KL and inventory algorithms to detect a pipeline rupture. The system gives the operator the confidence to shut down the pipeline, limiting product loss, environmental damage, and fines.

The Rupture Detector module detects and alarms a rupture on a pipeline that is running, shut in, or starting up, with or without flow meters.

The system alarms in seconds to minutes, even if the pump trips within ten seconds after a rupture occurs.

Atmos Rupture Detector is also available as a stand-

* "Field Testing of Negative-Wave Leak Detection Systems," API 2014 Pipeline Conference and Cybernetics Symposium Proceedings 8-10 April 2014, San Antonio USA.



alone system

Hardware that overcomes the limitations of conventional pipeline infrastructure

Conventional leak detection technologies are limited by typical pipeline instrumentation and communications when it comes to leaks below the minimum detectable threshold of 1%. Atmos proprietary flow and pressure instrumentation and communications can be seamlessly added to Atmos LDS packages to detect leaks below the threshold and accurately locate them faster.

Atmos AWAS units

These are high-speed data acquisition devices with a range of functionality that collect data for leak detection, stand-alone communication, local leak data processing, and solar power options.

Non-intrusive pressure and flow sensors

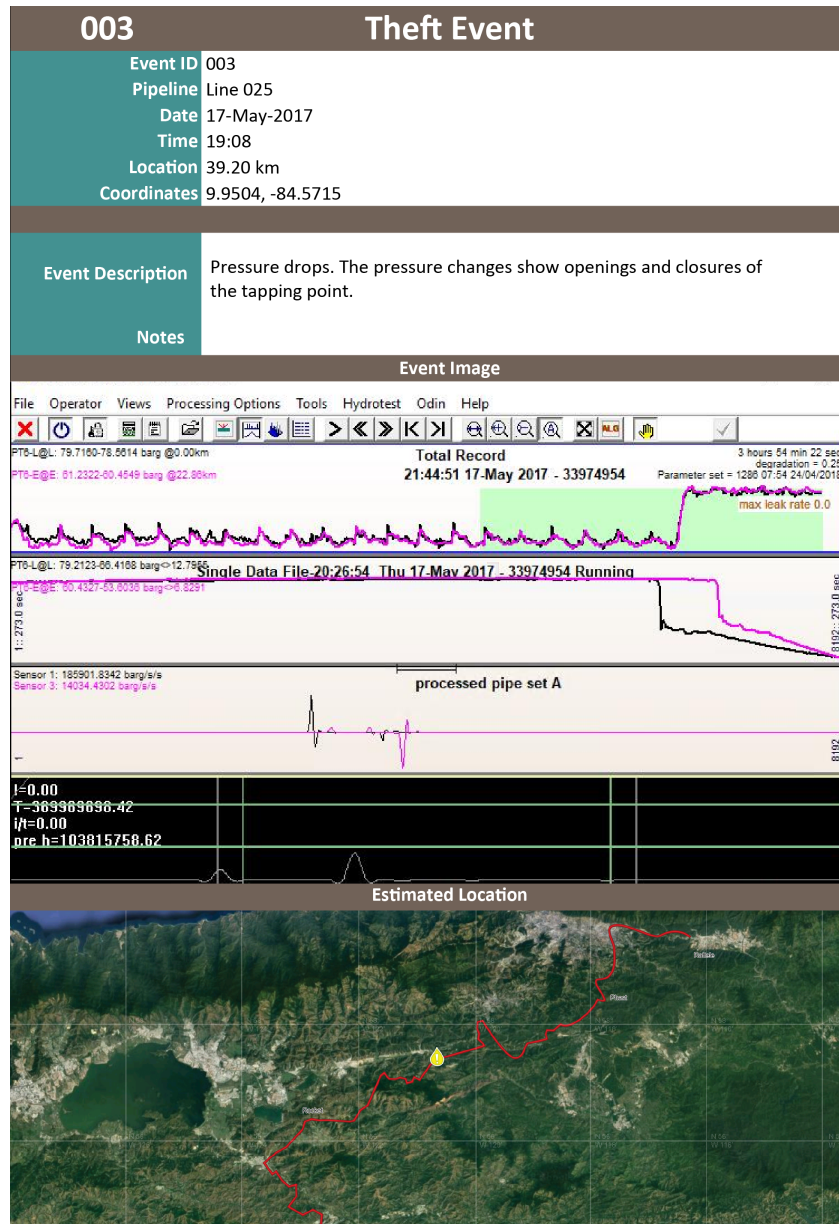
This is an easy retrofit, with no cutting or drilling required.

Theft Net

Theft Net combines fixed and portable hardware solutions to collect and analyze pipeline data. Experienced engineers, trained in the latest theft detection techniques, scrutinize the pipeline data in even greater detail to locate the theft site to within meters. The human element adds superior accuracy and provides highly sensitive detection without the



Atmos non-intrusive instrumentation



Real theft event report

Atmos International (Atmos) provides pipeline leak detection and simulation technology to the oil, gas, water, and associated industries. The company was founded in 1995 in the UK by the inventor of the statistical pipeline leak detection system – Atmos Pipe,

now one of a suite of leak and theft detection solutions from Atmos. These technologies are implemented on hundreds of pipelines in over 50 countries, including major oil and gas companies such as Shell, BP, ExxonMobil, and Total.

With associated offices in the USA, China, Russia, Singapore and Costa Rica, and local agents in 28 countries, the multi-cultural and multilingual team can provide effective support all over the world.

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