

## Atmos Wave

# Proven leader in negative pressure wave leak and theft detection technology\*

### Effective leak and theft detection for pipeline with no flow meters

Technological advances in communication and instrumentation make this fast and accurate leak detection system very robust and reliable. It is a great leak detection solution for pipelines that lack flow meters and has an outstanding track record in detecting and locating product theft all around the world.

### Main benefits

- Detects when thieves open or close the theft valve on an illegal tapping point
- Accurately locates the theft or leak
- Easy to retrofit
- Detects leaks during steady-state, transient and shut-in conditions



Tapping points detected by Atmos Wave

### Main features

- Typically about 4-5 minutes to detect a leak on a 100km pipeline section (including processing time)
- Performance proven on pipeline sections up to 240km with no intermediate pressure sensors
- Verified to detect leaks as small in size as a 1mm hole
- Typical sensitivity with high reliability is below 0.5% of the pipeline's nominal flow rate\*\*
- Proven location accuracy within 10m
- Expected location accuracy below 0.25% of monitored section length
- Uses 'off-the-shelf' pressure sensors from high-quality manufacturers
- No flow meters required but can be utilized if available as secondary system inputs
- The compact, high-speed, data acquisition unit gathers high-fidelity data to assure outstanding performance
- Acquired data is stored locally in the Atmos Wave acquisition system (AWAS) during communication failures, ensuring no leak is missed
- Complies with API 1130, 1149, 1155 and 1175

### Detects minute pressure changes from very small leaks and thefts

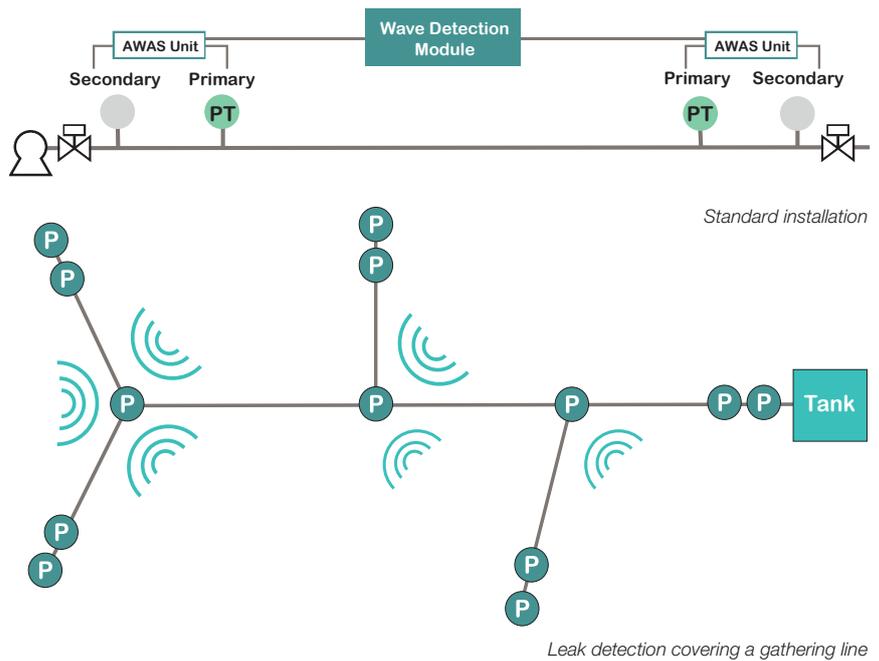
A leak generates negative pressure waves that travel through the fluid upstream and downstream away from the leak site. High-resolution sensors at the inlet and the outlet of the protected segment capture the pressure change as the wave passes.

Atmos Wave uses this wave rarefaction data to accurately pinpoint the leak and estimate how much fluid leaked.

Three comprehensive algorithms filter out the noise and present the analog pressure data in a detailed 3-dimensional map. This unique holistic analysis of the combined pressure data from both the inlet and the 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 pipeline configurations, on pipelines with liquid products, on pipelines with gas products and on pipelines that transport multiphase product. Extensive performance evaluation and field trials have proven that Atmos Wave consistently differentiates leak/theft signals from pressure changes caused by transient operations.

Atmos Wave detected more leaks than the competing systems and generated no false alarm, while the competing systems produced hundreds of false alarms during stringent field evaluations conducted on a crude oil pipeline by the PRCI (Pipeline Research Council International)\*.



### System outputs

- Leak alarm
- Leak location
- Leak rate and volume lost
- Leak time
- Watchdogs via OPC

### Sensors used

- Primary sensors are pressure sensors positioned 0.3km – 240km apart
- Flow and pressure can serve as secondary inputs for full section coverage (i.e., no blind zones close to the pipeline ends)

### Data source

The Atmos Wave data acquisition system acquires 4-20mA instrument input data at high resolution and a high sample rate.

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

\*\* The number of false alarms relates to the optimal sensitivity for a given pipeline operation scenario, the inputs available to the system, and the performance of the instrumentation itself.



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### About Atmos International

Founded in 1995, Atmos International provides pipeline leak and theft detection, simulation technology, instrumentation and engineering services to the energy, water and associated industries. Atmos is the first choice of most pipeline companies worldwide, and is extensively used by major operators like Shell, BP, ExxonMobil, Petrobras, Enbridge and Total. With associated offices in the USA, China, Russia, Singapore, Indonesia, Colombia, Ecuador, Peru and Costa Rica, and local agents in 28 countries, our multi-cultural and multilingual team is dedicated to effective global support for the lifetime of our products all over the world.

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