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Siemens Energy Spontaneous Leak Detection Service

Overview

October 2020



Setting the context for today's presentation



We will be discussing spontaneous leak detection.

We define this as a an event that causes an immediate breach in the pipeline.

The breach will generate a negative pressure wave which the Siemens/ProFlex SLDS will detect and report.

This will not detect a creeping leak such as a seal that is leaking small amounts of product over time.



Why look at new leak detection technology?



Our new leak detection technology brings:

Speed: detect leaks in seconds before significant environmental damage occurs.

Location: pinpoint leak location typically to +/- 20 to 50 feet minimizing excavation cost/time to find leaks

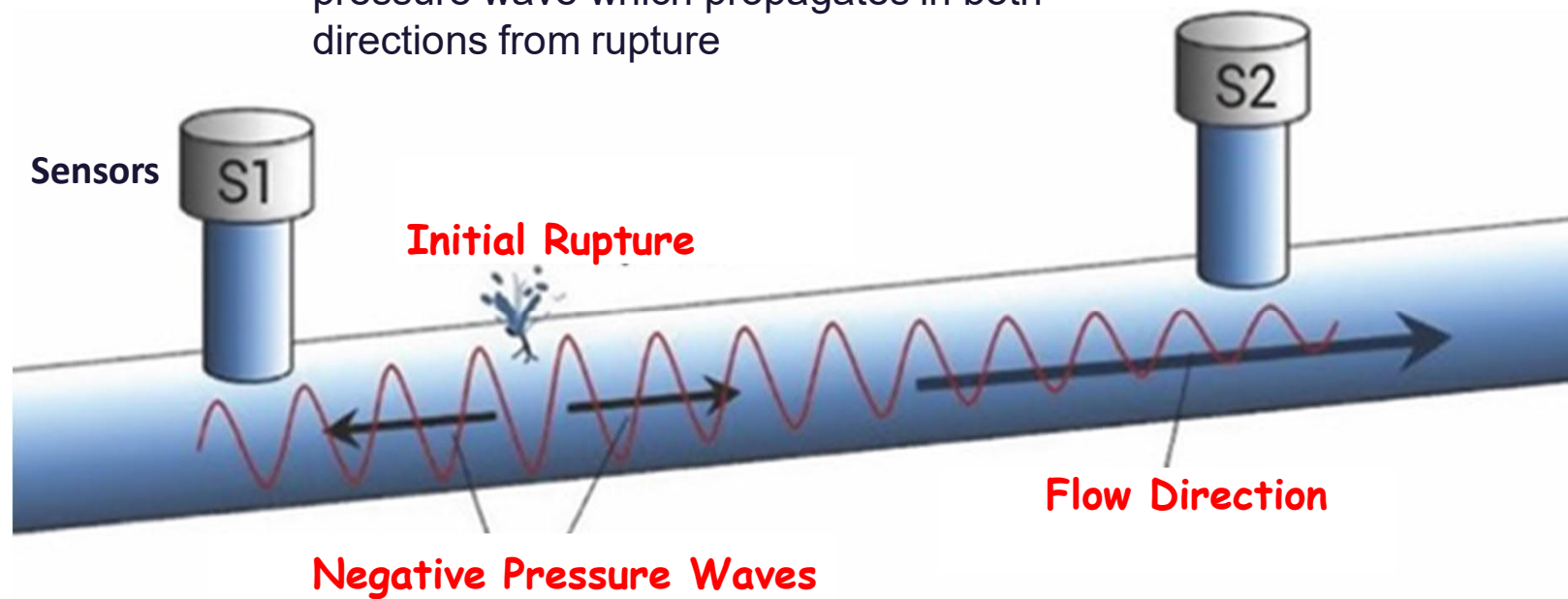
Reduce Product Loss: identify leaks typically as small as ½ to 2 inches dramatically reducing product loss

Layered Security – supplement existing leak detection systems for critical pipeline segments

Regulations – Be in a position to quickly respond to new/pending regulations

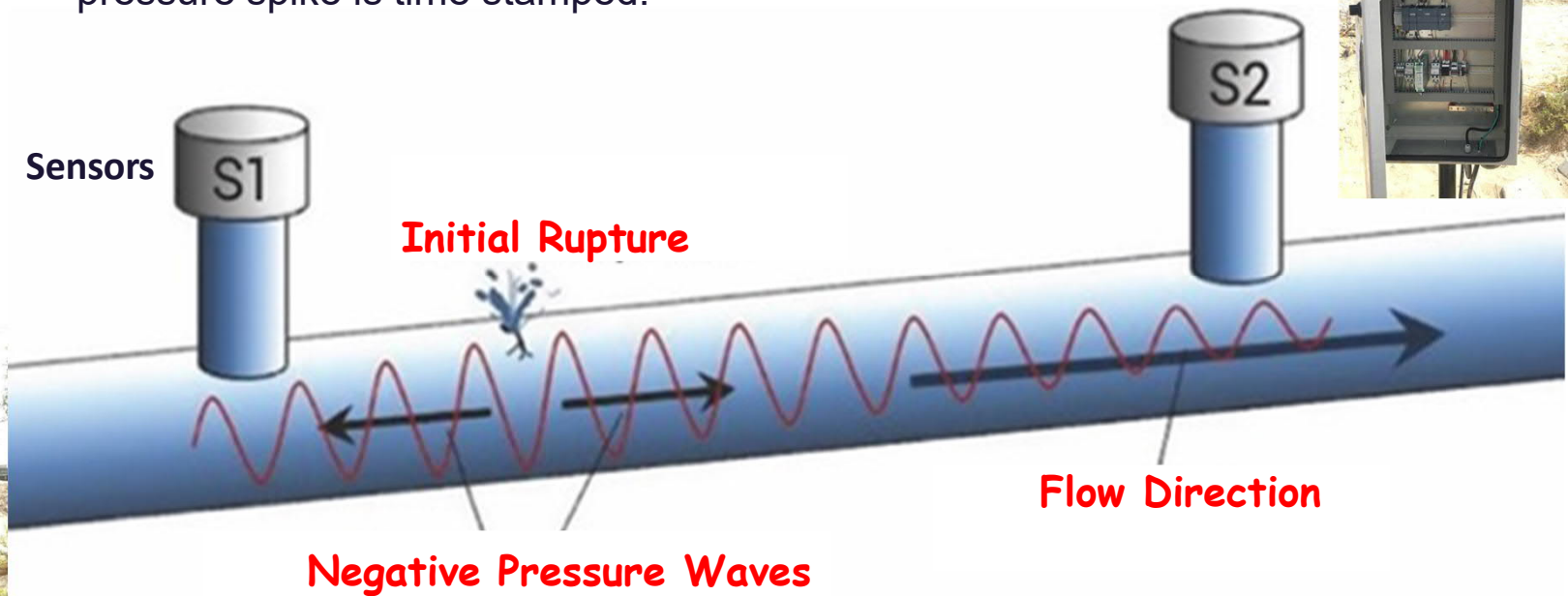
How we detect and localize small leaks in seconds Enhanced negative pressure wave detection

Initial rupture in pipe generates negative pressure wave which propagates in both directions from rupture



How it works – Enhanced negative pressure wave detection

Edge computing processes the pressure and other sensor data with advanced algorithms to detect pressure wave from background noise. Detected pressure spike is time stamped.



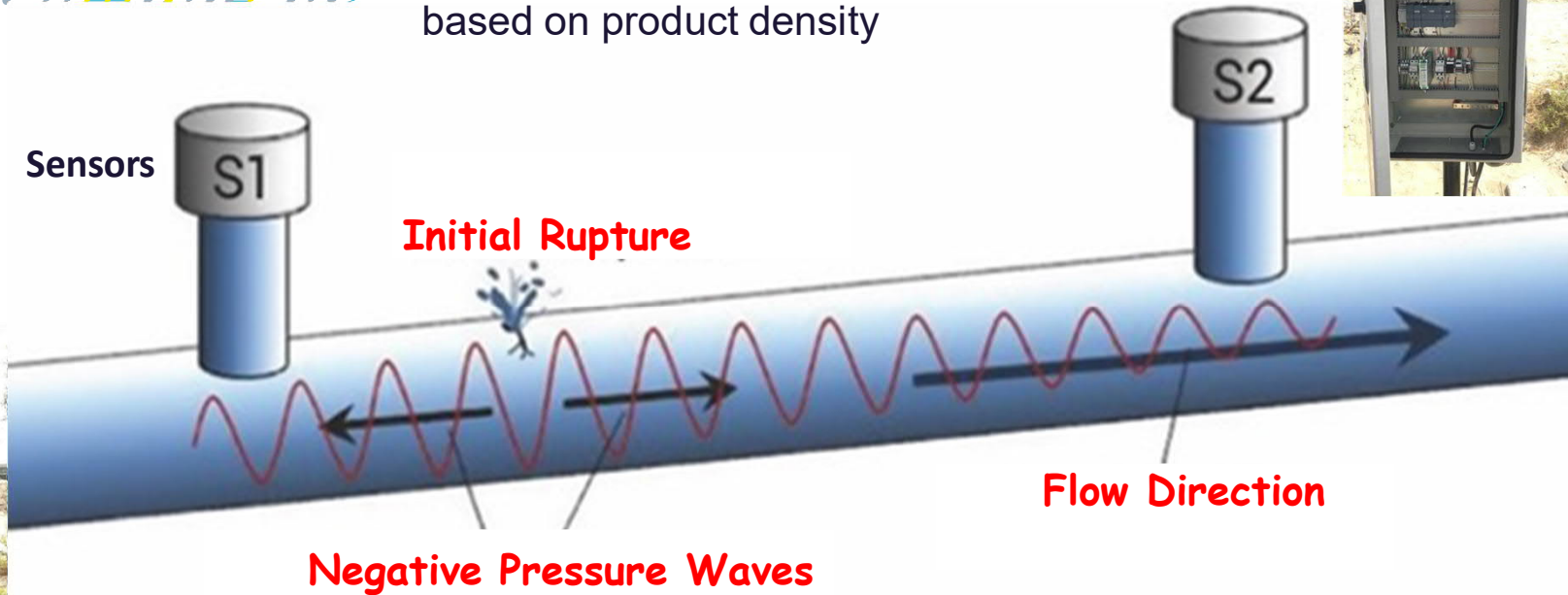
Edge computer – LTE/Satellite
and Solar/mains power



How it works – Enhanced negative pressure wave detection

Siemens Energy Cloud

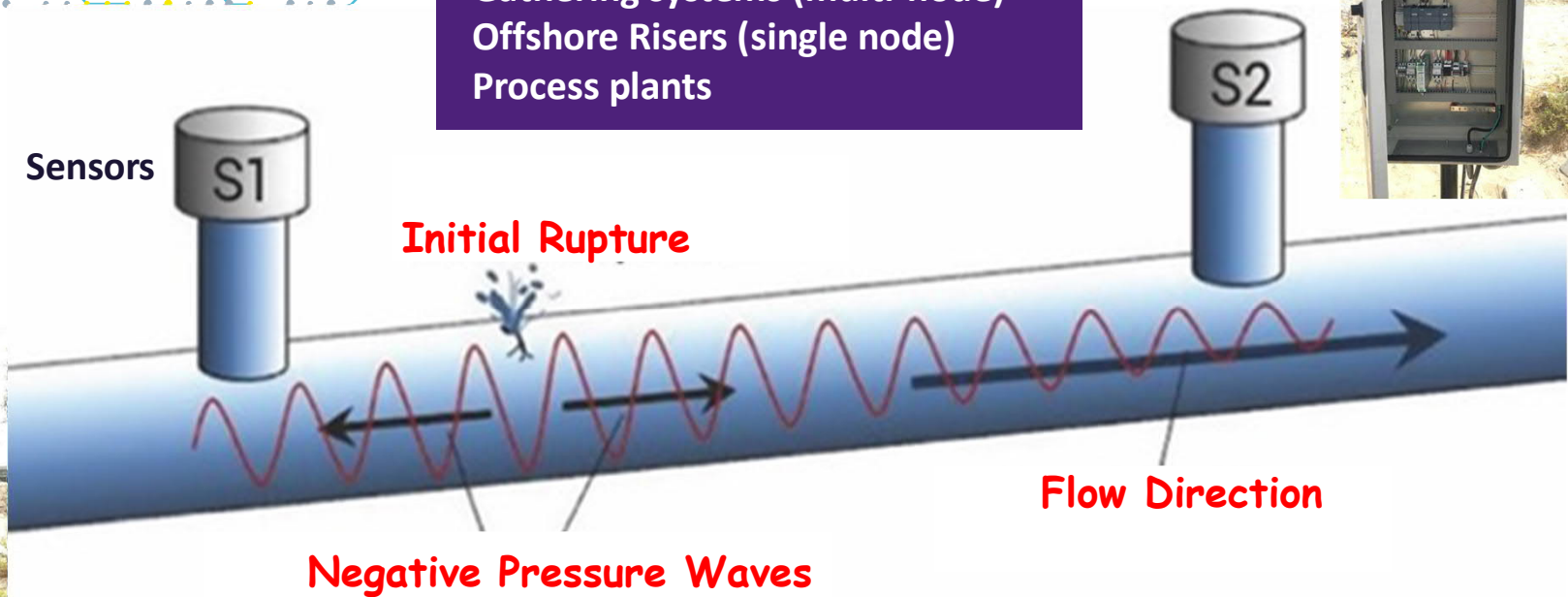
The pressure spike and time stamp are transmitted to the cloud. Cloud computing compares time stamps and localizes the leak based on product density



How it works – Enhanced negative pressure wave detection

Siemens Energy Cloud

Applications:
Pipelines (multi-node)
Gathering systems (multi-node)
Offshore Risers (single node)
Process plants



Technology is applicable to water, gases, oil, condensate, multi-phase flow



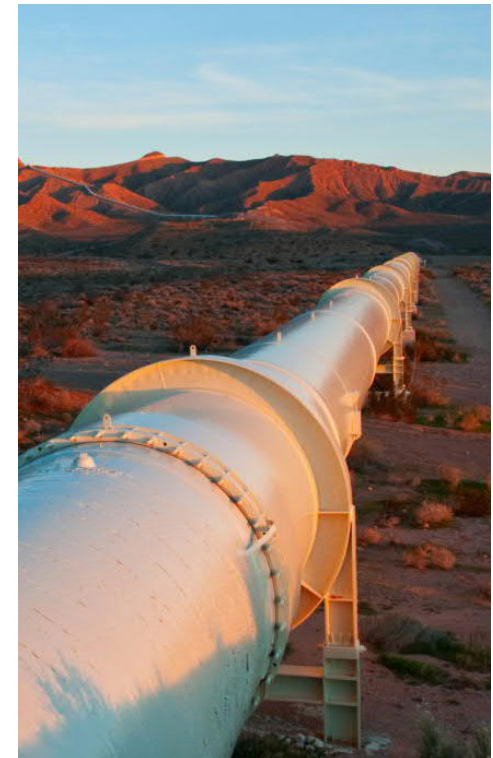
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ProFlex brings disruptive technology to leak detection



Why disruptive:

- Engineered solution that is pipeline specific providing highly accurate real-time results
- System is calibrated for customer's specific pipeline operating conditions resulting in specialized filters and leak detection algorithms
 - Results in a high level of accuracy in determining leak events from background operational noise minimizing false positive alarms
 - System is able to calibrate itself in real time to more accurately predict leak location subject to variation in operating conditions
- Ease of system deployment on brownfield and greenfield pipelines – only requires smallbore branch connection
- No requirement for mains power supply or hardwired communications



How does our approach differ from other leak detection technologies?

The key differentiator is performance:

- Provides a non intrusive, cost-effective solution that can detect and pinpoint leaks in seconds without requiring a large loss of product from pipeline. As an example, our technology can detect leaks in range of ½ to 2 inches within a second or two.
- Typical mass balance system requires 1.5% - 4% volume loss, pressure threshold margin typically set at -15% pipeline low operational pressure



	Siemens Energy	Mass/Volume Balance	Pressure Threshold	Fiber Optic
System Sensitivity	⚡⚡⚡⚡⚡	⚡⚡	⚡	⚡⚡⚡
Leak Localization	⚡⚡⚡⚡	⚡⚡	⚡	⚡⚡⚡⚡⚡
Ease of Deployment	⚡⚡⚡⚡⚡	⚡⚡⚡	⚡⚡⚡⚡⚡	⚡
Transient Conditions	⚡⚡⚡⚡	⚡⚡	⚡	⚡⚡⚡⚡
System Cost (Low – High Cost)	⚡⚡	⚡⚡	⚡	⚡⚡⚡⚡⚡

Implementation of SLDS is straightforward

The SLDS is an Engineered Solution that is tailored for your specific pipeline physical and operating conditions.

- The first step is a field test using portable SLDS hardware to determine feasibility
- The next step is determining the number of nodes and location and then installing the nodes and sensors along the pipeline
- We then “tune” the system to your specific pipeline operating conditions
- Operational handover
- Ongoing maintenance and support

Overall goal is minimal impact on pipeline operations and staff

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We supply leak detection as a service to minimize impact on your operations and staff

- Three year subscription
- Siemens designs, installs, tunes and maintains SLDS
- Siemens maintains SLDS filter detection robustness
- Quarterly review sessions
- Annual onsite review
- Siemens provides all ongoing hardware and software solution support
- New SLDS solution enhancements included as part of subscription

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We see many benefits of SLDS to pipeline operators

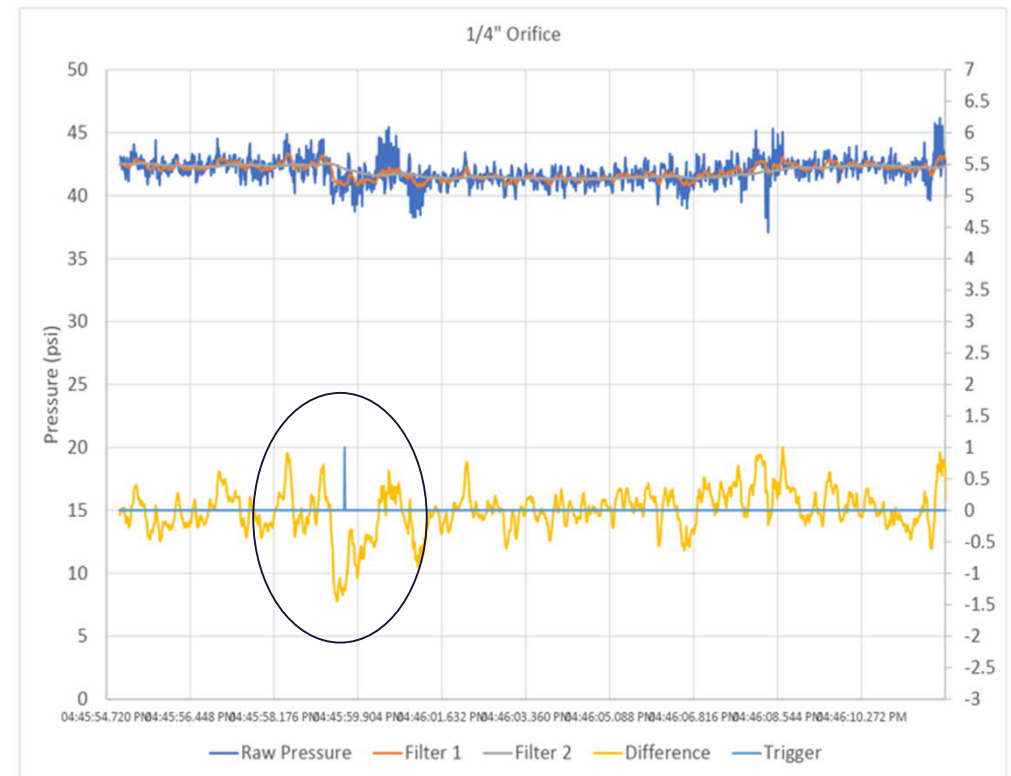
Fast, localized detection of small spontaneous leaks results in:

- Lower reputational risk
- Avoidance of lost value of product
- Lower cost/time for excavation to find leak
- Lower cost of repair due to earlier detection
- Applicable to brownfield infrastructure
- Comply with PHMSA rules
- Faster response time / minimal false positives
- System supports additional sensor inputs to capture additional operating parameters

On the Liquid side, PHMSA issued a final rule encouraging pipeline operators to “make better use of all available data to understand pipeline safety threats.” PHMSA also extended leak detection requirements to all non-gathering hazardous liquid pipelines.

PHMSA, October 2019

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Next steps



- Discussion on possible applications within the customer asset mix
- Deeper dive into the benefits and technology
- Demonstration of technology on Siemens Energy flow loop
- Field demonstration on customer asset with “portable” data collection units
- Detailed implementation discussion for an asset – site survey, detailed operating conditions, budget, implementation timing