Naftosense

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Getting Ahead of Leaks & Spills

Stefan Balatchev, Naftosense's R&D coordinator, explains how its polymer absorption sensors are helping solve enviromental and operational challenges

LEAKS IN pipelines, storage tanks, and industrial systems pose serious risks, including hazardous spills, environmental contamination, and financial losses. Traditional leak detection methods, such as visual inspections, pressure monitoring, and infrared sensing, often have limitations in accuracy, responsiveness, and cost-effectiveness.

Polymer absorption sensors offer a cutting-edge, real-time solution for leak detection. These sensors are capable of detecting hydrocarbons and other chemicals with high sensitivity and reliability, making them invaluable for modern oil and gas operations.

UNDERSTANDING POLYMER ABSORPTION SENSORS

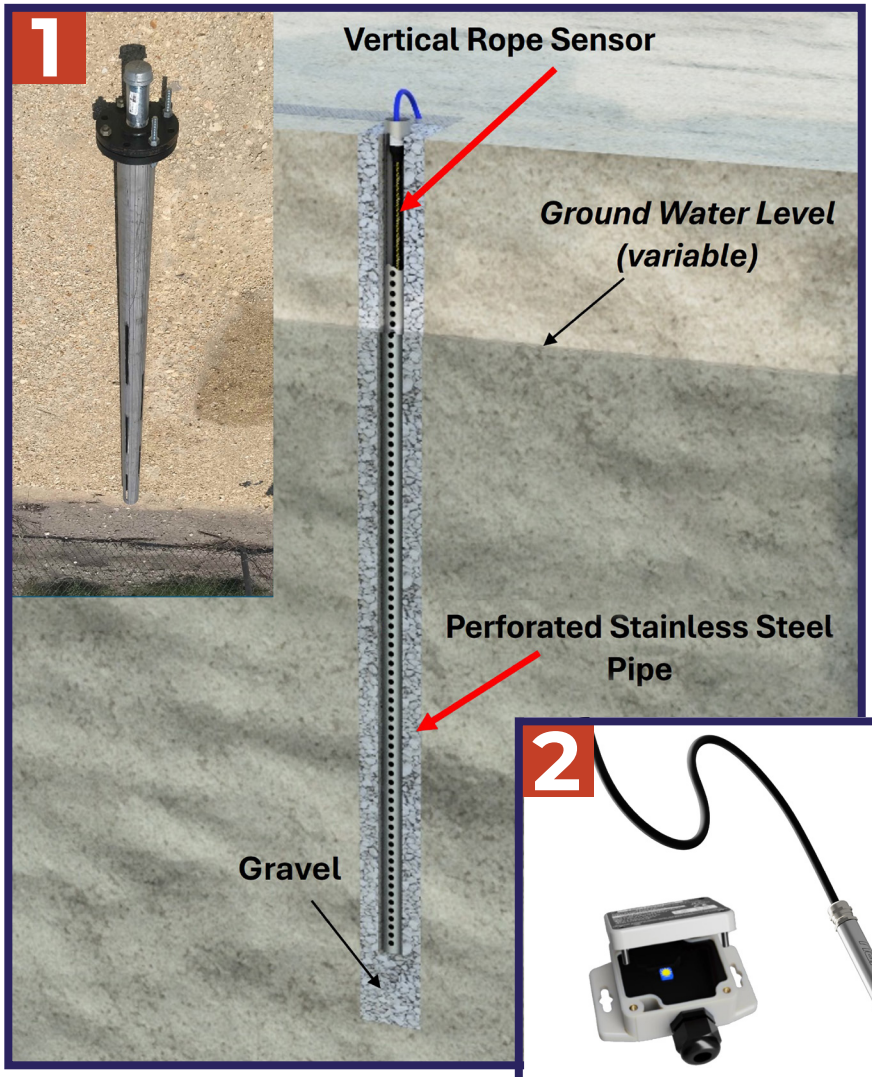
Pipeline leak detection is vital for industries managing hydrocarbon liquid transportation systems. With growing regulatory oversight and aging infrastructure, innovative solutions are needed to prevent environmental damage and enhance operational safety. Naftosense provides advanced leak detection technologies addressing these challenges effectively. This white page explores Naftosense's solutions, their applications, features, and benefits, with a comparison to complementary systems like Lindsay SentraLink LD.

WORKING PRINCIPLE

1 **Selective polymer materials:** The polymer must have a high affinity for the target chemical species.

2 **Absorption mechanism:** The polymer absorbs the target compound, leading to physical changes such as expansion, viscosity alteration, or dielectric property modifications.

3 **Signal transmission:** Changes in the polymer properties are converted into detectable signals through optical, electrical, or mechanical means. The most common sensing technique involves measuring variations in the material's electrical properties, such as resistance or capacitance.



APPLICATIONS OF POLYMER ABSORPTION SENSORS

Polymer absorption sensors are particularly valuable in detecting leaks in oil and gas infrastructure due to their high sensitivity, rapid response, and adaptability to various environments.

Pipelines serve as the critical arteries of the oil and gas transportation network, and their integrity is paramount to avoid severe economic and environmental damage. To safeguard against leaks, polymer absorption sensors have been effectively utilised along pipeline routes, including block valves and pig launchers, to provide continuous surveillance for hydrocarbon leaks. These sensors are sensitive enough to detect even the smallest of leaks, offering early warnings that empower operators to address potential issues swiftly, preventing them from escalating into significant hazards.

Similarly, storage tanks, which are susceptible to leaks caused by structural degradation, corrosion, or mechanical failures, are monitored for safety. By placing polymer absorption sensors below or around these tanks, it's possible to detect vapour or liquid leaks early on, averting substantial spills. This technology is especially beneficial for

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monitoring hard-to-inspect tanks, such as underground storage tanks or those with floating roofs.
The offshore oil and gas industry, with its platforms and subsea pipelines, faces the unique challenge of operating in harsh marine environments where leak detection is both critical and difficult. Polymer-based sensors, which are designed to withstand extreme conditions, are deployed to monitor these structures, capable of detecting oil spills in real time. Their durability and low maintenance requirements make them well-suited for the demanding conditions of deep-sea environments.

Refineries and chemical processing plants, which deal with a variety of hydrocarbons and hazardous materials, also rely on these sensors. Integrated into process monitoring systems, polymer absorption sensors can identify leaks in pipelines, valves, and storage tanks, providing immediate data that is crucial for preventing accidents and enhancing overall plant safety.

APPLICATIONS FOR NEW FUELS

As the world shifts towards low-carbon fuels, ethanol and methanol have become popular as cleaner alternatives to traditional fossil fuels. Polymer absorption sensors have proven effective in detecting leaks of these alcohol-based fuels within storage and transportation systems, ensuring their safe management and mitigating the risk of environmental contamination. The technology is also capable of monitoring other biofuels, including biodiesel, bio-jet fuel (also known as SAF or BAF), and green gasoline.

The emerging field of liquid organic hydrogen carriers (LOHC) represents a novel approach to hydrogen storage and transportation. Ensuring that LOHCs are handled without leaks is crucial for maintaining system efficiency and safety. Polymer-based sensors excel in detecting LOHC leaks by pinpointing specific hydrocarbons and chemical changes, which allows for prompt corrective measures. Their integration into hydrogen-based energy systems is a step forward in enhancing the reliability and safety of sustainable energy solutions.

Complementing Naftosense: Lindsay SentraLink LD

Naftosense's hardware pairs effectively with Lindsay SentraLink LD for comprehensive monitoring:

- **Real-Time Visibility:** Web-based platform for 24/7 dashboard monitoring.
- **Remote Accessibility:** Cellular or satellite communication for ALL remote locations.
- **Self-Powered:** Battery powered for a complete off the grid leak detection system.
- **User-Friendly:** Elecsys Connect has factory developed leak detection dashboards with remote configuration. Email and text alerts for instant notification of leak alarms.
- **Applications:** Pipelines, remote locations, tank farms, refineries, and produced water sites.

Applications and Benefits

Naftosense and Lindsay technologies ensure a robust, complete, hydrocarbon leak detection system for your critical applications:

- **Pipeline Monitoring:** Early detection in remote and sensitive areas.
- **Refineries and Tank Farms:** Reliable hydrocarbon alarms to reduce risks in containment berms, water collection systems, floating tank roofs, lift pumps, block valves, loading terminals, and other areas sensitive to leaks.
- **Environmental Safety:** Early notification of small leaks (~1oz of product) mitigates spill impact through rapid awareness allowing appropriate site response.

Conclusion

Naftosense's solutions meet the needs of liquid pipeline industries with reliability and adaptability. Complementary systems like Lindsay SentraLink LD enhance monitoring, creating a comprehensive framework for protecting infrastructure and the environment.

01 Diagram illustrating absorption software functionality, refer to labeling for key components

02 Polymer Absorption Sensor

03 The Lindsay SentraLink LD system