

Floating Roof Tank Monitoring with WirelessHART Technology – Solution Sheet

Results

- Early leak detection and notification of failure conditions
- Public and environmental protection
- Cost effective in-service installation

Application

Aboveground Storage Tank (AST) floating roof monitoring

Customer

Petroleum Storage Facility Operators

Application Characteristics

Monitoring ASTs for failure conditions that may lead to events such as a sunken floating roof, product or water on deck, stuck seals, and others.

Challenge

The consequences of AST floating roof failure can be significant, which, in rare cases, can even lead to a full surface fire and subsequent boil-over. Timely detection of failure conditions allows operators to implement early corrective action.

Unusual deck and ladder inclination or vibration across the floating roof indicates that abnormal operation may lead to an accident. The presence of hydrocarbons and excessive accumulation of water on deck is an accident in progress.

Floating roof movement makes deck placement of wired monitoring devices impractical and expensive in comparison to wireless battery-operated ones. The cost of planning and installing electrical and singalong cable around existing AST infrastructure can be substantial.

Devices that monitor tank activity typically face harsh environmental conditions, including extreme temperatures, intense UV radiation, precipitation, and high winds.

Syscor's Polymer Absorption Sensor and WirelessHART technology was developed in close cooperation with the petroleum industry



Syscor's PCU-X11 Inclinator and HCDW sensor probe within the magnetically mounted Floating Roof Mounting Bracket

Solution

Syscor's Intrinsically Safe FR-Tracker™ 2.0 monitoring system is completely wireless and deployable on in-service AST floating roofs. Installation requires no hot or cold work. All Syscor devices have a battery life of 10+ years based on a sampling rate of once per minute.

Deck Inclination & Vibration: The Inclinometer contains a high accuracy (0.1°), dual-axis digital inclinometer sensor. It is recommended that at least three redundant Inclinometers be installed on the deck to detect unusual inclination and vibration events. Each deck Inclinometer requires a Floating Roof Mounting Bracket for installation. Strong magnets secure the bracket to the deck.

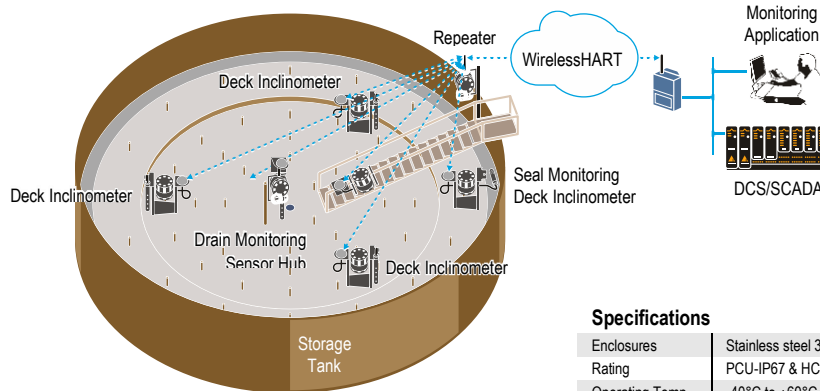
Ladder Inclination & Vibration: An Inclinometer can also be installed on the deck's ladder railing to detect unusual inclination and vibration events.

Deck Hydrocarbon Detection & Water Level Accumulation: The Hydrocarbon Detector with Water Level (HCDW) sensor probe detects hydrocarbons (butane and heavier) and measures water accumulation. Upon contact with hydrocarbons, the HCDW's Polymer Absorption (PA) sensor swell resulting in a change to baseline resistance change is greater than an applied threshold, the FR-Tracker 2.0 system alerts the operator. The HCDW also contains 5 inches of resistive sensors in 1/2 inch increments that only detect conductive liquids (e.g. water).

Sticking Seals: For optimal detection, Hydrocarbon Detector (HCD) sensor probes can be mounted directly to the secondary seal. Each HCD contains micro-electro-mechanical sensors (MEMS) that can detect vibration events caused by sticking seals. HCDs must be wired to an Inclinometer and position on the floating roof edge with magnets. The sensor probe also contains PA sensor to detect hydrocarbons, butane and heavier, if failure of the floating roof allows product to flow onto the deck.

Drain Monitoring: An HCDW detect hydrocarbons and measures water accumulation near the deck's drain. The sensor probe must be wired and mounted directly to then Sensor Hub, which must be installed on a deck leg near the drain.

Repeater: The Repeater must be installed on the landing platform or tank rim to create a wireless network pathway between the tank interior and the rest of the site.



Specifications

Enclosures	Stainless steel 316
Rating	PCU-IP67 & HCD/W-IP68; NEMA 4X
Operating Temp.	-40°C to +60°C [-40°F to +140°F]

About WirelessHART

WirelessHART is a communication standard (IEC 62591; 2.5 GHz DSSS) adopted by the petroleum industry. It is a secure, scalable, and self-forming mesh network protocol. Device data interconnects with site DCS/SCADA through a WirelessHART Gateway. Configuration of mesh communication paths is not required. WirelessHART security is robust consisting of industry standard techniques. WirelessHART devices add redundancy to existing operations and monitor conditions where wired alternatives were not previously feasible.

Components



PCU-X11 Inclinerometer (Deck)



PCU-X11 Inclinerometer (Ladder)



PCU-X11 Inclinerometer w. HCDW (Hydrocarbon Detection & Water Level Accumulation)



PCU-X11 Inclinerometer w. HCD & Accelerometer (Sticking Seals)



PCU-X01 Sensor Hub w. HCDW (Drain Monitoring)



PCU-X00 Repeater w. Repeater Antenna Kit