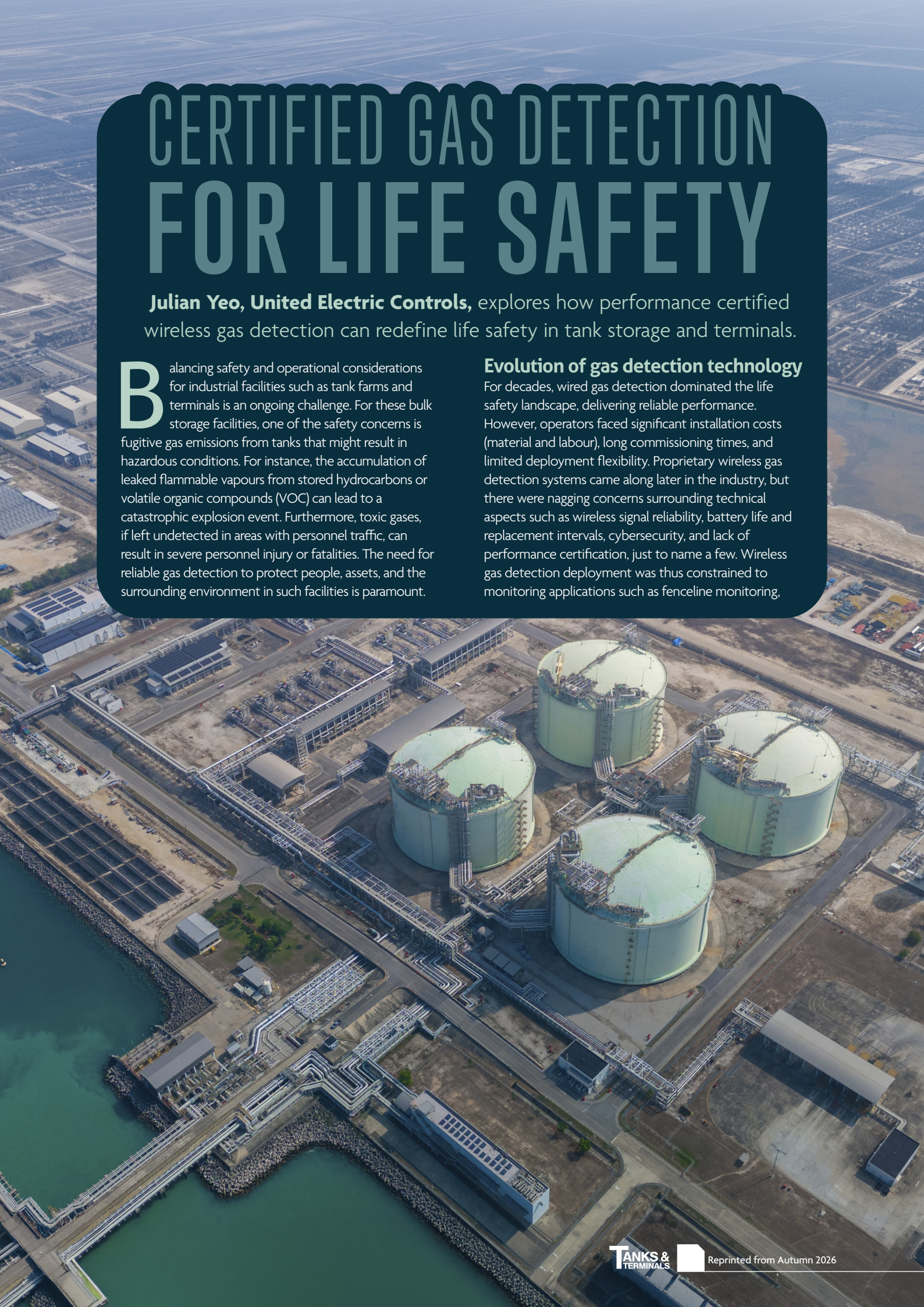
CERTIFIED GAS DETECTION FOR LIFE SAFETY

Julian Yeo, United Electric Controls, explores how performance certified wireless gas detection can redefine life safety in tank storage and terminals.

Balancing safety and operational considerations for industrial facilities such as tank farms and terminals is an ongoing challenge. For these bulk storage facilities, one of the safety concerns is fugitive gas emissions from tanks that might result in hazardous conditions. For instance, the accumulation of leaked flammable vapours from stored hydrocarbons or volatile organic compounds (VOC) can lead to a catastrophic explosion event. Furthermore, toxic gases, if left undetected in areas with personnel traffic, can result in severe personnel injury or fatalities. The need for reliable gas detection to protect people, assets, and the surrounding environment in such facilities is paramount.

Evolution of gas detection technology

For decades, wired gas detection dominated the life safety landscape, delivering reliable performance. However, operators faced significant installation costs (material and labour), long commissioning times, and limited deployment flexibility. Proprietary wireless gas detection systems came along later in the industry, but there were nagging concerns surrounding technical aspects such as wireless signal reliability, battery life and replacement intervals, cybersecurity, and lack of performance certification, just to name a few. Wireless gas detection deployment was thus constrained to monitoring applications such as fenceline monitoring,



temporary work areas (for shutdowns and turnarounds), or remote site monitoring. It was not accepted as part of a life safety strategy where a wireless gas detector becomes a direct input to the plant's fire and gas system, triggering alarms that support emergency response decisions.

Fortunately, wireless gas detection technology has advanced tremendously in the past decade. Improvements in sensor technology, battery management, development of open industrial wireless communication technology (e.g., WirelessHART), and enhanced cybersecurity measures have made modern wireless detectors just as reliable and robust as their wired counterparts.

One major turning point for the industry is the recent availability of wireless gas detectors that are certified to the IEC/EN 60079-29-1 'Performance requirements of detectors for flammable gases'.

IEC/EN 60079-29-1 certification

The IEC/EN 60079-29-1 certification is a rigorous process involving third-party testing of performance, environmental resilience, fault detection, diagnostics, and software integrity for combustible gas detectors. Achieving this certification validates a gas detector's performance.

Key certification requirements for wireless gas detectors include:

- Verified gas detection accuracy.
- Response consistency across temperature, humidity, and pressure.
- Electromagnetic compatibility (EMC) immunity.
- Fault reporting for sensor failures, memory errors, or diagnostic anomalies.
- Data integrity validation through cyclic redundancy check (CRC) and packet tracking.
- Reliable wireless transmission without corruption.
- Compliance with regulatory and insurance standards.

This gold standard for performance certification has traditionally been associated with wired gas detectors but it has now been achieved with wireless gas detectors such as United Electric Controls' Vanguard WirelessHART Gas Detector.

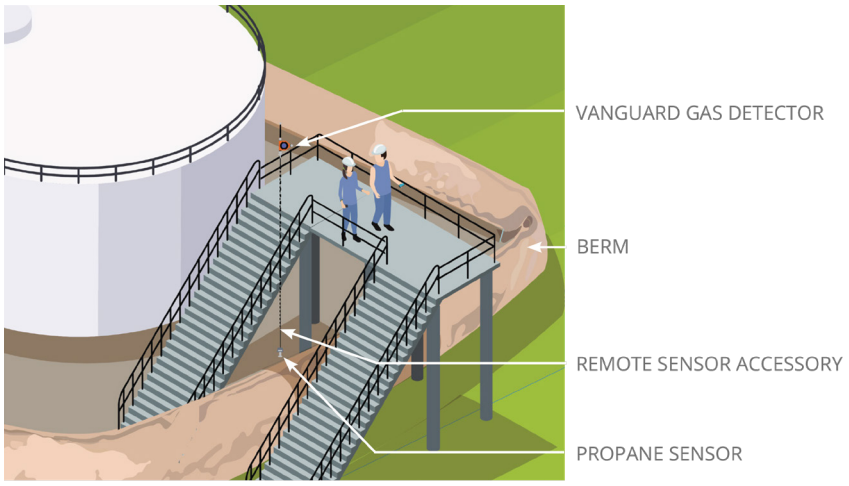


Figure 1. Illustration of the Wireless Vanguard Gas Detector deployed around a propane gas tank.

Wireless gas detection technology can now satisfy life safety requirements conventionally reserved for wired systems, and can now be deployed for life safety applications such as:

- Alarm and shutdown systems.
- Emergency ventilation activation.
- Automated evacuation signalling.
- External emergency response notifications.

Applications for wireless gas detectors

Certified wireless gas detectors can be especially useful in locations where there is a risk of combustible gas accumulation, and wired installation is hard to reach, costly, or disruptive to facility operations. Many of these storage facilities were designed decades ago, so detection coverage within the facility is porous with numerous blind spots. Deploying certified wireless gas detectors is an efficient and scalable way to augment reliable coverage for personnel protection. Relevant terminal applications include:

- Loading racks for truck, rail, or marine transfer.
- Pump skids and seal areas.
- Tank bunds and dike areas.
- Valve manifolds and product transfer points.
- Vapour recovery units.
- Temporary maintenance zones.
- Brownfield tank storage expansions.
- Perimeter or remote sections of the facility.

Case study

Challenge

An end user wanted a more efficient way to scale its gas detection coverage for its propane tank farms. It was using wired detectors in previous installations but it was a very costly operation to lay cables and conduit wherever and whenever they needed a monitoring point. There were other logistical challenges as well. For instance, since propane gas is heavier than air, propane sensors must be placed at the bottom of the berms surrounding their tanks. Once a month, due to the user's plant requirements, maintenance checks must be performed on the gas detectors. A worker must be sent down into each berm to check each gas detector. With approximately 50 tanks on-site and multiple gas detectors per tank, the end user would have to climb down into each berm to check its operation. Some berms are split into multiple sections and would require climbing in and out several times to check each gas detector.

Solution

The end user decided to deploy WirelessHART gas detectors across the propane tanks farms to reduce the total cost of installation as well as time to install. They already had a WirelessHART network established within the facility, so proceeding with the Vanguard gas detector made it easy to scale detection coverage. This technology is also a performance certified wireless gas

detector, bolstering user confidence in the reliability of sensor performance as well as signal integrity.

Such sensor reliability was essential from a life safety point of view to ensure that the operators could accurately verify if there was were leaks in the berms before sending someone in.

In addition, to improve maintenance efficiency and network reliability, the user deployed a remote sensor accessory to the wireless gas detector. The remote sensor accessory is an intrinsically safe cable that allows the detector enclosure to be placed about 3 m away from the area where the leaks will be detected. The end user extended the sensor to the bottom of their berms and installed the detector display at eye level, next to the bridge crossing each berm. This facilitated maintenance workers to check each Vanguard without lowering themselves into each berm, improving safety and speed of the maintenance check.

Attaching the gas detector enclosure to the bridge raised the antennas to be above the berms. Should the gas detectors be deployed close to ground level within the berm, there would be limited connectivity to the WirelessHART mesh network. The raised detectors now have direct radio line of sight to the mesh network and gateway, saving the end user from purchasing and installing repeaters to transmit the network signal down into each berm.

Deployment considerations

The performance certification is but a starting point for deploying reliable wireless gas detection in life safety applications. A wireless detector should only be used for life safety when the full application is properly engineered, documented, installed, and maintained.

Key considerations include:

- Is the detector certified to IEC 60079-29-1 for the intended gas detection application?
- Has the wireless network been designed for reliability, coverage, and redundancy?
- How are alarms routed, acknowledged, and escalated?
- Are battery status and device diagnostics integrated into maintenance workflows?
- Are cybersecurity protections in place, including authentication, encryption, access control, and firmware management?
- Has the application been reviewed through management of change?
- Is the detector being used for warning and alarm purposes, or as part of a higher-level safety function requiring additional assessment?

Wireless gas detection should not be adopted for life safety simply because it is easier to install. It should be adopted where it improves risk reduction, meets recognised performance requirements, and is supported by proper engineering, cybersecurity, diagnostics, and maintenance practices. The availability of IEC/EN 60079-29-1 certified wireless gas detectors gives tank terminal operators an efficient and scalable method to enhance life safety coverage where traditional wired systems may be difficult to deploy. T&T