Ultrasonic Detection of Gas Leaks in Ammonia Plant Extends Safety Profile for Major Fertilizer Manufacturer

RESULTS

- Early warning safety solution for potential gas leaks
- Increased safety for personnel and property
- Reduced need for dangerous, high tank maintenance
- Factory calibration for life eliminates up to 64 hours of maintenance time per year per unit, a cost estimated at $50,000 for 10 units

Ultrasonic gas leak detection improves safety for a fertilizer manufacturer in its challenging urea production environment.

APPLICATION

Fertilizer production with urea and ammonia plant.

CUSTOMER

A major international fertilizer production facility in Asia Pacific.

CHALLENGE

A world-class fertilizer manufacturer in Asia Pacific employs closed manufacturing processes, using natural gas and fresh air as input materials and producing urea and ammonia as output products. The plant has its own power supply unit, which makes the plant's operation uninterruptible and independent from the national power network supply. The plant has four main units: ammonia unit, urea unit, utility unit and product unit, among other functional units.The engineering staff runs the plant safely and efficiently, and the plant reached 10 million tons of urea production in July 2017.

Like most plants in its industry, this facility had basic fire and gas detection capabilities; however, there were vulnerabilities. The process produces a large quantity of light gases in the process flow such as hydrogen, carbon monoxide, and carbon dioxide, all of which tend to rise and disperse quickly. Therefore, the application of point gas detection is typically not very useful because of the relatively slow response time of traditional gas detectors. Hydrogen gas, in particular, is highly flammable and will burn in air at a very wide range of concentrations between 4 percent and 75 percent by volume. If a small leak of hydrogen occurred in the pipe at high temperature, it could cause a flame.

In the urea unit, the facility had a 40-meter tank containing hydrogen. Due to the flange connection of the tank, there was a risk of leakage, which traditional point gas detectors that rely on zone coverage could not adequately detect. Maintenance personnel were required to climb the tank to check on its integrity every two to three days, a process requiring a 30-minute climb each way, incurring huge operational costs to the plant.

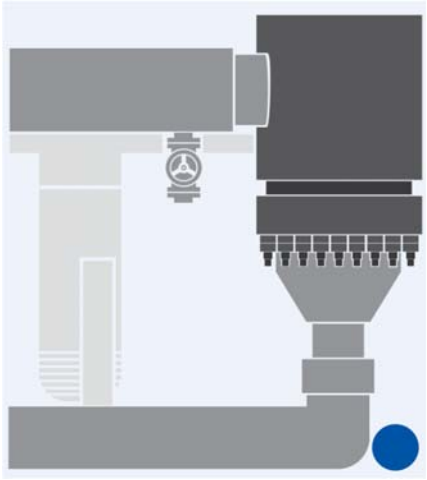
EMERSON

The company was beginning a search for an improved gas detection method when they experienced a small hydrogen fire from a leak in the pipeline in the urea unit. The mishap spurred immediate investigation of a better way to provide early warning of gas leaks in these challenging locations.

SOLUTION

Emerson experts had advised the company that the Incus ultrasonic gas leak detection system could be used to provide early detection of gas leaks under pressure. When the fertilizer company investigated further, it learned that ultrasonic gas leak detection could be used in its application because the high pressure gases and leak size would cause an ultrasonic noise. The ultrasonic noise makes it detectable by the Incus, which "hears" the leak in the ultrasonic range rather than perceiving a gas cloud, such as is done by traditional gas detection systems. The ultrasonic gas leak detector gave the company a high level of safety assurance. Because of its failsafe operation, it is always listening, even during self-test mode, with no dead periods for unrevealed failures. It was also estimated that the coverage radius of the ultrasonic detector would be within 10 meters, which was appropriate for the installation requirements. The best approach for calculating coverage area is to decide on the minimum leak rate to be detected and work from the maximum and minimum hole sizes to determine the sound pressure level above the ultrasonic background noise.

In addition to coverage area and ultrasonic detection, the Incus is also a highly rugged device as required in this application. It is not affected by water due to its piezo-ceramic sensor, is highly stable, and is made of corrosion-resistant stainless steel that resists the ambient air in an urea plant, which is very corrosive. The rugged design of the Incus eliminates the need for regular spare replacements and is estimated to decrease maintenance requirements by 70 percent over traditional safety detection devices. In addition, because the Incus is factory calibrated for life, it eliminates up to 64 man hours per year customarily required for on-site calibration of each unit, a function that is often performed in dangerous or challenging environments.



Ultrasonic gas leak detectors are placed near reactors, a common source of pressurized gas releases.

RESOURCES

Incus Ultrasonic Gas Leak Detector

Emerson.com/Incus

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Twitter.com/Rosemount_News
Facebook.com/Rosemount
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