# Air Cooled Heat Exchangers

Ultrasonic gas leak detection (UGLD) is capable of offering an enhanced mechanism for detecting pressurised gas leaks in applications where more traditional technologies fail to perform effectively due to high natural ventilation rates or excessive vibration. Detection methods such as point and open path IR absorption, catalytic beads and EC cells are dependent on large localised gas clouds forming in order to detect a gas leak. Such gas clouds form well in enclosed areas however, in exposed or elevated areas subject to strong winds leaking gas dilutes quickly with the leak potentially going undetected for long periods of time.

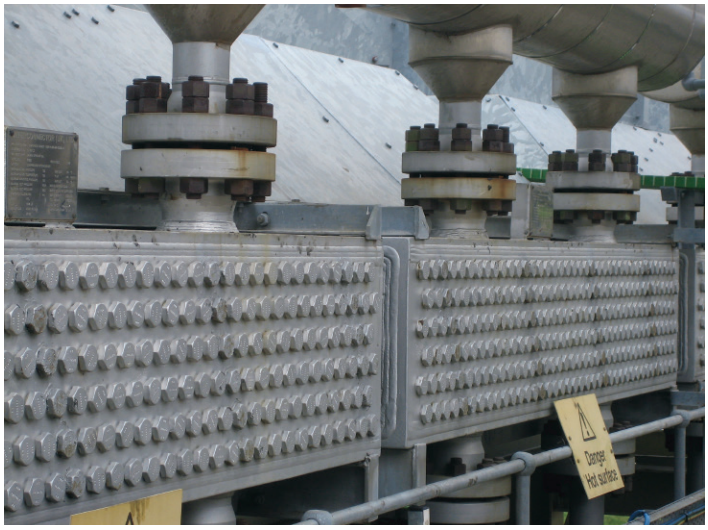
## Application

An application where UGLD's offer the most suitable technology for detection is air cooled heat exchangers. These pieces of process have hundreds of potential leak points and are normally located in elevated positions operating with high pressures (up to 350 bar) and temperature.

The increased elevations mean gas leaks are difficult to detect due to the rapid dilution of leaking gas caused by the increased air flow present. Due to this speedy dilution, point and line of sight detectors rarely detect gas in concentrations which are sufficient to trigger alarms. In addition line of sight detectors may suffer from persistent issues with misalignment due to high vibrations caused by the fans themselves. It is fair to say gas detection in fin fan regions can be challenging for most technologies however a robust solution is offered with ultrasonic gas leak detectors.

**Figure 1 – Industrial Air Cooled Heat Exchanger Block** (above fans)

**Figure 2 – Industrial Air Cooled Heat Exchangers Block** (above fans)

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## Mapping Services

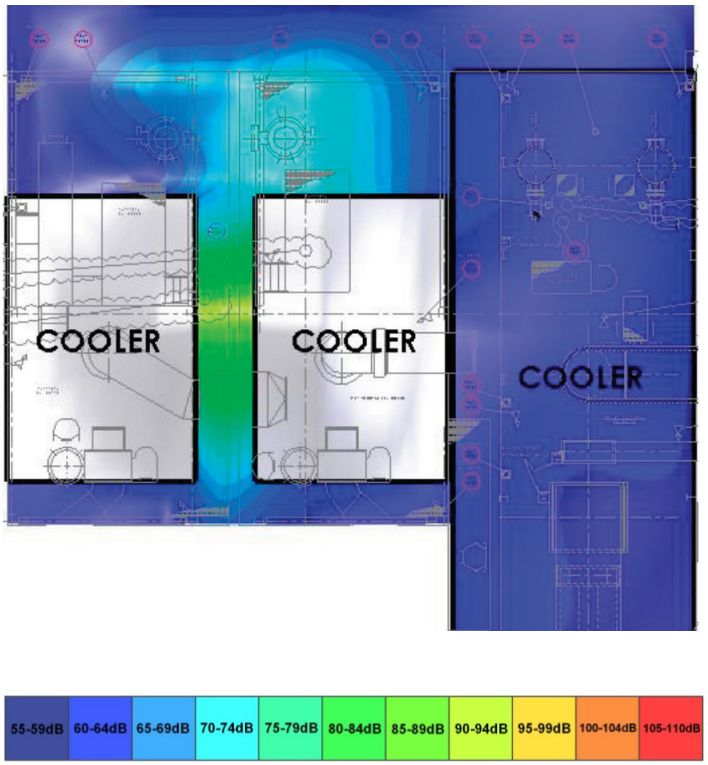
Once a client has accepted ultrasonic gas leak detectors may offer detection benefits for their facility a survey is required. The survey makes recommendations to establish detector positioning, sensing range, minimum and maximum leak rates detectable, alarm levels and recommended alarm delay settings. The single most important factor for detection is that there must be a difference (delta) between the sound level of a potential gas leak and the normal plant operation for UGLD's to work.

Ultrasonic noise can be generated in a number of ways that may lead to inappropriate positioning or alarm condition such as; mechanical noise, process generated ultrasound, electrical equipment. The main reason for undertaking a survey is to measure the ultrasound in the operational plant, quite simply because we cannot hear what the detector hears. Where new build installations are considering the use of UGLD's, assumptions of background sound levels are made based on a wealth of experience from live plant studies.

Ultrasound mapping is undertaken using a calibrated device that measures the operational plant sound level in the frequency range of the detector. A scaled plot of the target area is used and divided into a 5 meter grid broadly speaking North-South, East-West. At each intersection the sound level is measured and a polar plot constructed which then can be amalgamated into an overall background sound plot for the target area, see figure 3. The detection area is then matched to the plant process and can be verified on commissioning.

The UK Health and Safety Executive (HSE) classifications hydrocarbon gas leaks as follows;

**Figure 3 – Sound Profile Plot**




*Ultrasonic Background Scale.*

| Leak Category | Leak rate (Kg/s) | Duration |
|---|---|---|
| Minor | < 0.1 | 2 minutes |
| Significant | 0.1 to 1 | 2 to 5 minutes |
| Major | > 1 | > 5 minutes (> 300 Kg release) |

The categories stated above are based upon current general practice and in most cases UGLD are specified to detect a leak rate of 0.1 Kg/s. The main challenge with specifying a single leak rate is that not all 0.1 Kg/s leak rates are detectable by UGLD.

Rather than specifying a single leak rate, a refined technique is to find a suitable detection radius (meters) that ensures the desired leak rate is detected while maximizing the range of leak diameters (gas leaks) to be covered. The images below are presented for illustrative purposes.

Figure 4 stretches the detection range to the maximum, but only a tiny window of gas leaks is detectable. Figure 5 shows a significantly increased range of detectable leaks but sacrifices detection range. For many installations general area coverage (maximum range) is not appropriate, it is important to tailor the range to the target risk.

**Figure 4 – Coverage Maximizing Detection Range**

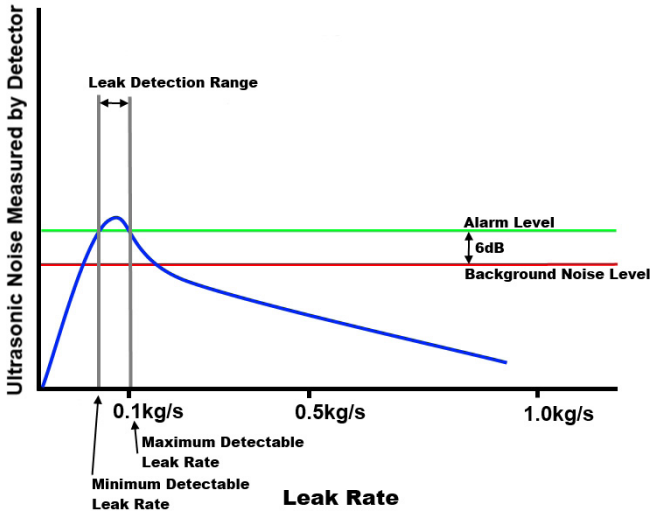
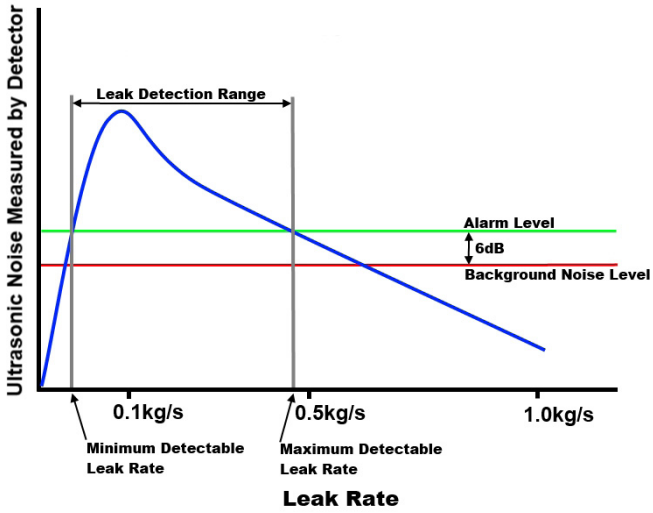



**Figure 5 – Coverage Maximizing Detectable Leak Rates**




## Detector Placement/Coverage

**Figure 6 – GDU-Incus Installation**

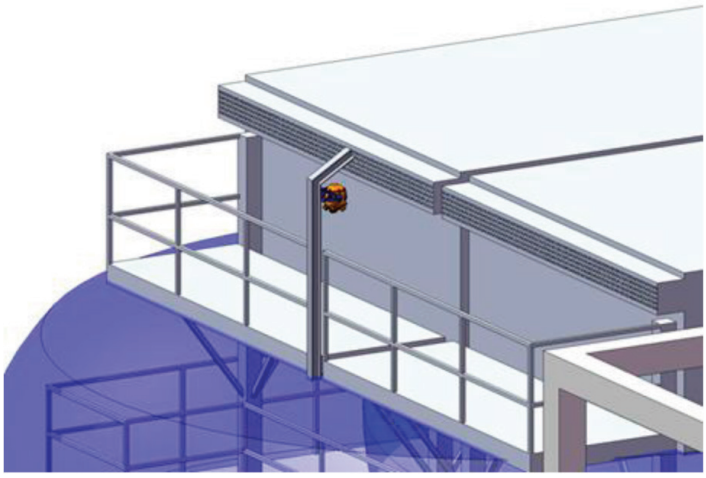


**Figure 7 – GDU-Incus Installation and Coverage**

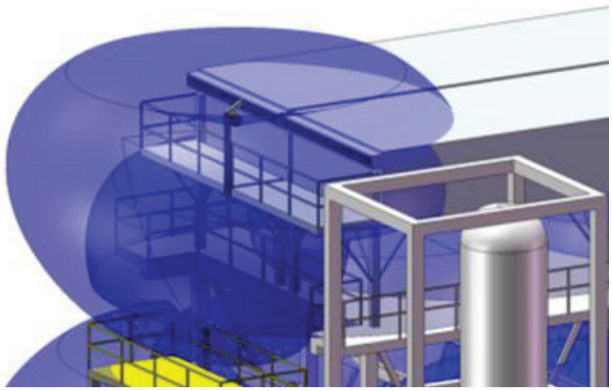
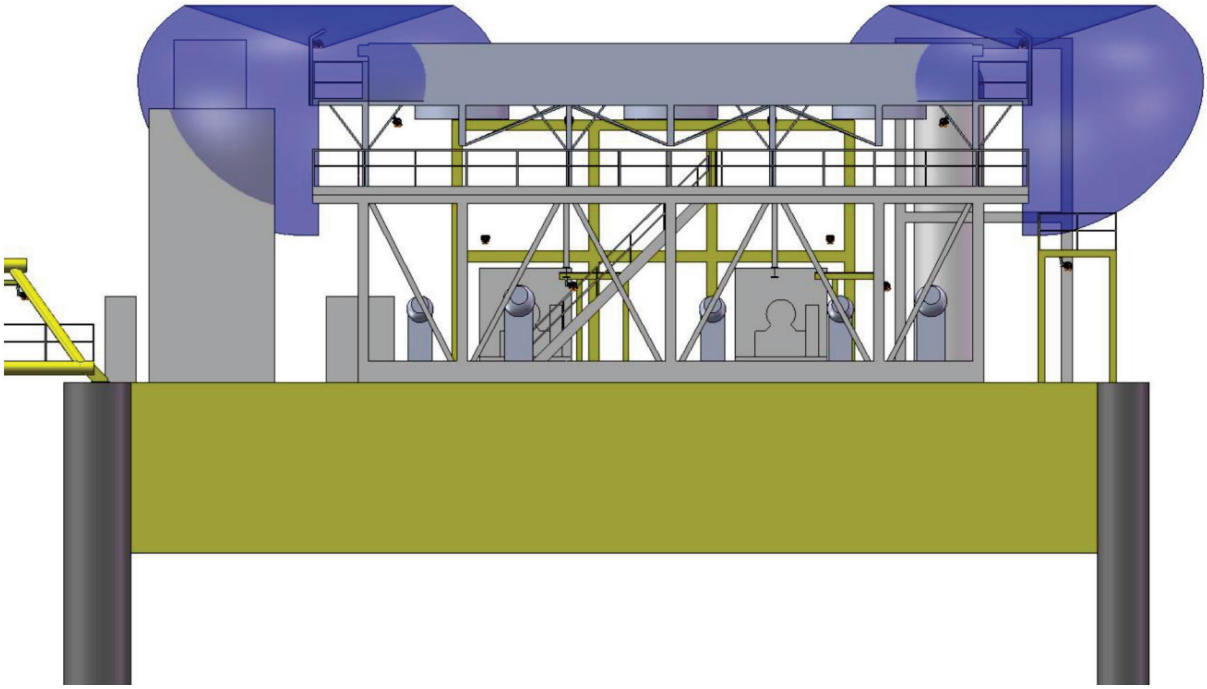


**Figure 8 – GDU-Incus Full Coverage**



## Summary

The GDU-Incus is an ultrasonic gas leak detector for detecting airborne ultrasound generated from pressurized gas leaks. It has an inherent capability to respond to pressurized gas leaks no matter what the ambient air velocity, directionality or gas concentration. The GDU-Incus allows for gas leaks to be detected in the most extreme weather conditions with no loss of leak detection capability. The environment traditional gas detectors are exposed to in fin fan regions poses no problem for the GDU-Incus and you can be confident the GDU-Incus will provide your installation with consistent gas detection cover.

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