# Fixed Gas Detectors – Total Speed Of Response

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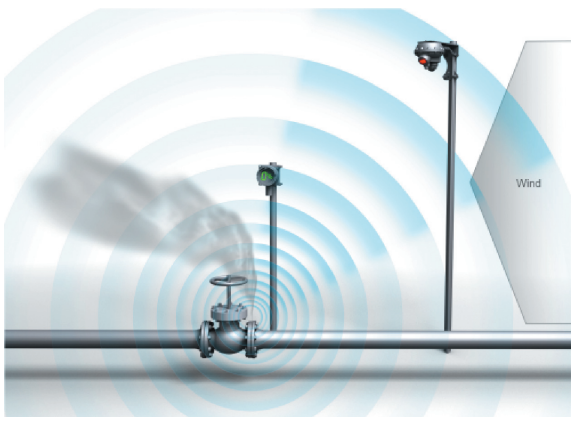
**It is essential to provide a true picture of the actual response time of a gas detection system to understand the advantages of ultrasonic gas leak detection.**

**Ultrasonic gas leak detection technology works by listening for ultrasound emitted from pressurized gas leaks. The detectors do not have to wait until the gas concentration has accumulated to a dangerous gas cloud. This significantly reduces the response time.**

Conventional point gas detectors can be based on at least two different principles. 1) Infrared (IR) sensors provide a measure for the gas concentration when gas gets absorbed by the infrared source. 2) Catalytic sensors provide a gas concentration based on a chemical reaction on the catalytic sensor element.




*Whereas the point detector needs to be in contact with the gas to detect the leak, the ultrasonic detector immediately responds to the leak by picking up the ultrasonic leak noise.*

## Conventional Gas Detectors – and response time

Historically, when referring to the response time for conventional gas detectors, it is often measured in seconds (using the term T90). However, this response time is based on gas being injected directly into the sensor head, which is not likely to be the case in an outdoor windy installation where the gas leak will be several meters away from the gas detector.

Therefore, when it comes to the total speed response time for a conventional gas detection system, it is important to also include the factor that the gas needs to accumulate and get from the leak point to the detector. Total speed of response for conventional gas detectors should therefore be calculated like this:

$$T_{total} = T_{detector} + T_{gas}$$

'$T_{detector}$' can also be referred to as T90 (or T50) and it simply tells how long time it takes for the gas detector to reach 90% (or 50%) of the correct reading when a well-defined gas concentration is injected directly into the sensor-head of the detector. $T_{detector}$ is normally 10-20 seconds[1].

'$T_{gas}$' tells how long time it takes for a certain gas concentration to travel from the leak spot to the detector. This parameter is not very often taken into consideration simply because it is very difficult to predict it due to changing wind directions and fast dilution of the gas cloud. $T_{gas}$ is typically measured in minutes or hours.

In a safety system with gas detectors it is inadequate to use $T_{detector}$. Instead, you need to know the total speed of response ($T_{total}$), which is the only parameter that provides a true picture of the actual response time of the gas detection system.

## Ultrasonic gas leak detectors - and response time

*An ultrasonic gas leak detector installed in a gas plant in Denmark*

Ultrasonic gas leak detectors, such as the Gassonic Observer, work by picking up the high-frequency ultrasonic leak noise, which is generated by all pressurized gas leaks. The performance standard is set according to which mass flow rate (leak rate) that needs to be detected. The main advantage of an ultrasonic gas detector compared to a conventional gas detector, is that it does not need to wait for a gas concentration to accumulate and form a potentially explosive cloud before it can detect the leak.

The total speed of response for an ultrasonic gas leak detector is calculated like this:

$$T_{total} = T_{detector} + T_{ultrasound}$$

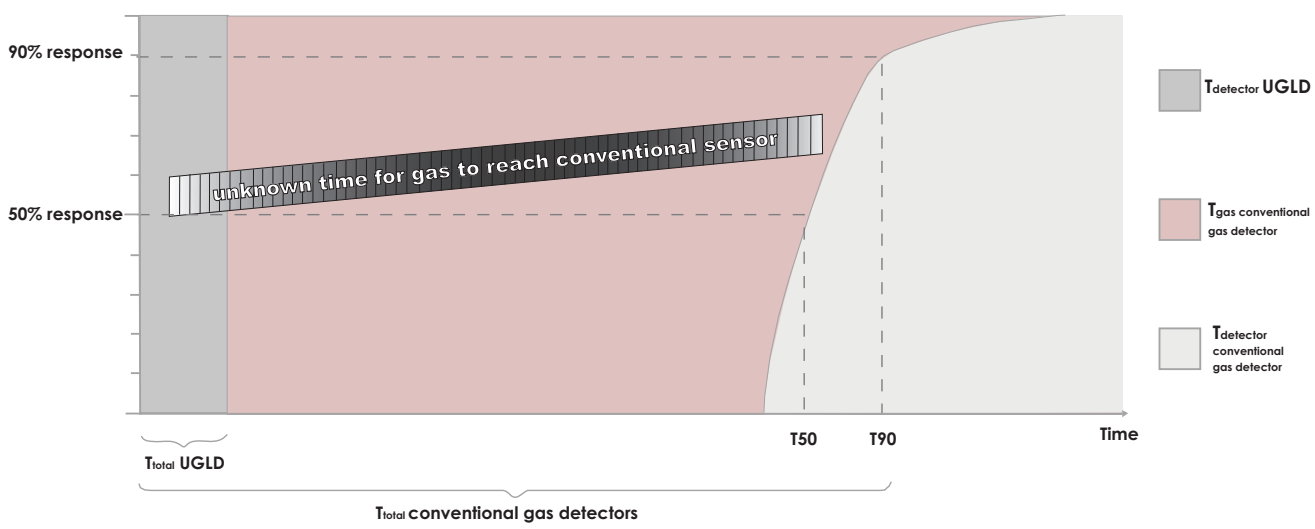
$T_{detector}$ for an ultrasonic detector will typically be equal to the alarm delay time, which is implemented in the detector to avoid nuisance alarms. The delay is typically 10-30 seconds.

$T_{ultrasound}$ is typically measured in microseconds since it is equal to the time it takes for the ultrasonic sound to travel from the leak spot to the detector. The graph below shows the $T_{total}$ for an ultrasonic gas leak detector [UGLD].

## Conclusion

When taking into consideration the speed of response to gas leaks, making ultrasonic gas leak detectors part of the plant fire and gas detection system adds an alternative or complementary layer of protection, which may increase detection efficiency while reducing the need for a high point sensor count. As the technology is based on sound propagation instead of the transport of gas molecules, detectors respond to hazards at a significantly faster rate than concentration-based sensors. The detectors are unaffected by environmental conditions like wind, leak dilution, and the direction of the leak, which indicate that they have high detection reliability. When a gas leak occurs, the ultrasound generated by the leak travels at the speed of sound from the source to the detector therefore reacting much faster to the dangerous gas leak.

**Total Speed of Response for Fixed Gas Detectors**




[1]*varies for different models and detector types (IR, catalytic, toxic)*