



**We know what it takes . . .**

### **2017-2018 Gas Detection Seminars**

## **Practicable approaches to mitigate risks from flammable and toxic gas releases . . . with CAPEX and OPEX considerations.**

The ability of the gas detection system to detect gas releases reliably and quickly is crucial for the mitigation of flammable gas explosion risks or toxic gas poisoning risks. Deciding detector placements for good detection coverage that will ensure fast alarming of gas releases is therefore a critical task for the gas detection system engineer. This task is significantly more difficult when the area to be monitored is an open space that is subjected to changes of wind speed and direction. Having to balance between risk mitigation and cost considerations further complicates this task.

This series of seminars will present how some of MSA's leading gas and flame detection technologies can help improve detection coverage for faster alarming and faster execution of other risk mitigation actions; practicably with a low cost of ownership.



**Seminar speaker:** Edwin Choo

The speaker has a Bachelor's Degree in Electrical & Electronics Engineering from the National University of Singapore and is a Certified Functional Safety Professional. He has 25 years of professional experience in Fire & Gas System solutions design and implementation, and is presently MSA's Detection Product Group Manager, Pacific Asia Region.

[www.MSAafety.com/detection](http://www.MSAafety.com/detection)

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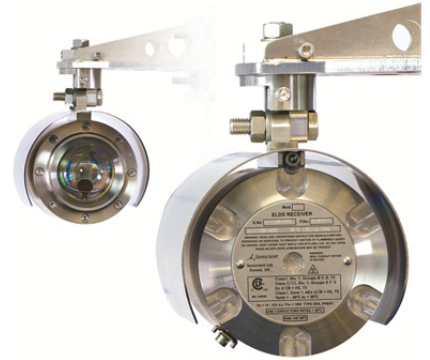
## Seminar 1:

### A method to improve the likelihood and speed of detecting dangerous natural gas releases for fast gas detection alarming

Natural gas typically contains a high percentage of methane ( $\text{CH}_4$ ) gas plus a few other hydrocarbon gases, usually in significantly smaller amounts. Depending on where it is extracted from, natural gas can also contain small amounts of carbon dioxide ( $\text{CO}_2$ ) and hydrogen sulfide ( $\text{H}_2\text{S}$ ), in which case the gas is termed sour natural gas.

With the aid of gas dispersion modeling, this seminar will illustrate how a high sensitivity ELDS™ OPGD (Measuring range: 0-1000ppm.m, 0-1LEL.m) can significantly improve the likelihood and speed of detecting flammable natural gas releases in windy open spaces . . . by measuring  $\text{CH}_4$  at lower concentrations.

The use of the ELDS™ OPGD as an alternative solution for detecting highly toxic  $\text{H}_2\text{S}$  in open spaces will also be presented; to show that this solution can produce a very high degree of detection coverage at a significantly lower cost of ownership.



Other topics that will be covered in this seminar:

- How ELDS Harmonic Fingerprinting guarantees no false alarming, even at low concentration measurements.
- How the ELDS measurement accuracy is maintained by the Harmonic Fingerprint Lock technique.
- How the ELDS safety functions are checked daily to maintain high system safety integrity.

Duration: 120 minutes.

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## Seminar 2:

### Detecting gas releases in high wind open spaces reliably and quickly by measuring the ultrasonic sound pressure level (SPL) of leaks with an intelligent UGLD

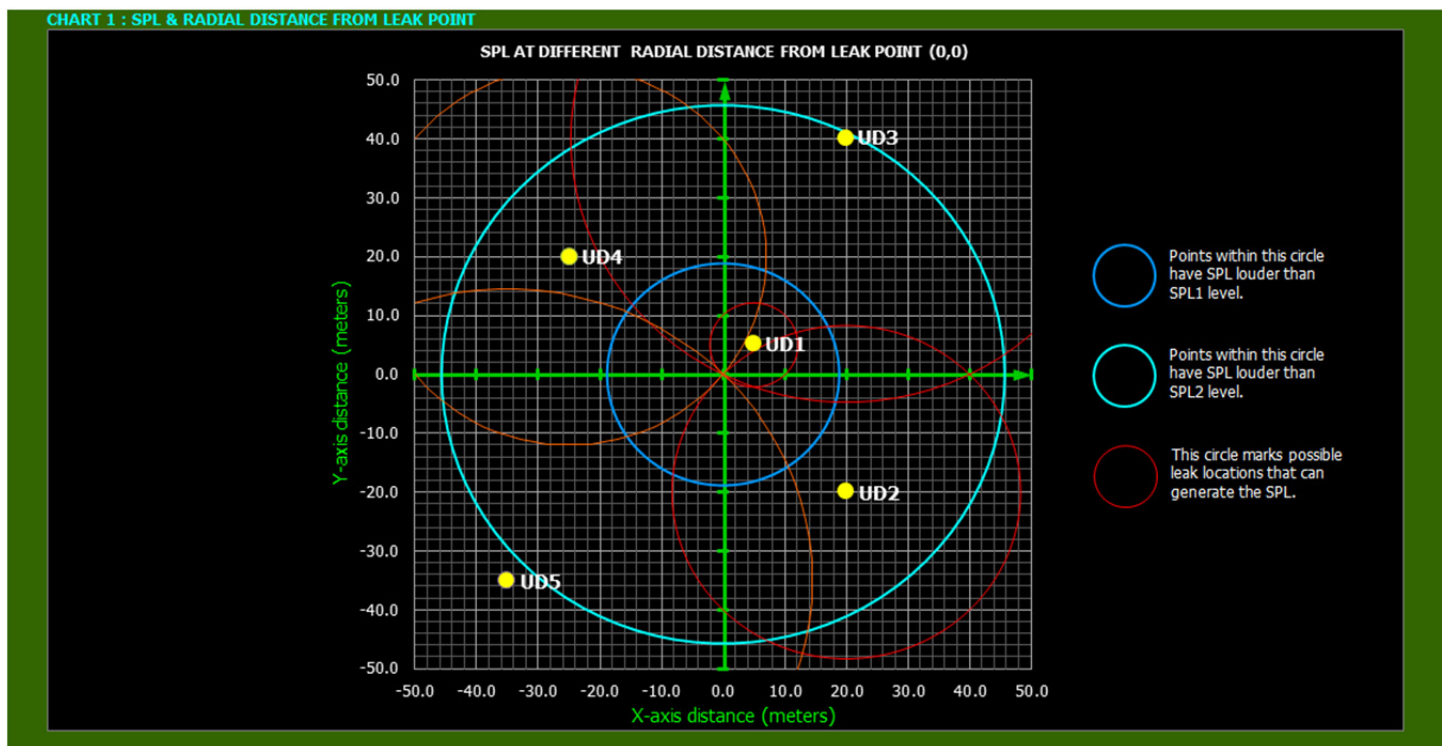
A change in wind direction can alter the dispersion path of the released gas; moving it away from the stationary gas detector. This can render the gas detection system ineffective and allow the gas release to continue for a longer period, thus multiplying the risk factor. Wind can also dilute the gas plume to such an extent that the gas concentration falls below the minimum measuring sensitivity of the gas detector; at the location of the detector. Closer to the release point, the released gas concentration will be at a significantly higher concentration.

This seminar discusses how the Ultrasonic Gas Leak Detector (UGLD) can be a very effective solution for detecting high pressure gas releases very shortly after it occurs, even in high wind open spaces. A well designed spread of the UGLD can result in very high gas detection coverage without a large quantity of conventional gas detectors. Consequently, the costs of implementation and maintenance will be very low.



The discussion will cover:

- Factors that influence and limit the performance of the UGLD.
- How the placement of a UGLD can be field tested for confirmation of detection coverage; to validate engineering design.
- How multiple UGLD units can be used together to determine the possible location of the gas release point.



Duration: 60 minutes

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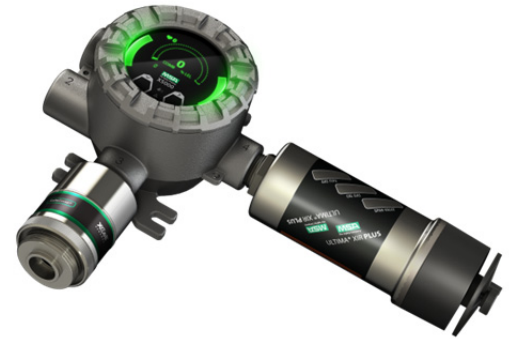


## Seminar 3:

### Using gas dispersion modeling and gas mapping to position point type gas detectors more effectively in open spaces

All point detectors measure gas concentration only when it comes into contact with the gas. Detector placement is therefore a crucial engineering task. The general rules of thumb for placing point type gas detectors that are often quoted are; 1) Place gas detectors near potential points of gas release; 2) Place gas detectors within zones of potential gas accumulation.

In practice, this guidance is often too simplistic to be truly useful to the gas detection system engineer, especially when the monitored area is outdoors where wind factors can affect gas dispersion, and when there are multiple potential points of gas release for the engineer to deal with. Further compounding the problem are factors such as source terms of release, ambient pressure and temperature, wind stability, composition of gas, height of release, direction of release, impingement, roughness of terrain, area confinement and obstructions. Gas dispersion modeling and gas mapping tools are often used to compute all these factors in aid of this design process. The ultimate aim is to quantify and position detectors for best coverage.

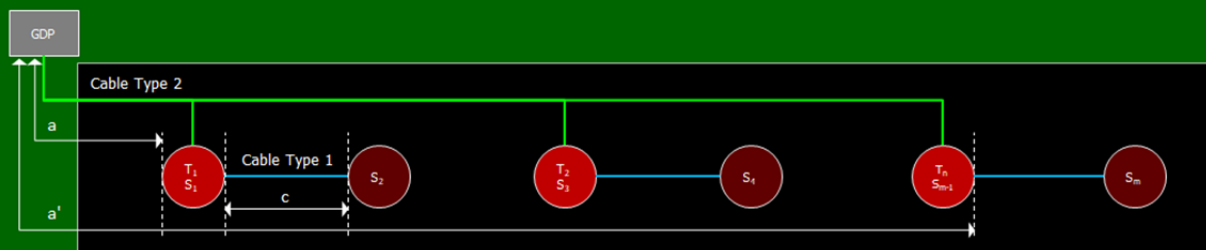


Depending on the degree of conservativeness, gas dispersion modeling and gas mapping can result in a larger number of detectors than first anticipated, for the desired detection coverage. Rationalizing detector quantity to balance between cost and coverage can be difficult.

Using worked examples the seminar will discuss and illustrate:

- Key factors that influence gas dispersion.
- Gas detection coverage and how it matters in risk assessment.
- How the dual sensor feature of the S5000 and X5000 detectors can help reduce the total cost of implementation, without sacrificing the desired detection coverage.
- How XCell sensors with TruCal features can reduce the need for detector maintenance and significantly lower total cost of ownership, without affecting system safety integrity.

**ARCHITECTURE 2 : Transmitter with integral sensor plus remote sensor, home-run cabling from transmitter only**



Parameters	Value	Unit	Remarks
Number of detection points :	100		
Number of transmitters with integral sensor, n :	50		
Number of remote sensors, m :	50		Mounted at distance c from transmitter.
Number of cable glands :	150		Assume similar for all devices.
Distance (ave) from GDP to each TX, a-a' :	500.0	m	
Distance (ave) from a transmitter to a remote sensor, c:	25.0	m	
Total length of Cable Type 1 :	1,250.0	m	3C with individual shield.
Total length of Cable Type 2 :	25,000.0	m	4C with individual shield.

Duration: 90 minutes

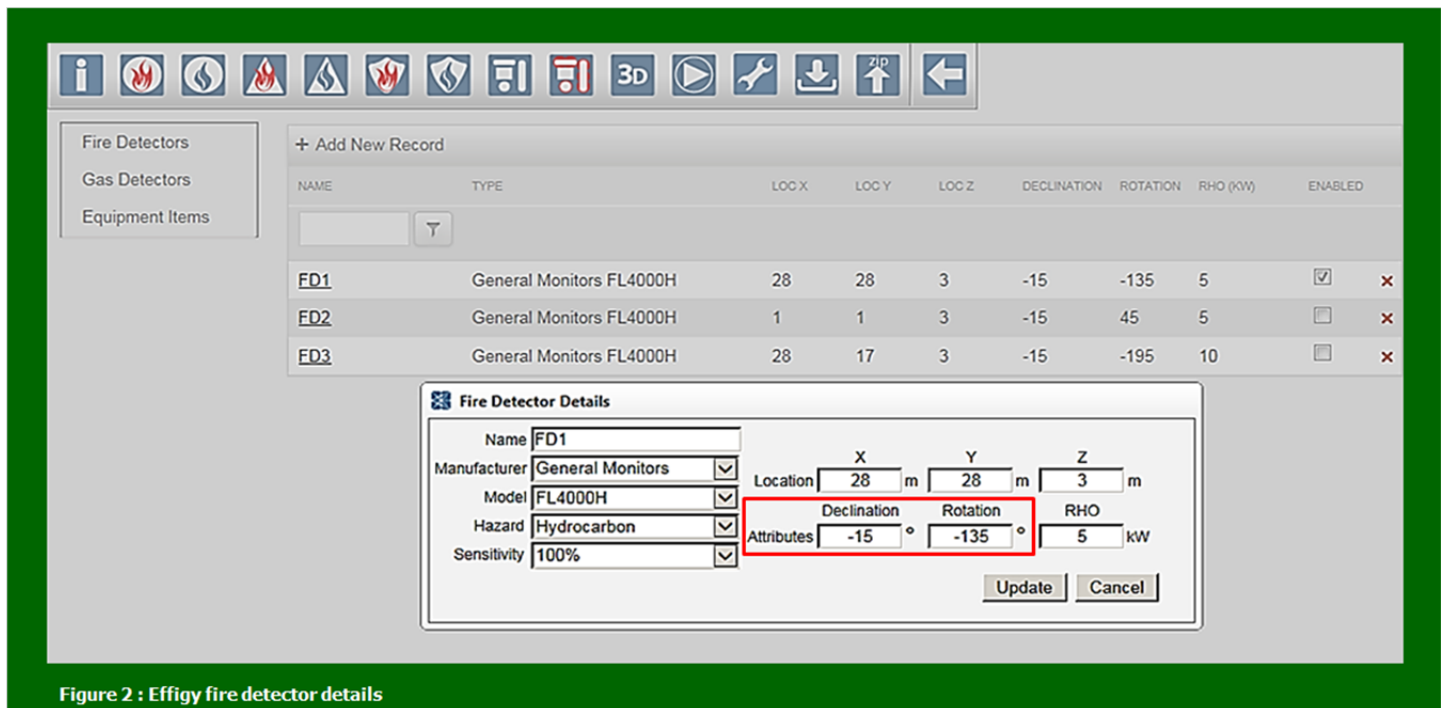
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## Seminar 4:

### Using flame mapping to place, orientate and angle flame detectors for more effective detection coverage

The ability of a protection system to suppress fires and execute other protective actions before more severe consequences occur is highly dependent on the system's ability to detect the fire reliably and quickly. One measure of ability is detection coverage. A high degree of detection coverage usually means a higher ability to react effectively.

In flame detection systems, the choice of sensing technology, the design of detector optics, detector positioning, detector mounting height, rotation orientation and declination angles are key factors that can affect the degree of detection coverage.



The screenshot displays the Effigy software interface for managing fire detectors. On the left, a sidebar lists 'Fire Detectors', 'Gas Detectors', and 'Equipment Items'. The main area shows a table of detectors with columns for NAME, TYPE, LOC X, LOC Y, LOC Z, DECLINATION, ROTATION, RHO (kW), and ENABLED. Three detectors are listed: FD1, FD2, and FD3, all of type 'General Monitors FL4000H'. A 'Fire Detector Details' dialog box is open for FD1, showing fields for Name, Manufacturer, Model, Hazard, Sensitivity, Location (X, Y, Z), Declination, Rotation, and RHO. The Declination and Rotation fields are highlighted with a red box.

NAME	TYPE	LOC X	LOC Y	LOC Z	DECLINATION	ROTATION	RHO (kW)	ENABLED
FD1	General Monitors FL4000H	28	28	3	-15	-135	5	<input checked="" type="checkbox"/>
FD2	General Monitors FL4000H	1	1	3	-15	45	5	<input type="checkbox"/>
FD3	General Monitors FL4000H	28	17	3	-15	-195	10	<input type="checkbox"/>

Name	FD1		
Manufacturer	General Monitors	Location X	28 m
Model	FL4000H	Location Y	28 m
Hazard	Hydrocarbon	Location Z	3 m
Sensitivity	100%	Declination	-15 °
		Rotation	-135 °
		RHO	5 kW
		<input type="button" value="Update"/> <input type="button" value="Cancel"/>	

Figure 2 : Effigy fire detector details

Flame mapping is a software simulation process that is now widely applied to assess detection coverage. Except for sensing technology and optics design, all other parameters used in flame mapping are installation related. For the simulated detection coverage to be realized, the installation parameters used in the flame mapping exercise must be physically applied to the detectors. Quite often, it is found that rotational and declination angle adjustments of flame detectors after mounting on site are done poorly or not at all. The result is poor detection coverage; which unfortunately may remain unknown until there is an actual fire.

The seminar discusses and illustrates:

- How flame mapping is used to determine detector placement, for optimum deployment quantity
- Factors that influence flame detection coverage
- Applying the flame mapping parameters in the real world

Duration: 60 minutes



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