Capability Statement
Gas Detection Optimisation

Introduction

MMI have developed methods based on Computational Fluid Dynamics (CFD) techniques to assess the effectiveness of gas detector systems. These are used to validate arrays of detectors (often placed on a regular grid) and determine whether more detectors are required to detect gas leaks or whether any detectors in the array are redundant.

Methodology

The CFD model geometry can be developed from CAD or other available information and the locations of the detectors (both point and beam) are included. Detectors are grouped with respect to Fire Zone and voting configuration, plus Alarm and Executive Action set points are noted.

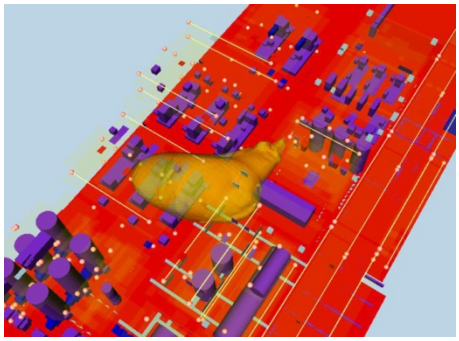
The performance standard for the detectors is often case-specific and determined by a duty holder's procedures. The analysis is tailored for the required performance standard which may be based on criteria such as:

- Minimum cloud size to be detected
- Minimum release rate to be detected
- Cloud that would generate overpressure leading to fatality/loss of structural barrier

The CFD Dispersion analysis is carried out taking into account: the gas release location, direction and rate; the fluids being released (heavy/light gases); and the wind speed and direction.

The scenarios are deliberately selected to try and defeat the fire and gas system by creating the largest, undetected, flammable volume. The most significant outputs form the CFD results for gas detector layout designs are:

- Is release detected?
- Time to Alarm and Executive Action
- Gas cloud size at Alarm and Executive Action
- Is the Performance Standard for the gas detection system met?



Visualisation of Point/Beam Detectors & Cloud at an Alarm level of 10% LFL

The gas detection system can be optimised by: addition/removal of new detectors; changes to detector type (e.g. beams instead of points) and voting configurations; changes to Alarm and Executive Action set points; changes to the segregation of Fire Zones.

Advantages of Methodology

Placing detectors on a regular grid will often lead to too many detectors being specified and detectors not being located where gas accumulates. The methods developed by MMI overcome this and provide a number of advantages:

- A robust, evidence-based approach to the placement of gas detectors
- Gas detector configurations are assessed quantitatively
- Capital and maintenance cost savings where GDs shown to be redundant can be removed or array spacings increased
- It can prove that by the addition of a small number of detectors a significant reduction in the number of undetected releases can be achieved
- Evidence provided to duty holders and regulators for the effectiveness of the system

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