Capability Statement
Flame Detector Optimisation

Introduction

MMI has developed “MMI-Cast” a ray-casting software tool that can accurately evaluate a detector layout and determine the optimum locations to maximise the volume coverage. This has advantages over traditional methods as it can reduce the number of detectors required, maximise the volume “seen” by the detectors, and provide evidence to duty holders and regulators for the effectiveness of the system. The evaluation in MMI-Cast is based on each detectors performance, location and orientation, and the obstructions to their line of sight within the fire area using. It uses a 3D model computational model of the module or fire zone such as shown in Figure 1. Two dimensional (2D) results can be provided, e.g. the coverage viewed at a number of elevations in 2D, which will clearly highlight gaps in detection.

Methodology

The software calculates whether there are any gaps in detector coverage sufficient for any volume not to be covered or a defined fire size to go undetected. MMI-Cast outputs the percentage of fire area volume covered by a number of flame detectors (e.g. 90% of volume covered by 4 detectors; 70% of volume covered by 3 detectors). This can be provided for the entire fire zone, or for smaller regions, which is useful if leak sources are concentrated within a certain area. The Performance Standard used to assess the system is generally case-specific and MMI uses the relevant criteria required by duty holders, such as:

- A minimum fire size being detected
- A certain percentage volume of the fire area being covered by a numbers of detectors (1ooN, etc.)
- A certain percentage volume of smaller regions within the fire area being covered by a number of detectors

To determine detector coverage the ray casting calculations are carried out for each fire zone. Results can be presented as:

- 3D representation of the coverage by different numbers of detectors (1ooN, etc.)
- 2D cut planes at different elevations to show any gaps in the coverage
- 3D and 2D representations of where a fire of a particular size could go undetected
- Percentage coverage statistics of the fire zone as a whole and/or smaller areas within it

Finally, the flame detectors layouts within each fire zone can be optimised automatically within the MMICast model by:

- Changing current detector locations
- Changing current detector orientations
- Addition of new detectors

Advantages of Methodology

- Calculation method accurately assesses the effectiveness of flame detector configurations and allows them to be assessed quantitatively
- Sensitivity studies and layout optimisation can be done quickly as the model is quick to run once it has been set-up
- Potential reduction in number of flame detectors whilst retaining or improving coverage leads to capital and maintenance cost savings
- Evidence provided to duty holders and regulators for the effectiveness of the system

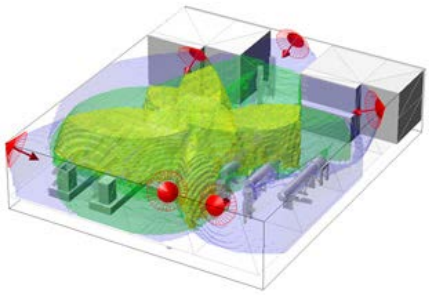

Figure 1: Coverage for 6 flame detectors (red) showing volume visible to one (blue), two (green) and three (yellow) detectors

This methodology has been presented at FABIG and IChemE Hazards events.