

HSE information sheet

Advice on gas detection strategies for HVAC duct inlets

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Introduction

This information sheet provides advice for duty holders regarding the detection of flammable gases in HVAC (heating, ventilation and air conditioning) duct inlets. It is based on research work triggered by an incident on an offshore platform where there was a delay in confirmed detection, despite gas being ingested into HVAC inlets. The research reviewed the literature on the subject and included an assessment of flammable gas ingestion and mixing in offshore HVAC ducts. This provides a basis for a set of recommendations for duty holders to include in development of their gas detection strategies. Although this sheet is focused on offshore HVAC ducts, the principles outlined are also likely to be relevant to onshore installations in which gas detection is required for HVAC ducts.

Background

The accidental release of flammable gas on offshore installations can lead to the build-up of a hazardous flammable or explosive mixture. Gas detection systems play a key role in reducing the risks from releases through early detection and enabling subsequent intervention.

Gas detection systems in hazardous areas would normally be expected to detect all reasonably foreseeable releases, but there may be situations, for example for large releases or in specific weather conditions, when gas could reach areas such as HVAC inlets without being detected by normal platform systems.

The Health and Safety Executive commissioned research which examined circumstances where a gas jet or plume could be partially ingested into an HVAC inlet. If an HVAC inlet ingests a non-uniform distribution of gas then there is the possibility that this could be 'missed' by the detection system, and flammable gases could be drawn into safe or hazardous areas.

This research has provided a basis for advice to HSE inspectors and industry on the effectiveness of flammable gas detection strategies for offshore HVAC ducts. This sheet brings the recommendations to the attention of the industry.

Recommendations for flammable gas detection strategies for offshore HVAC ducts

The circumstances of the incident that triggered this research and the results from the research work^{1,2} indicates that in some circumstances there may be potential for gas releases to be 'missed' by detection systems in HVAC duct inlets. The predicted non-uniformity in gas concentration should be taken into account in the selection and siting of gas detectors at HVAC inlets.

The recommendations on flammable gas detection strategies for offshore HVAC ducts are listed below. Duty holders should consider these recommendations and review their gas detection strategies for HVAC ducts:

1. Detector alarm levels should be set as low as reasonably practicable: 10% LEL or less.
2. Point catalytic, point infra-red, extended path point infra-red, cross-duct beam infra-red and aspirated point detector systems all have the potential to be effective in detecting non-uniform distributions of flammable gas in and around HVAC ducts, provided that their sensitivity is sufficiently high (ie low detection limit) and that due regard is given to the possibility that gas will be distributed non-uniformly.
3. Extended path point infra-red detector systems currently appear to offer the greatest sensitivity, but multiple detectors should be used and sited so as to anticipate non-uniform mixing.
4. Cross-duct beam infra-red, extended path or aspirated point detector systems should be based on two beams or lines of aspirated point probes so as to ensure optimal coverage of the duct cross-section.
5. Mixing elements have the potential to reduce any non-uniformity in the distribution of gas in a duct but their effectiveness should be proven. Mixing elements will result in additional resistance to flow in a duct but this ventilation pressure drop may not be very significant.
6. In the absence of purpose-designed mixing elements no significant benefit from the perspective of gas mixing can be gained from siting detectors immediately inside an HVAC duct compared to locating them immediately outside the HVAC inlet.
7. In the absence of purpose-designed mixing elements or a series of bends upstream from gas detectors, no significant benefit can be gained from siting detectors a significant distance downstream from an HVAC inlet.

Relevant legal requirements

Health and Safety at Work etc Act 1974 (HSWA), Sections 2 & 3

Offshore Installations (Safety Case) Regulations 2005 (SCR05), Regulation 12

Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (PFEER) Reg. 10, and 19.

References

1. Assessment of gas detection strategies for offshore HVAC ducts based on CFD modelling Research Report RR602 HSE Books 2007
<http://www.hse.gov.uk/research/rrhtm/rr602.htm>.
2. Assessment of flammable gas ingestion and mixing in offshore HVAC ducts: Implications for gas detection strategies. C J Lea, M Deevy and K

O'Donnell. Hazards XX, Manchester, Institution of Chemical Engineers, April 2008

Further information

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This information sheet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do