

GENERAL INTRODUCTION TO POSITIONING OF GAS DETECTORS

The problem for gas detection systems in general, for 95% of installations there are no precise guidelines, either national or international, that could be followed to determine the number, spacing and positioning of gas detectors for a given industrial installation. There are industry / application / internal company specific guidelines eg. guidelines for monitoring CO in car parks, platform ex-detection monitoring in the North Sea, which however vary greatly in their recommendations about spacing and obviously cannot be applied for all industries and applications.

Most guidelines such as eg. ISA-RP 12.14, Part II – 1990 and API Publication 2031, avoid the issue of spacing and therefore the decision of how many detectors are appropriate for a given application, leaving this decision for the plant operator to determine depending on his own risk assessment / analysis.

However these guidelines all cover the following points that **MUST** be considered after the approximate locations of the detectors have been decided, to determine their exact position of installation in the plant:

1. Purpose of Gas Detection System

There are 3 main purposes for locating any gas detector. The choice of location of a gas detector is primarily determined by the purpose or combination of purposes for which it is intended:

1.1. Leakage monitoring

The measuring head has to be installed as close as possible taking into consideration the other points listed below, to the likely points of leakage (flanges, valves, pressure reducers, pumps, etc), to facilitate leakage detection as early as possible.

1.2. Area monitoring

For areas where there is no clear potential leakage source (eg. solvent / paint warehouse), the detectors are distributed evenly throughout the hazardous area taking into account local flow conditions (eg. type of ventilation system).

According to the type of hazard and hazard risk assessment, one detector is used for an area of 40 to 80 square meters.

1.3. Personal protection (for toxic gases)

For areas where there is no clear potential leakage source (eg. laboratory workplace), the detectors are placed in the inhalation area (head height) of the workplace.

2. Ambient operating conditions – temperature, pressure, humidity

Mount all detector heads and instruments in areas that ensure compliance with the manufacturer's specifications.

For locations not in compliance with the manufacturer's specifications, pump sampling type systems may have to be considered to draw the gas into a place where the detector specifications can be complied with.

3. Flow velocity

Has to be especially considered for combustible gas detection systems based on catalytic sensors where flow velocities of > 6 m/s can lead to false alarms. These false alarm problems can be eliminated by fitting the sensor with wind calming plates or protective covers which however will lead to increased response times !!

4. Flow direction

Has to be considered to position detector such that chance to pick up a leak are maximised.

5. Vibration, shock and mechanical protection

The detectors should be installed at places with low vibration and where mechanical shocks are NOT to be expected.

In some cases (g. operation of fork lifters) protection cages around the detector are recommended.

6. Electromagnetic Interference (EMI)

Generally properly grounded shielded interconnecting cables and enclosures provide sufficient protection against EMI. Cable shields should be grounded at one point at the controller end only unless otherwise specified.

Both detector locations and cable routing should be such to avoid proximity to high EMI sources (eg. high voltage equipment, fluorescent lamps and pulse signal lines).

7. Cross – sensitivities to other gases

Detectors should be positioned to avoid contact with other gases to which they have a high x-sensitivity.

8. Accessibility

Detector locations should take into consideration access for future maintenance and calibration tasks. In case of low positioned detectors, 30 cm clearance should be kept above ground level.

9. Gas Type

9.1. Flammable Gases

Hydrogen, Methane and Ammonia are much lighter than air, detector placement should be at or above point of potential leakage and in ceiling areas where gas pockets might accumulate (so called gas nests)

All other flammable gases (eg. propane, butane) and vapours (eg. methanol, toluene) are heavier than air so that they can flow across the ground covering wide areas. For early detection the measuring head should be installed as low as possible (provided of course there is not a forced ventilation system which could influence the natural gas/vapour movement determined by density).

9.2. Toxic gases

As long as they appear in low concentrations behave as having the same density as air being spread by diffusion and convection – as toxic detectors are principally for personnel protection, the installation of toxic gas detectors is normally at breathing level.

However if the temperature of the leaking toxic gas is higher than ambient air it will rise, therefore detector location above point of leakage in this case.

9.3. Liquefied Gases

In the event of a leak these can flow downwards due to cooling down during expansion. The detector installation height at low levels (30cm to 100 cm) above ground level.