Choosing the right gas sampling tube

Technical Note 20

Introduction

A recent incident has once again highlighted that choosing the correct sampling system is a topic that may not be overlooked. In this case, a flammable gas mixture was sampled through a gas hose onto a gas detector fitted with an LEL sensor. Although the mixture contained a concentration above 100 %LEL, the flammable component was mostly absorbed by the hose material, leading to the situation that hardly any flammable gas reached the gas detector. Hot work proceeding based on the false reading resulted in the ignition of a flammable atmosphere and fatal injury.

This document will cover some of the different gas sampling hose materials and their differences.

Types of gas sampling hoses

Last-O-More®:

In search of the preferred gas sampling hose, some gas detection specialists have developed the Last-O-More hose. Proven to be highly resistant to most chemicals it also provides great user comfort since it's highly flexible, weather- and impact resistant.

PVC

Polyvinylchloride (PVC) was discovered by accident in 1885. It was until the 1960s when PVC hose became popular and replaced most rubber tubing. Due to its composition PVC will react with oil-based chemicals, such as higher alkanes, that will break down the tube eventually.

Polyurethane

Unlike PVC Polyurethane (PU) is resistant to most oilbased chemicals. However, PU tubing could attract moisture in humid environments. Although not absorbed by the PU itself, some compounds may be lost by absorption by the attracted moisture.

Tygon®:

The brand name for a type of PVC tubing widely used in analytical chemistry. Tygon® is non-reactive to most gasses, but it could reportedly be releasing some carbon monoxide. The low flexibility of most Tygon tubing is also a downside when working with portable gas detection equipment.

Silicone

Most silicone tubing will not only react with reactive compounds like chlorine, but it will also give off silicone vapors, which could poison a catalytic LEL sensor. Due to this effect, it's not recommended to use any type of silicon-containing tubing when using this type of sensor. The use of silicone tubing is also not recommended when trying to measure reactive compounds.

Sampling advise

To mitigate the risk of false lower readings by absorption, it is advised that users should function test (bump test) the complete gas detection system, including sampling hose, using the target component prior to any field measurement taken. It's also advised to replace any dirty or old gas sampling hoses. Some tubing, like Last-O-More, does come with a printed date code.

GAS	O_2	CO	H_2S	PH_3	SO_2	NO	NO_2	HCN	NH_3	CL_2	Alkanes C_1-C_6	Ethylene oxide	Formalde-hyde	Benzene	Butadiene	Acids (HCl, HF)
Last-O-More®	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	+
Tygon	++	+	++	++	++	++	++	++	++	++	++	+	+	+	++	-
PVC	++	++	++	++	++	++	++	++	-	+	++	-	-	--	+	--
Silicone	++	++	++	-	+	+	-	+	--	--	-	-	-	--	-	--

This table illustrates the use of different tubing materials on different target components.

Legend:

++: Hose material will not affect gas reading
+: Some minor absorption could occur, limited effect on reading
-: Absorption of target gas, lower reading expected
--: High or full absorption of target component, severely lower reading