



The Importance of Tubing Selection for Gas Detectors

Introduction

Transparent tubing is often promoted as a low-cost option for drawing sample air from confined spaces, but it lacks the chemical inertness required for reliable gas detection — the same reason clear tubing is avoided for fuel and windshield-fluid lines in the automotive industry. Once a fluid or vapor is drawn in, the inner wall becomes contaminated - visible discoloration indicates a reaction between the sampled gas and the tube material. PTFE tubes show high inertness rate, but at a higher cost and with a tendency to flake internally, which blocks the sample lines. Inexpensive aquarium-grade PVC tubing is often repurposed for gas sampling, but its characteristic odour alone signals it's a poor choice for this application. Especially when working with LEL gases, false reading can result in the ignition of a flammable atmosphere and injuries.

The Last-O-More sampling hose offers the best price-to-performance ratio available. Its low adsorption directly affects higher measurement accuracy, furthermore this performance holds consistently across a variety of tested gases.

Types of sampling hoses

Last-O-More®:

Last-O-More hose is the answer for the shortcomings of all the others tube types. Last-O-More is manufactured from FKM, which shows a proven high resistance to a various specter of chemicals, it provides great user comfort and it's highly flexible and durable with temperature variations.

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 oil based 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, as well as high pricing.

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.

Performance Testing and Gas Compatibility

The Last-O-More tubing does not flake, stays highly flexible over its service life, and resists collapsing or pinching (kinking) even under repeated handling, across a temperature range of -20°C to 50°C. It is available in two sizes; 3x5 mm (3 mm inner diameter) and 5x8 mm (5 mm inner diameter), black and clearly marked as a gas-sampling tube to prevent misuse, and is compatible with **Ball Floats, Pressure Regulators, Docking Station, PID and SST units, especially SST4 Pump**. With valves it forms a tight, stable connection that holds up across repeated test cycles.

To determine the delay time under various conditions, three different flow rates were tested on the same device using the standard QUAD gas mixture (Methane, Carbon Monoxide, Hydrogen Sulphide, and low-percentage Oxygen), with a particular focus on the Hydrogen Sulphide readings, as a main reference point.

Table 1 shows the flow in real life conditions, where the gas source is connected to one end of the tube and a detection device to the other, two tube lengths were tested; 10 m & 45 m. As expected, the narrower tube (5x3 mm) shows a shorter delay time, reaching up to 17 sec for 10 m and 65 sec for 45 m. The thicker tube (8x5 mm) shows a longer delay, reaching 46 sec for 10 m and up to 185 sec for 45 m, at a flow rate of approximately 300 ml/min. As the flow rate increases, the delay time decreases, resulting in 11 sec for 10 m and 41 sec for 45 m with the 5x3 mm tube.

Table 1: Flow in real life conditions. Tested with: SST4 Mini & PID Devices.

Inner Diameter	Tube Length (m)	Delay time for Flow 1 (~300 ml/min)	Delay time for Flow 2 (~400 ml/min)	Delay time for Flow 3 (~500 ml/min)
3 mm (5x3)	10	17 sec	12 sec	11 sec
5 mm (8x5)	10	46 sec	29 sec	26 sec
3 mm (5x3)	45	65 sec	44 sec	41 sec
5 mm (8x5)	45	185 sec	120 sec	117 sec



Table 2 shows how much of a delay there is with a sampling tube, when gas is drawn through it by the SST4 Pump, for two tube sizes and at a constant flow of 230 ml/min. Tube with the inner diameter of 3 mm, holds 35.355 ml of gas – for 5 m of length, resulting in 9.2 seconds of travel time – from the inlet to the device. Tube with the inner diameter of 5 mm, holds, 98.2 ml of gas – for 5 m of length, resulting in 25.6 seconds. The smaller tube is better by choice when a fast response is crucial.

Table 2: Tube delay on SST4 Pump.

Inner Diameter	Tube Length (m)	Volume of the Tube (ml)	Pump Flow (ml/min)	Delay (sec)
3 mm (5x3)	5	35.355	~230	9.2
5 mm (8x5)	5	98.2	~230	25.6

Why 3 mm Tube?

Faster Flow → Shorter Delay !

Less Volume → Quicker First Detection !

Lighter Tube → Easier Handling !

Stronger Rubber → Better Grip on SST & PID Devices !



Testing of gas compatibility was carried out using two tube lengths, ~ 1 m and ~ 3 m, the results are shown in **Table 3**. In addition to, several other gases were measured, including QUAD gas, **styrene, toluene, xylene, acetone, ethanol, ethylbenzene, hydrogen, IPA and propylene oxide**. All gases that passed through the Last-O-More tubing produced expected results, which implies that there was no absorption and confirms consistent performance across the tested range.

Table 3: Shows the impact of different types of tubes on different gases.

Tube length: ~ 1 m & ~ 3 m.

GAS	Benzene	Cl ₂	CO	ETO	H ₂ S	HCl	HCN	Hexane	NH ₃	NO ₂	N-Pentane	O ₂	PH ₃	SO ₂
Last-O-More	++	++	++	++	++	++	++	++	++	++	++	++	++	++
Tygon	+	++	+	+	++	-	++	++	++	++	++	++	++	++
PVC	--	+	++	-	++	--	++	++	-	++	++	++	++	++
Silicone	--	--	++	-	++	--	+	-	--	-	-	++	-	+

For additional information contact WatchGas

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

Disclaimer

Caution is advised for PID and benzene-related applications involving aromatic or heavier organic vapours, such as: **benzene, toluene, xylene, ethylbenzene, styrene and heptane – particularly at higher concentrations or with prolonged exposure time**, as these may partition into the FKM material and diffuse back out causing delayed readings, reduced recovery, or cross-contamination of later samples. Similar effects are possible with **ETO, VOCs and organic solvents** – a new or contaminated hose may delay response, retain part of the sample, cause a memory effect, or release trapped vapours during later measurements.