



BTEX Monitoring Tube for Fenceline Monitoring



Introduction

Camsco's BTEX Monitoring Tube is designed and engineered to meet the needs for fenceline monitoring of BTEX and 1,3-butadiene near refineries, even though it may be utilized independently as a passive sampler for BTEX detection in ambient air.

The petroleum industry is the largest industrial source of emissions of volatile organic compounds (VOCs), a group of chemicals that affect public health directly as well as indirectly by contributing to the formation of ground-level ozone (smog). US EPA estimates VOC emission from the oil & natural gas industry at 2.2 million tons a year in 2008.

BTEX is the acronym for Benzene, Toluene, Ethylbenzene, and Xylene; four compounds that are representative of overall refinery emissions. Passive sampling onto sorbent tubes followed by TD-GC/MS analysis is a well-established method for BTEX monitoring by the British National Physical Laboratory (NPL), and is employed by the US EPA in its effort to develop new protocol/regulations for refinery emissions.

Refineries contain hundreds of emission points for VOC, and the BTEX Monitoring Tube/shelter assembly needs to be hung on various locations along the fenceline surrounding a refinery. After 1~2 weeks of passive sampling, the BTEX Monitoring tube can be detached from its shelter, re-sealed and sent to a laboratory equipped with TD-GC/MS for analysis. Tubes can be conditioned and reused for roughly 100 thermal cycles, keeping the monitoring cost very low.



Figure 1. A BTEX Monitoring Tube (Camsco Part Number **BTEX-T**) protected by tube shelter and Passive Sampling Cap (Camsco Part Number **BTEX-S** and **DC60**, respectively)

Highlights of Camsco's BTEX Monitoring Tube include:

- EPA Compliant, pre-conditioned Carbograph™ 5TD
- Inert coated internal metal parts to protect sample integrity over a relatively long sampling period
- Error-proof identification: high quality sorbent tubes with unique COGNI system
- Supported by field accessories such as weatherproof tube shelter and bug/dust proof passive sampling caps (Figure 1)
- Field tested at refineries and subsequently analyzed by third-party laboratories

BTEX Capture Tube configuration:

- Stainless Steel 1/4" x 3.5" tube filled with Carbograph™ 5TD, 60/80 mesh
- Carbograph™ 5TD is equivalent to Carbopack™ X

Volatility Range C3~C8



Volatility Range – Continued

The BTEX Capture Tube has a rather narrow C3 ~ C8 volatility range specific to BTEX (C6 ~ C8) monitoring. It also captures 1, 3-butadiene (C4), another air pollutant and potent carcinogen from refineries.

Technical Guide



BTEX Tube



- Carbograph™ 5TD is selected based on the comprehensive studies by Nicholas A Martin et al. at NPL, UK. Using their state-of-the-art controlled atmosphere test facility (CATFAC), the researchers found this sorbent to have near-perfect adsorption and desorption characteristics for benzene.
- As shown in the picture above, the passive sampling cap should be put onto the sampling end, which is the end with corsets, and the direction of the text/number readout should match the direction of air diffusion into the tube.
- All tubes need to be pre-conditioned before sampling, and sealed properly after sampling for transit to a laboratory.
- Sampling time is normally 1~2 week, which averages out daily fluctuations, operational/shift differences, and night/day temperature differences.
- Ask Camsco experts for a complete instruction manual for BTEX Capture System.

Temperatures

Maximum Temperature:	400°C
Conditioning Temperature:	350°C
Desorption Temperature:	325°C ~ 350°C

Comparison to other Methods:

- Compared to the use of emissions factors to develop emissions inventories, the BTEX Monitoring Tubes provide much more direct/accurate assessment of the emission. The tubes also involve the direct contribution from variables (temperature, wind, etc.) that are difficult to incorporate to the emission factors.
- Compared to the use of remote sensors to evaluate VOC emissions, the BTEX Monitoring tubes offer no real-time capability, but rather a time-averaged results over a week or two. However, the tubes provide both qualitative and quantitative analysis of each compound collected, a capability no sensor can match.
- Compared to active sampling using sorbent tubes, the BTEX Monitoring Tubes require no electricity (battery or AC), has one less variable or potential failure from pumps, and are much easier to implement/maintain.

References

US EPA: Emissions from the Oil & Natural Gas Industry
(www.epa.gov/airquality/oilandgas/basic.html)

EN 14662:2005. Ambient air quality-Standard method for measurement of benzene concentrations

US EPA: Emission Estimation Protocol for Petroleum Refineries, Version 2.1.1 March 2011

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