

Volatile Organic Compounds Monitoring

The availability of reliable, accurate and precise monitoring methods for VOCs is a primary need for Government agencies and Industry addressing daily monitoring requirements related to odour complaints, fugitive emissions and trend monitoring.

Volatile Organic Compounds (VOCs) are organic chemicals that easily vaporize at room temperature. They are called organic because they contain the element carbon in their molecular structures. VOCs include a wide range of individual substances, such as hydrocarbons (for example benzene and toluene), halocarbons and oxygenates. Hydrocarbon VOCs are usually grouped into methane and other non-methane VOCs. Methane is an important component of VOCs, its environmental impact is principally related to its contribution to global warming and to the production of ground level or lower atmospheric ozone. Oxygenates arise in vehicle exhausts and via atmospheric chemical reactions. Evaporation of solvents, used for example in paints, cause a release of hydrocarbons, oxygenates and halocarbons to the atmosphere.

Two sampling methods most commonly used to collect ambient VOC samples are solid adsorbents and stainless steel canisters. Samples can be collected over various time periods to comply with Provincial and Federal regulation.



Figure 1 - VOC Tubes

Solid Adsorbents Sampling

(Figure 1)

Ambient air is drawn through a cartridge containing adsorbent material. Volatile organic compounds are captured on the adsorbent while major organic atmospheric constituents pass through. After sampling, the cartridge is returned to a laboratory for analysis.

Air volume is critical to the accuracy of the results. Mass flow controllers are highly recom-



Figure 2 - Mass Flow Controlled VOC Sampler

mended in determining accurate sample volumes. (Figure 2) Analog output from the mass flow controller can be connected to a data logger to continuously record flowrate and total air volume.

Stainless Steel Canister Sampling

(Figure 3)

Canister-based monitoring method for VOCs has proven to be viable and widely used since the 1980s. Ambient air is collected in a stainless steel canister. A sample is drawn through a sampling train comprised of components that regulate the rate and duration of sample into a canister. Advantages of canister sampling is as follows;

- convenient integration of ambient samples over specific time period
- ease of storing and shipping
- storage stability for many VOCs over periods of up to 30 days
- repeat analysis (unlike adsorbent material, additional samples can be removed from the canister for subsequent analysis)
- multiple sample analysis utilizing several analytical techniques

Rotek Environmental Inc. has designed and developed instrumentation to support both adsorbent cartridge and canister sampling methods.



Figure 4 - Canister Control Module



Figure 3 - Canister Sampling

Sampling equipment can be automatically triggered on with external parameters such as wind direction or other ambient air monitoring equipment.

Rotek can coordinate sampling and QA/QC requirements such as;

- installation and removal of samples
- flowrate calibration
- travel, duplicate and field blank requirements
- sample submission, chain of custody documentation
- data reporting and validation
- liaison between client and laboratories

Polycyclic Aromatic Hydrocarbons (PAHs) and Dioxins/Furans Monitoring

(Figure 5)

Compounds such as PAH, Dioxins / Furans and PCBs could be considered semi-volatile and need to be collected in both vapour and particulate form. Gases will adhere to the particulates. Sampling equipment is designed to collect both VOC compounds along with the particulates. The vapour portion of the sample will be drawn

through the filter and is collected on several collection mediums such as; Polyurethane foam or XAD resin.

The following US EPA approved sampling and analysis methods are recommended for the sampling of organic compounds;

- **METHOD TO-2** (Method for the Determination of Volatile Organic Compounds (VOCs) in Ambient Air by Carbon Molecular sieve Adsorption and Gas Chromatography/Mass Spectrometry (GC/MS)
- **METHOD TO-4A** (Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air using high Volume Polyurethane Foam(PUF). Sampling followed by Gas Chromatographic/ Multi-Detector Detection (GC/MD)
- **METHOD TO-9A** (Determination of Polychlorinated, Polybrominated and Brominated/Chlorinated Dibenzo-p-Dioxins and Dibenzofurans in ambient air.
- **METHOD TO-13A** (Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air Using Gas Chromatographic / Mass spectrometry (GC/MS)
- **METHOD TO-14A**
Determination of Volatile Organic Compounds (VOCs) In ambient Air Using specially-Prepared Canisters with Subsequent Analysis by Gas Chromatography
- **METHOD TO-15**
Determination of Volatile Organic Compounds (VOCs) In Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography Mass Spectrometry (GC/MS).



Figure 5 - PUF Sampler