THE CARO ADVANTAGE
SOIL VAPOUR

INTRODUCTION

Soil vapour has been an exciting new regulatory segment in BC. Many don't realize just how far ahead BC is when compared to the rest of North America. With any developing initiative, there has been and will continue to be areas for improvement. CARO has approached soil vapour with the objective of being industry t***echnical leaders***. Our accomplishments include:

1. **Thermal Desorption (TD**) - We selected TD as the most cost effective, practical and technically sound approach for testing VOCs in soil vapour. This approach is gaining widespread industry acceptance as the predominant soil vapour method.
2. **Instrumentation** – CARO was the first Western Canadian laboratory with TD "*recollection*" ability, allowing duplicates and dilution of high samples.
3. **CALA Accreditation** – CARO was the first Canadian laboratory to gain accreditation for soil vapour by TD (www.cala.ca)
4. **BCMOE Standard Methods** – We authored the provincial VOC by TD and VHv methods.
5. **Research and Development** – Our study, *"Assessment of Volatile Organic Compounds from Tubing Used for Soil Vapour Sample Collection VOC"* conducted in partnership with the SABCS has standardized industry sampling material selection.

We are proud of our accomplishments and are continuing to move the state-of-the-art forward in BC, North America and Europe. Following is discussion on important new developments that will ***improve soil vapour data quality and help reduce costs***.

"NEW" SVI™ TD TUBE DEVELOPMENT

We are pleased to introduce the new **Vapor Intrusion *(SVI™) TD Tube***. Developed in partnership with PerkinElmer, this device has important performance benefits over other TD tubes. The SVI tube has now become the industry standard for this application.

What challenges have we seen? Common perception is that all TD tubes are equivalent. This is not the case! In fact most commercial TD tubes have not been specifically designed for soil vapour applications. Issues include:

1. **Low Safe Sampling Volumes (SSVs)** for certain LMW VOCs cause noticeable breakthrough and inability to meet regulatory-level detection limits.
2. **Soil Moisture** retained on the TD tube reduces sorption performance and increases breakthrough potential. Moisture also degrades GC/MS performance by reducing detection specificity and forcing detection limits upwards.
3. **Diverse Contaminant Profiles** include VOCs ranging from nC3 to nC20 at concentrations over seven orders of magnitude. Issues include breakthrough, overload, un-reportable data, irreversible binding of HMW compounds and contaminant carry-over.

What are the benefits of the SVI™ TD Tube? The **SVI™ TD Tube** combines positive attributes of existing TD tubes with new sorbent media technology:

1. **High Safe Sampling Volumes (SSVs**) - In fact, this is the only TD tube we've tested (using BCMOE procedures) with SSVs greater than 10 L for our Schedule 11 VOC list.
2. **Hydrophobic Media** – Next-generation sorbent media prevents water from competing for VOC sorption sites - this reduces breakthrough potential. Also, less water allows better GC/MS chromatography – this improves data quality.
3. **Broad Performance Range** – Excellent sorption/desorption performance from nC3 to nC20. This allows larger sample volumes for analytes ranging from LMW chlorinated VOCs to CCME F2 (nC16) fractions and even PAHs. It also helps protect TD tube integrity. The result is that less test samples are needed and more reproducible results are possible.

Why is the SVI™ TD Tube so important to our clients?

1. CARO has helped develop the market's most sophisticated TD tube designed specifically for the challenges of soil vapour.
2. The **SVI™ TD Tube** has performance benefits that will **improve data quality and save time and money**.
3. Our clients can have the peace of mind that "***CARO understands soil vapour science".***

Our findings have been well received at conference presentations in North America and Europe. Stay tuned for notification of upcoming scientific journal publications.

"NEW" LOWER DETECTION LIMITS

An early soil vapour challenge was achieving regulatory-level detection limits (DLs). One solution was high sampling volumes - some may recall collecting over 50 L of sample. Not only did this consume valuable field resources, it also exceeded safe sampling volumes for many VOCs. Currently, most laboratories can achieve regulatory level DLs with less than 10L of sample.
However, a new challenge has emerged. **High concentration samples** up to seven orders of magnitude above DLs are common**.** Issues include:

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1. High samples require **dilutions** that proportionally raise DLs in many cases above regulatory standards.
2. TD tube **overload** leads to questionable data as analytes break through or are under-reported.

During development of the high capacity **SVI™ TD tube**, we also **developed proprietary procedures to significantly reduce soil vapour DLs**. Our industry leading DL ability enables reporting to much lower levels than previously possible (i.e. for risk assessment). Also, lower sample collection volumes are possible. In most cases, residential standards can be achieved with only 1L (or less) of sample.

What advantages do lower DLs provide?

1. **Reduced Sampling Time** – Instead of 60+ minute sample collection times, as little as 10 minutes are necessary (1L @ 0.1L/min). This will save considerable field time and expense.
2. **Minimized Tube Overload** - By reducing sample volumes, VOC loading is reduced and the impact of high concentration samples is minimized. To date, this has noticeably allowed much more useable data more frequently.
3. **Minimized Water Effects** – By reducing moisture loading, we improve GC/MS chromatography performance.

Refer to http://www.caro.ca/soilvapour.html for current soil vapour VOC capabilities and DLs.

OUR VALUE APPROACH

We have listened to our clients and have worked hard to improve soil vapour TD technology. CARO provides the most flexible, practical, technically sound and cost effective soil vapour solution in the industry. We also recognize that strong support is essential to project success. This is particularly true for soil vapour.

Our value approach is simple:

1. **Client Collaboration:**
   - We understand client's perspective through consultation and hands-on field experience.
   - Reporting is clear, comprehensive and flexible: Excel, PDF, or custom EDDs.
   - Available equipment: **SVI™ TD tubes,** calibrated pumps, Helium detector, manometers, tubing, etc.
2. **Technical Knowledge:**
   - Comprehensive knowledge of analysis, sample collection, and regulatory issues.
   - Defensible aliphatic-aromatic fractionation for risk assessment; interpretation of difficult samples; product characterization.
3. **Staff Commitment to Client Success**
   - Our team: 50+ staff; many with 10+ years experience; professional chemists (PChem); quality auditors; industry board members.
   - **Our culture recognizes that staff and corporate success results from our client's success.**

THANKS TO OUR CLIENTS

Soil vapour has been a successful new market segment for us. Thanks to existing and new clients for the opportunity to be of service. We value the relationships as well as the collaborative feedback.

We would like to remind everyone of our full-service capabilities. We employ a technical and service based approach to all the work we do:

- **Organic Contaminants** – BCMOE, CCME
- **Metals** – soil, water, vegetation, biota, air
- **Air Quality** - soil vapour, equipment rental
- **Water Potability** – microbiology, CDWQG
- **General Water Chemistry** – monitoring, wastewater
- **Toxicology**
- **Custom Data Reporting**
- **CALA Accreditation** - for specific tests (www.cala.ca)

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