

ABSTRACT:

EPA Method TO-17 states that sorbent tube samples should be refrigerated at <4°C in a clean environment during storage and analyzed within 30 days of sample collection. Calscience hopes to show that the need for maintaining the samples at <4°C has no effect on the stability of VOC's on a sorbent tube during the 30 day holding time window.

INFORMATION:

EPA Method TO-17 is written as an alternative to the canister-based sampling and analysis methods that are presented in Compendium Methods TO-14A and TO-15, and to the previous sorbent-based methods that were formalized as Compendium Methods TO-1 and TO-2. All of these methods are of the type that includes sampling at one location, storage and transport of the sample, and analysis at another.

In TO-17 the collection of VOCs in ambient air samples is accomplished by pulling ambient air through a sorbent tube. This method is generally recognized to have a number of advantages over canister based methods. These include the small size and light weight of the sorbent tubing which leads to greater portability and transport.

Even though the use of sorbent tubes increases the portability and transport of the sample, you have a major disadvantage as the method requires that the sorbent tube be maintained at < 4°C both before and after sampling.

Sorbent tubes must be kept inside a storage container at <4°C within the laboratory previous to sampling, during transportation, and only allowed to reach ambient temperature during the sampling period. Once sampling is complete, the sorbent tubes must again be kept at <4°C during transport back to the lab, and maintained within the laboratory in a refrigerator at <4°C until ready for analysis.

DISCUSSION:

The refrigerator temperature, as well as the room temperature, was monitored daily; the sorbent tubes were maintained throughout the project at a temperature consistent with EPA Method TO-17, see Figure 1 for the daily refrigerator temperature.

The percent recovery of a selected subset of volatiles (Benzene, Ethylbenzene, Toluene, P/M Xylene, O Xylene, Naphthalene, PCE, and TCE) was measured in accordance with EPA Methods TO-15 and TO-17 on Days 1, 2, 3, 4, 7, 14, 21 and 28 post spiking. For EPA Methods TO-15 and TO-17 a check of the calibration curve must be performed every 24 hours to ensure that the GC/MS continues to be in control. For the instrument to be deemed in control the percent deviation for each target analyte must be within ±30% of the daily RRF (24-hour) compared to the mean RRF in the most recent initial calibration. This criteria was used to determine if the average daily percent recovery of the subset of analytes was within method acceptance criteria.

Sorbent tubes stored at ambient temperature as well as those refrigerated to <4°C started to drift out of control between 14 and 24 days storage, see Figures 2 and 3.

All summa canister results were in control for the duration of the project, see Figure 4.

Blanks were also monitored for the duration of the project in both summa canisters and sorbent tubes. One set of sorbent tubes was stored refrigerated and the other set was stored at ambient temperature. One set in each environment was analyzed weekly; the other set was only analyzed at the end of the project. All summa canisters, whether analyzed weekly or at the end, had no reportable analytes. Both sets of sorbent tubes which were analyzed weekly started to show contamination between 14 and 21 days. Both sets of sorbent tubes not analyzed until the end of the project had no reportable analytes. See Figure 5.

Naphthalene's average daily percent recovery was acceptable by both methods, see Figure 6.

EXPERIMENT:

Calscience will monitor the percent recovery of a select group of VOC's sampled onto a sorbent tube. One set of spiked sorbent tubes will be maintained at < 4°C and the other set of spiked sorbent tubes will be kept at ambient temperature. Both series of spiked sorbent tubes will be analyzed in accordance with EPA Method TO-17. Calscience will also monitor the percent recovery of the same subset of VOC's sampled in a summa canister in accordance with EPA Method TO-15, as the EPA has accepted that VOC's are stable for at least 30 days in a summa canister at ambient conditions. In addition, blanks will be prepared and analyzed under the same conditions as the sorbent tubes and summa canisters.

CONCLUSION:

Spiked sorbent tubes were stored at ambient conditions as well as in a refrigerator maintained at <4°C for the duration of the project. The recovery of a subset of analytes was measured and was well within EPA Method TO-17's analytical uncertainty for a time period of at least 14 days post spiking. Therefore, the stability of volatile organic compounds on sorbent tubes does not seem to be the result of maintaining the temperature at <4°C.

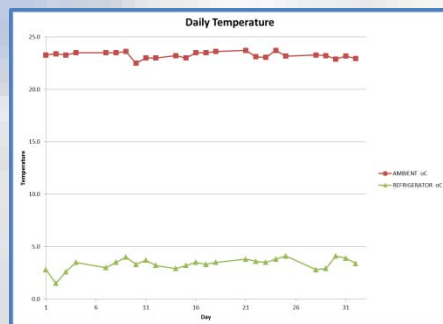


Figure 1

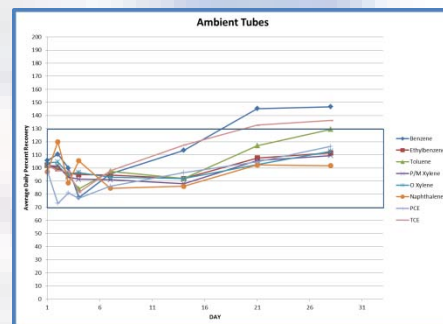


Figure 2

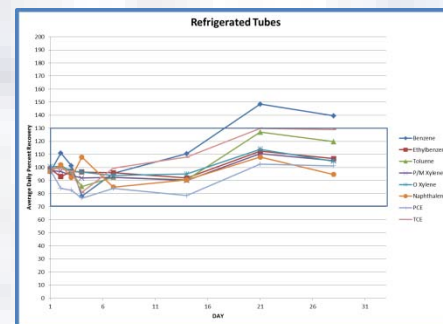


Figure 3

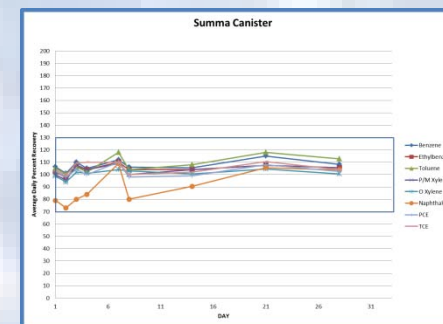


Figure 4

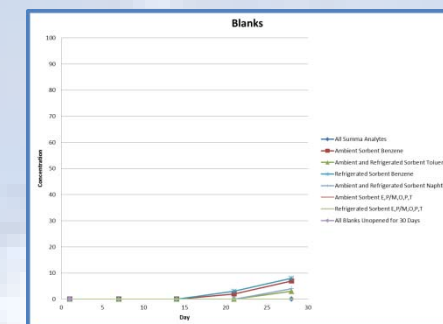


Figure 5

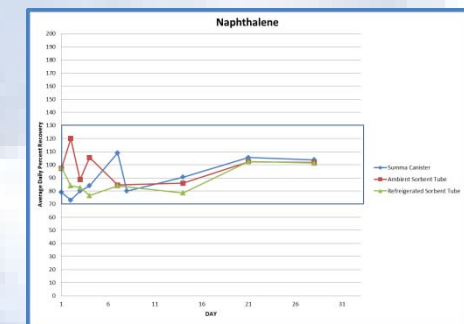


Figure 6