Application Note 104

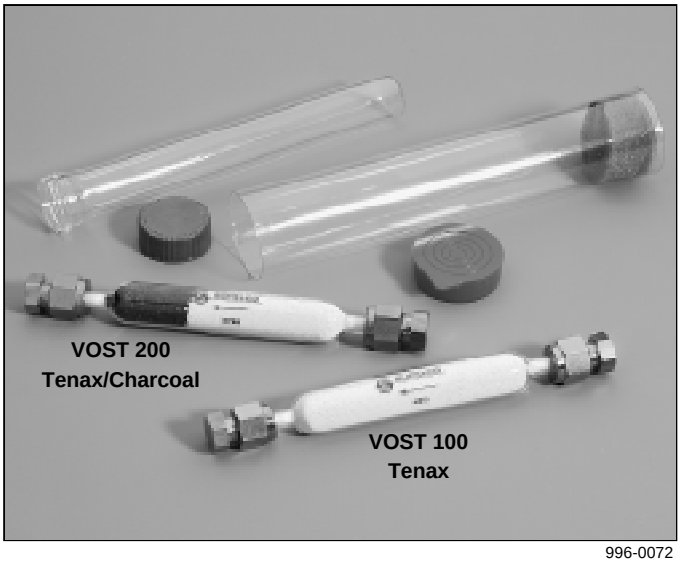
Analysis of Stack Emissions Using VOST Air Sampling Tubes and Capillary GC

United States EPA SW-846, Method 0030, Volatile Organic Sampling Train (VOST), describes the sampling of emissions for volatile compounds from hazardous waste incinerator stacks. Supelco's VOST air sampling tubes are designed to fulfill the method requirements and provide low background levels.

Key Words:
▯ desorption ▯ sampling train ▯ stack gas

VOST air sampling tubes meet the specifications for US EPA SW-846, Method 0030, Volatile Organic Sampling Train, which explains how to sample emissions for volatile compounds (boiling point range 30-100°C) from hazardous waste incinerator stacks. The VOST tubes — VOST 100 and VOST 200 — trap these emissions for thermal desorption and gas chromatography/mass spectrometry (GC/MS) analysis (see Figure A).

Figure A. VOST Tubes With Storage and Shipping Containers



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The high-purity adsorbents used in the VOST tubes provide consistently low background levels. VOST 100 tubes are packed with Tenax® TA 35/60, a porous material based on 2,6-diphenylene oxide polymer that traps volatile and semivolatile compounds and has a low affinity for water and methanol. VOST 200 tubes are packed with Tenax TA 35/60 and petroleum charcoal 20/40 (2:1 by volume). Petroleum charcoal is a naturally occurring adsorbent that traps the more volatile compounds. (See Figure B for a diagram of a VOST tube.)

The two tubes are assembled in a sampling train in series, with the VOST 100 followed by the VOST 200 as a back-up to trap the more volatile compounds. At flow rates between 250-1000mL/min, a total volume of 5-20L of air is collected on each VOST pair. Up to six VOST pairs may be collected from the same source, replacing each pair after a maximum of 20L has been collected.

Following collection, the VOST tubes are thermally desorbed by heating and purging with an inert gas. The effluent is transferred and bubbled into organic-free water in a purge-and-trap system. Analysis is by GC/MS as described in Method 5041, Protocol for Analysis of Sorbent Cartridges from VOST. This analysis technique is used because the sampled tubes may contain high quantities of moisture, which might otherwise present problems in a thermal desorption system. More than the 35 compounds listed in Method 5041 can readily be collected with the VOST tubes. However, low recoveries of polar compounds may result because of poor purging efficiency from water.

Figure B. Structure of a VOST Tube

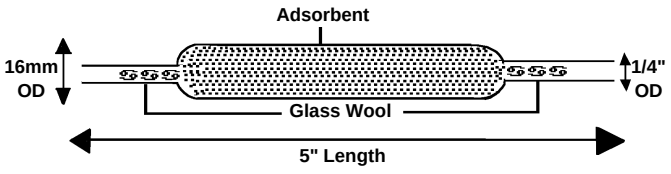

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Figure C. Comparison of Calibration Standard with Spiked VOST Tubes

Sampling Tubes:	VOST 100 (Cat. No. 2-0074) VOST 200 (Cat. No. 2-0075)
Purge Trap:	VOCARB™-4000
Cat. No.:	**20308**
Column:	**SPB™-624, 75m x 0.53mm ID x 3.0µm film**
Cat. No.:	**2-5432**
Oven:	35°C (5min) to 200°C at 10°C/min, hold 2min
Carrier:	helium, 8mL/min
Det.:	FID, 300°C

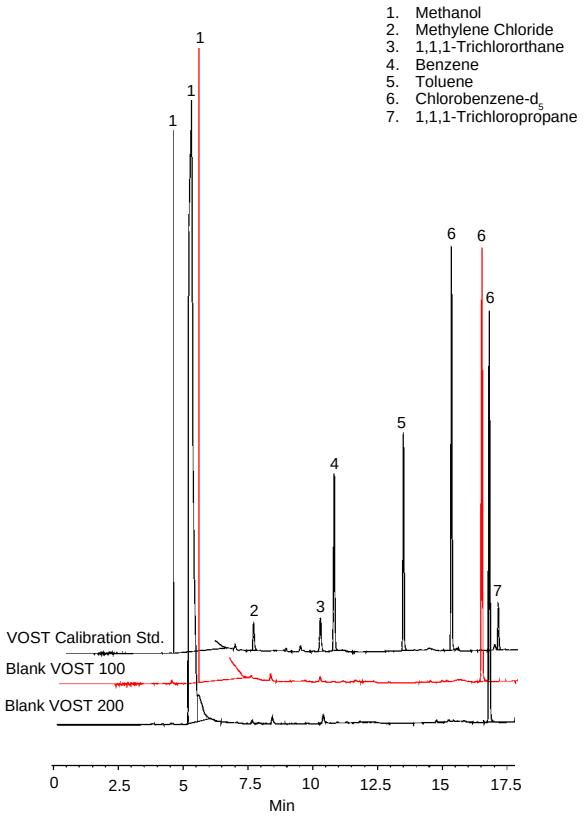

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Table 1. Quality Assurance Specifications

Background:	<20ng single component by GC/FID
Surrogate Recovery:	50-150%
Pressure Drop:	<5 inches water at 50cc/min

Figure C compares a calibration standard at 20ng with blank VOST tubes that have been spiked with 50ng chloro-benzene-d_5 as a surrogate to monitor extraction efficiency. The chromatograms illustrate the high purity of the adsorbent, preconditioned and ready to use. The GC conditions encompass the elution range of the target compounds from the EPA method. Peaks comprising the calibration standard represent the most commonly found adsorbent contaminants.

The VOST tubes are sealed with stainless steel Swagelok® end fittings and enclosed in a screw-capped glass storage container that holds a charcoal packet to maintain sample integrity. The storage container is then packed in a protective flex tube to minimize breakage in shipping. Each batch of VOST tubes is tested for both recovery and background as described in Table 1. In addition, each tube has a certificate of analysis and a unique serial number, which ensures accurate sample identification. Tubes may be reused following conditioning with inert gas flow at temperatures 10-15°C above the desorption temperature.

Supelco has the capability of making VOST tubes to the specification of the customer. Choose your own type of tube material, dimensions or adsorbent. Quotations and prototypes are available upon request. Contact Supelco Technical Service for more information: 800-359-3041 or 814-359-3041.

Ordering Information:

Description	Cat. No.
VOST 100, Tenax TA	**20074-U**
VOST 200, Tenax TA and petroleum charcoal	**20075-U**
Empty Glass Tube, 11.5cm x 16mm ID	**21993**
Glass Storage Container	**21998**
SPB-624 Fused Silica Capillary Column, 75m x 0.53mm ID, 3.0µm film	**25432**
VOCARB-4000	**20308**
Stack Gas Effluents VOC Mix, 200µg/mL, 37 components in methanol:water (80:20)	**47636-U**

Contact our Technical Service Department (phone 800-359-3041 or 814-359-3041, FAX 800-359-3044 or 814-359-5468) for expert answers to your questions.