

EPA 8260: Analysis of Volatile Organic Compounds by GC-MS



Application Note

AN0034

INTRODUCTION

The United States Environmental Protection Agency (US EPA) was established in 1970 with the aim to protect human health and the environment. Since then environmental contamination has been at the forefront of government policy and regulation through US EPA methods for the analysis of environmental pollutants.

EPA 8260 is the standard method for the analysis of volatile organic compounds (VOCs) in ground water and solid waste by purge and trap (P&T) gas chromatography with mass spectrometry (GC-MS). EPA 8260 is a comprehensive method with more than 100 VOCs in the target compound list. The method is used to identify and quantify VOCs, with a boiling point <200°C, in a variety of solid waste matrices, regardless of water content.

The SCION Single Quad (SQ) mass spectrometer has a unique feature, Compound Based Scanning (CBS), for easy automated setup and optimisation of complex mixed mode methods. CBS makes use of libraries that store all the essential information about a compound such as retention time, time window, qualifier and quantifier ions. Compounds are loaded directly into a method, scan times are optimised with data acquisition and processing tables synchronised. Managing large number of SIM acquisitions is made easy in mixed mode.

This application note describes the analytical operating conditions for analysis of US EPA 8260 including Bromofluorobenzene (BFB) tune parameters and calibration details.

EXPERIMENTAL

The SCION 456-GC coupled with the SCION SQ MS and Tekmar Atomx XYZ P&T sample concentrator was used to achieve a highly automated and robust solution for VOC analysis.

Calibration curves were generated using five multi level calibration samples ranging from 24 – 600ppb (µg/L), with four internal standards held at a

constant concentration. The purge and trap and GC-MS parameters are listed in Tables 1 and 2. The purge and trap conditions for EPA 8260 come factory installed on the Atomx.

Table 1. Analytical conditions of the Atomx XYZ Purge and Trap

Variable	Value	Variable	Value
Valve Oven	140°C	Sample Preheat Time/Temp	1 min/45°C
Transfer Line Temp	140°C	Purge Time/Flow	11 min, 40mL/min
Sample Mount Temp	90°C	Desorb Preheat Temp	245°C
Pre-purge Flow	40mL/min	Desorb Time/Temp	2 min, 245°C
Condenser Purge Temp	20°C	Desorb Flow	100mL/min
Bake Time/Temp	2 min, 280°C	Condenser Bake Temp	200°C
Bake Flow	200mL/min		

Table 2. Analytical conditions of the SCION GC and MS

Variable	Value
Injector	S/SL, 1:100, 180°C
Carrier	1 mL/min
Column	SCION 624-MS 30m x 0.25mm x 1.4µm
Oven	40°C (2mins), 10°C/min to 170°C (1min), 50°C/min to 240°C (2mins)
Scan Range	50-300m/z
Manifold Temp	60°C

RESULTS

EPA Method 8260 specifies that the MS must be tuned via analysis of a BFB standard. The SCION SQ was tuned to meet these requirements for spectral resolution of BFB using target ion ratio tuning; built directly into the software. All acceptance criteria was met, thus passing specification as detailed in Table 3.

Table 3. BFB acceptance criteria and obtained values

m/z	Acceptance Criteria	Value
50	15-40% of mass 95	23.0
75	30-60% of mass 95	52.4
95	Base Peak	100
96	5-9% of mass 95	6.1
173	<2% of mass 174	0.5
174	>50% of mass 95	70.0
175	5-9% of mass 174	6.1
176	>95% but <101% of mass 174	97.3
177	5-9% of mass 176	6.1

Figure 1 details the chromatogram of the 120ppb calibration standard.

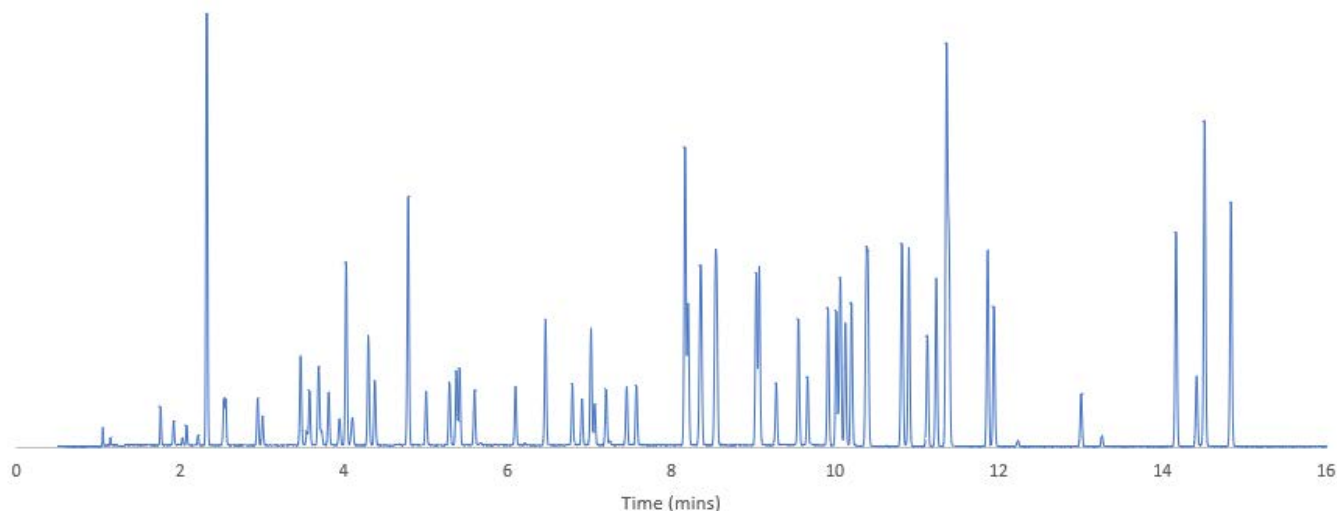


Figure 1. Chromatogram of VOCs in 120ppb calibration standard

CONCLUSION

The Tekmar Atomx XYZ purge and trap sample concentrator coupled with the SCION SQ Mass Spectrometer is a total solution for EPA VOC methods. The method is easily setup for both full scan and SIM methods using the unique Mass Spec Work Station software. Full separation of VOCs was easily achieved over a broad concentration range.