# Increasing Sample Throughput in Method 8260 Using the Novel Oven Design of the Clarus 600 GC/MS

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## Introduction

U.S. Environmental Protection Agency (EPA) Method 8260 – volatile organic analysis by gas chromatography/mass spectrometry (GC/MS) – is one of the most common GC/MS methods performed in environmental laboratories. To increase profits and meet customer needs, many environmental laboratories need to analyze more samples faster, increasing throughput. Achieving high levels of throughput in Method 8260 requires labs to maximize the efficiency of many different steps of the analysis, of which the most important is the GC/MS portion. The technique presented here utilizes modifications to typical instrumental parameters to dramatically increase sample throughput.

## Experimental

The experimental conditions used in this study are summarized in Tables 1 and 2 (Page 2). The largest improvement in throughput was achieved with the use of the fast-cooling capabilities of the PerkinElmer® Clarus® 600 GC. The novel oven design of the Clarus 600 GC allows for the oven to cool from 240 °C to 30 °C and become ready for a subsequent injection in approximately 7 minutes.

Additionally, the PerkinElmer TurboMatrix™ Headspace Trap sample-introduction technology will keep pace with the GC because of its ability to simultaneously equilibrate up to 12 samples; at the moment the GC becomes ready, the TurboMatrix Headspace Trap initiates the next sample analysis.

The analytical standards used in this study were diluted in methanol with the final analytical solutions prepared in reagent water. 10 mL of the final solution was drawn into a 10-mL syringe; internal standards and surrogates were added to the solution while it remained within the 10-mL syringe to reduce volatile losses. 10 mL of the final solution was gently added to each 22-mL headspace vial.



PerkinElmer® precisely.

## Results

The PerkinElmer application note "Measuring Environmental Volatile Organic Compounds by U.S. EPA Method 8260B with Headspace Trap GC/MS" demonstrates the ability of the Clarus GC/MS system to meet and exceed all of the QA/QC parameters necessary for Method 8260 analysis. In addition to meeting QA/QC requirements, laboratories also want to maximize sample throughput. The chromatogram in Figure 1 demonstrates the analysis of a 200-ppb Method 8260 standard. The 0.18-mm id column has reduced the runtime to less than ten minutes including the analysis of a number of atypical analytes, one of which is pentachlorobenzene. Pentachlorobenzene is relatively nonvolatile and demonstrates the ability of this technique to analyze compounds into the semi-volatile range.

*Table 1.* Headspace Sampler Conditions.

| **Headspace Sampler:** | **TurboMatrix HS-Trap 110** |
|---|---|
| Needle Temperature: | 90 °C |
| Transfer Line Temperature: | 200 °C |
| Oven Temperature: | 80 °C |
| Trap Temperature (Low): | 25 °C |
| Trap Temperature (High): | 280 °C |
| Dry Purge Time: | 5.0 min |
| Trap Hold Time: | 5.0 min |
| Desorb Time: | 0.5 min |
| Thermostat Time: | 17 min |
| GC Cycle Time: | 17 min |
| Vial Pressurization Time: | 1.0 min |
| Vial Decay Time: | 2.0 min |
| Outlet Split: | on |
| Column Pressure: | 20 psig |
| Vial Pressure: | 20 psig |
| Desorb Pressure: | 20 psig |
| Transfer Line: | 320 µm |

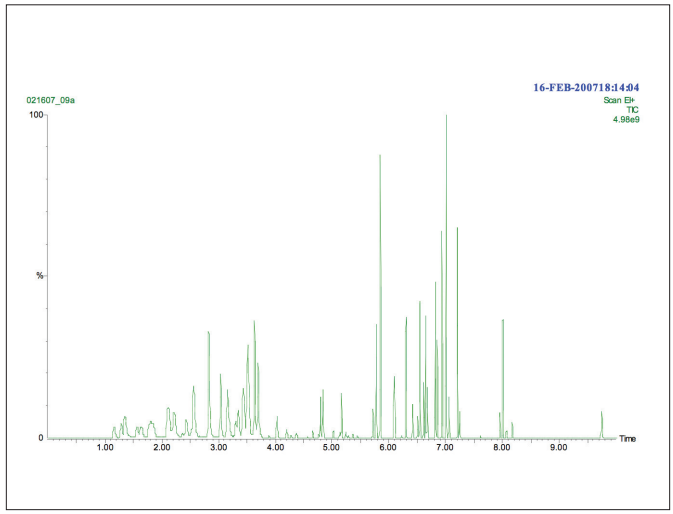


*Figure 1.* Chromatogram of Method 8260 volatile organic standard mix in water at 200 ppb.

*Table 2.* Gas Chromatograph/Mass Spectrometer Conditions.

| **Gas Chromatograph:** | **PerkinElmer Clarus 600 GC** | | |
|---|---|---|---|
| Headspace Connection Type: | Direct Connection | | |
| Analytical Column: | Elite 624 (20 m x 0.18 mm x 1.0 µm) | | |
| Injector Temperature: | 210 °C | | |
| Oven Program: | Temperature | Hold Time | Rate |
| | 30 °C | 0 min | 20 °C/min |
| | 100 °C | 0 min | 30 °C/min |
| | 155 °C | 0 min | 55 °C/min |
| | 240 °C | 2.06 min | End |
| **Mass Spectrometer:** | **PerkinElmer Clarus 600 T MS** | | |
| GC Inlet Line Temperature: | 250 °C | | |
| Ion Source Temperature: | 250 °C | | |
| Function Type: | Full Scan | | |
| Scan Range: | m/z 35-300 | | |
| Scan Time: | 0.2 sec | | |
| Interscan Delay: | 0.1 sec | | |

## Conclusion

The improvements in throughput were achieved with the use of a narrow-bore column (0.18 mm id) and fast oven cooling. The cycle time of this modified method is approximately 17 minutes, including pentachlorobenzene. A more standard Method 8260 list would conclude with the final component of 1,2,3-trichlorobenzene, reducing the chromatographic run time to 8.25 minutes, and the injection-to-injection time to 15.5 minutes. A cycle time of 15.5 minutes achieves more than 45 runs per 12-hour analytical QA/QC "clock". The increase in throughput is clearly apparent when you compare this injection-to-injection time to a typical cycle time of approximately 25 minutes, achieving 29 samples per 12 hours.

The technique demonstrated here will not only allow the laboratory to meet all of the QA/QC requirements of Method 8260, but also increase its instrumental throughput by nearly 50%.

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