

Maximizing Speed and Separations for Semi-Volatile Analysis on the DSQ II GC/MS Using EPA Method 8270D

Jessie Butler, Jason Cole, Eric Phillips, Thermo Fisher Scientific, Austin, TX, USA

Overview

Environmental laboratories that perform EPA Method 8270D on a daily basis require instruments that can run at maximum efficiency. The use of a split injection method with the DSQ™ II GC/MS makes it possible for laboratories to significantly increase productivity. This method lowers the cost of analysis by decreasing the frequency of instrument maintenance and extending the lifetime of consumable parts. Productivity is further enhanced when laboratories utilize the comprehensive and user-friendly EnviroLab™ Forms 2.0 software package to easily generate reports.

Results

The analysis time of the 120 base neutral and acid (BNA) target compounds and internal standards was less than 20 minutes, as measured from injection to detection of the final eluting compound. Over a concentration range of 5 to 160 ng/μL, the 120 BNA compounds analyzed had an average RSD of 7%. The average method detection limit (MDL) at a 99% confidence level was 0.11 ng/μL. Ten replicate injections were made at 50 ng/μL, which resulted in an average RSD of 2.0% for the 120 target compounds.

Methods

In full-scan mode, the DSQ II has excellent sensitivity, which allows a split injection to be utilized, thus diverting the bulk of the sample matrix away from the analytical column and mass spectrometer. A 1 μL injection was made in the split mode with a 60 mL/min split flow and a 3 mL/min column flow. The method used a hot needle style injection. A 5% phenyl 95% dimethylpolysiloxane phase TRACE™ TR-8270 column with dimensions of 30 m x 0.25 mm and a film thickness of 0.5 μm was used (Thermo Scientific P/N 26RF223P). The mass spectrometer was tuned automatically using Target Tuning software to meet DFPPP tuning criteria. The TIC for the mid-level standard is shown in Figure 1. Typical response factors for the Continued Calibration Compounds are listed in Table 1 from the calibration curve.

Data was acquired using Xcalibur™ instrument control software and then processed automatically using the EnviroLab Forms 2.0 software. A master method is available for each EPA Method and reports can be saved in *.pdf, *.doc, *.xls, or *.rtf format. Reports can also be uploaded to a laboratory information management system (LIMS) using XML format.

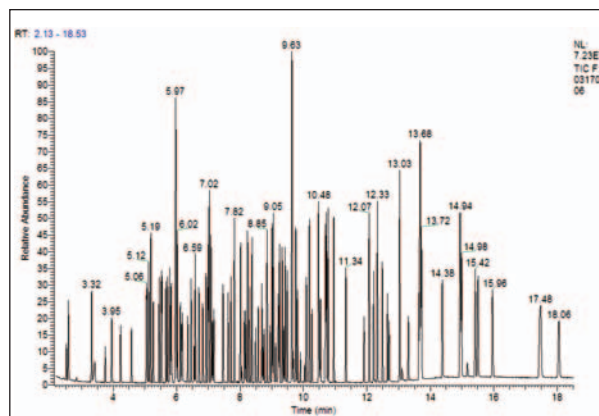


Figure 1: TIC of mid-level standard (40 ng/μL)

| Compound Name | Avg. RF | % RSD |
|-----------------------|---------|-------|
| Phenol | 2.282 | 4.70 |
| 1,4-Dichlorobenzene | 1.654 | 2.19 |
| 2-Nitrophenol | 0.128 | 8.50 |
| 2,4-Dichlorophenol | 0.256 | 8.63 |
| Hexachlorobutadiene | 0.120 | 2.58 |
| 2,4,6-Trichlorophenol | 0.330 | 10.88 |
| Acenaphthene | 1.201 | 1.63 |
| Diphenylamine | 0.774 | 1.88 |
| Pentachlorophenol | 0.087 | 9.10 |
| Fluoranthene | 1.212 | 3.82 |
| Di-n-octylphthalate | 1.846 | 14.30 |
| Benzo(a)pyrene | 1.207 | 7.13 |

Table 1: Typical Response Factors for CCCs

Key Words

- DSQ II GC/MS
- EnviroLab Forms 2.0 Software
- Split Injection Method
- US EPA Method 8270D

Conclusion

This method provides fast chromatography while maintaining excellent separations of the chromatographic peaks. The DSQ II successfully met the QC criteria for EPA Method 8270D in the split mode of injection using the TRACE GC Ultra™. During the analysis of over 2,000 samples, only one liner change was required to maintain excellent peak shape, and no DDT breakdown was observed. The carrier gas flow rate through the column provides increased column capacity which maintains chromatographic peak shape even for the high level standards. In addition, this decreases the residence time in the column thus minimizing the interaction of active compounds with active sites in the stationary phase. Combined with a fast scanning rate, this solution features excellent separation and short run times while enabling the analysis of more samples in each 12 hour shift.

EnviroLab Forms 2.0 software matches the workflow in environmental laboratories around the world, is simple to use, and allows novice users to be instantly productive. Now, adding a DSQ II system to an existing laboratory workflow is easier than ever.

For detailed information on the instrument and processing parameters, as well as calculated values for all compounds in the list, for method 8270 please visit our website at www.thermo.com/gc and request TN10140.

References

1. EPA Method 8270D Semi-volatile Organic Compounds by Gas Chromatography/Mass Spectrometry, Rev. 4 1998.
2. Environmental and Food Safety Kits Product Specification Sheet. Thermo Fisher Scientific Inc.

In addition to these offices, Thermo Fisher Scientific maintains a network of representative organizations throughout the world.

Australia

+61 2 8844 9500

Austria

+43 1 333 50340

Belgium

+32 2 482 30 30

Canada

+1 800 532 4752

China

+86 10 5850 3588

Denmark

+45 70 23 62 60

France

+33 1 60 92 48 00

Germany

+49 6103 408 1014

India

+91 22 6742 9434

Italy

+39 02 950 591

Japan

+81 45 453 9100

Latin America

+1 608 276 5659

Netherlands

+31 76 587 98 88

South Africa

+27 11 570 1840

Spain

+34 91 657 4930

Sweden/Norway/ Finland

+46 8 556 468 00

Switzerland

+41 61 48784 00

UK

+44 1442 233555

USA

+1 800 532 4752

www.thermo.com



Thermo Fisher Scientific,
Austin, TX USA is ISO Certified.

©2007 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of Thermo Fisher Scientific Inc. and its subsidiaries.

Specifications, terms and pricing are subject to change. Not all products are available in all countries. Please consult your local sales representative for details.

AN10164_E 02/07M