Global Analyser Solutions

HYDROCARBON TYPE ANALYSIS OF WASTE PLASTIC PROCESS OIL USING GC-VUV

PF250

VUV ANALYTICS

- ASTM D8519
- For waste plastics process oil (WPPO)
- Saturates, olefins, styrenes, mono-, di-, tri+ aromatics, total aromatics and PAHs

Get ready for ***tomorrow's analytics***

Hydrocarbon type analysis for plastic recycling

The chemical composition of waste plastics process oil (WPPO) is an important indicator of process performance and product quality in plastic recycling. The proportions of saturates, olefins, styrenes and aromatic hydrocarbons provide valuable information for optimisation of pyrolysis and depolymerisation processes and for evaluating the suitability of WPPO as feedstock for downstream refining or chemical production. ASTM D8519 introduces a modern GC-VUV method that combines gas chromatography with vacuum ultraviolet spectroscopy to identify and quantify hydrocarbon classes, even when chromatographic peaks overlap.

ASTM D8519

Waste plastic process oils contain thousands of hydrocarbons originating from polyethylene, polypropylene, polystyrene and mixed plastic waste streams. Conventional GC analysis often cannot resolve all overlapping compounds.

ASTM D8519 overcomes this limitation by combining chromatographic separation with VUV spectral deconvolution. Each time interval of the chromatogram is analysed independently using compound-class spectra and automated deconvolution algorithms. Co-eluting compounds are identified and quantified without requiring complete chromatographic separation. Results are reported as mass% and volume%. The working range is:

Total Aromatics:	%Mass 1 to 50
Monoaromatics:	%Mass 1 to 50
Diaromatics:	%Mass 1 to 15
Tri-plus aromatics:	%Mass 0.5 to 5
PAH:	%Mass 0.5 to 15
Saturates:	%Mass 5 to 99
Olefins:	%Mass 1 to 80
Conjugated diolefins:	%Mass 0.2 to 5
Styrenes:	%Mass 0.2 to 5

Automated spectral analysis

The analysis is fully automated using VUV Analyze™ software. After data acquisition, the chromatogram is divided into small time intervals. For every interval the recorded VUV spectrum is compared with an extensive spectral library, allowing overlapping compounds to be deconvoluted, identified and quantified automatically. This approach provides reliable hydrocarbon class analysis without complex multidimensional GC systems or extensive manual data processing.

Instrument specification

- Thermo Trace GC1600 with InstantConnect PTV (Programmable Temperature Vaporiser), capillary column and VUV VGA-100 detector
- VUV-Analyze™ software
- Runtime 34 minutes

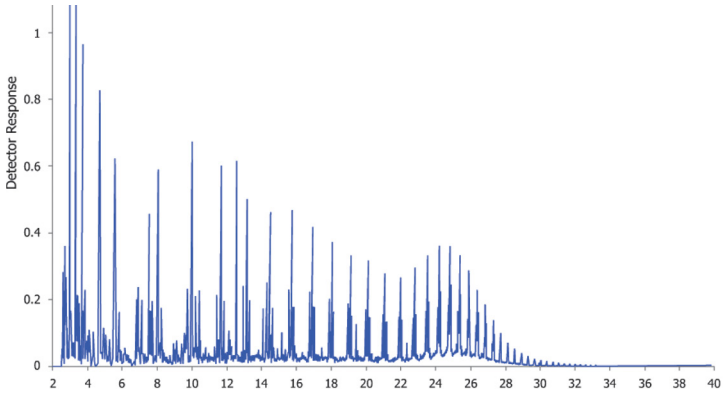

Figure 1 Waste Plastic Process Oil Chromatogram

C#	Total Saturates	Total Olefins	Conjugated Dienes	Total Styrenes	Total Aromatics	Total PAHs	Total Mono-Aromatics	Total Di-Aromatics	Total Tri(+)-Aromatics	Totals
C3	0.005	0.075								0.080
C4	0.036	0.321	0.117							0.357
C5	0.250	1.387	0.451							1.638
C6	0.658	3.812	0.846		2.210		2.210			6.679
C7	0.781	5.758	0.790		1.790		1.790			8.329
C8	1.381	4.526	0.502	0.733	0.946		0.946			7.586
C9	1.147	6.868	0.428	0.384	1.254		1.254			9.652
C10	1.558	2.811	0.083		1.111	0.677	0.434	0.677		5.480
C11	1.473	3.202			0.507	0.217	0.290	0.217		5.182
C12	0.669	4.188			0.481	0.318	0.164	0.318		5.338
C13	1.205	1.619			0.482	0.225	0.257	0.225		3.306
C14	1.346	2.731			0.571	0.395	0.175	0.241	0.154	4.647
C15	0.817	1.672			0.373	0.161	0.212	0.060	0.101	2.863
C16	0.742	3.024			0.337	0.197	0.140	0.036	0.161	4.103
C17	0.705	1.480			0.231	0.086	0.146	0.047	0.039	2.416
C18	0.630	2.311			0.262	0.173	0.089	0.102	0.071	3.202
C19	0.681	1.492			0.092	0.036	0.056	0.036		2.265
C20	0.738	1.600			0.111	0.086	0.024	0.086		2.449
C21	0.702	1.545			0.129	0.064	0.064	0.064		2.375
C22	1.000	1.794			0.081	0.046	0.035	0.046		2.876
C23	0.986	2.112			0.098	0.021	0.077	0.021		3.196
C24	1.383	1.894			0.063	0.001	0.062	0.001		3.339
C25	1.212	1.816			0.001	0.001		0.001		3.029
C26	0.660	1.805			0.003	0.003		0.003		2.467
C27	0.486	1.432			0.015	0.000	0.015	0.000		1.933
C28	0.365	1.040								1.406
C29	0.258	0.758								1.015
C30	0.190	0.464								0.653
C31	0.137	0.438			0.005		0.005			0.579
C32	0.098	0.263								0.361
C33	0.067	0.209								0.275
C34	0.052	0.195								0.247
C35	0.040	0.126			0.016		0.016			0.182
C36	0.034	0.099			0.000		0.000			0.133
C37	0.026	0.078								0.104
C38	0.021	0.043			0.000		0.000			0.063
C39	0.014	0.030								0.043
C40	0.013	0.021								0.035
C41	0.010	0.015								0.025
C42		0.021								0.021
C43		0.017								0.017
C44		0.013								0.013
C45		0.010								0.010
C46		0.007								0.007
C47		0.007								0.007
C48	0.000	0.008								0.009
C49		0.008								0.008
Totals	22.575	65.140	3.217	1.117	11.168	2.707	8.461	2.180	0.527	100.000

Figure 2 Mass% table

Ordering information	PF25X - ABCDE			
code X	0	1	2	3
GC model, power	1600, 230V	1610, 230V	1600, 115V	1610, 115V

For the selection of options (e.g. GC oven cryo valves, Power plug type and more), see the options table in the order guide.

About GAS

Global Analyser Solutions provides GC & GC-MS solutions for Energy, Refinery, Chemical and Environmental markets. Our analysers address a broad spectrum of measuring requirements with high precision and reliability. Please reach out for more information on our website. www.gassite.com