

Application Data Sheet

No.3

GC

Gas Chromatography

Analysis of Diesel Oil Samples in Compliance with ASTM D2887 Using the Shimadzu Simulated Distillation Gas Chromatograph System

In the ASTM D2887 test method, petroleum products with a boiling point range of 538 °C (C44 or equivalent) or lower are analyzed by GC system utilizing the total area method.

The Shimadzu GC-2010 Plus based distillation gas chromatograph system with LabSolutions software is compliant with ASTM D2887, and combines comfortable operability with high-level functionality.

This data sheet introduces an example of the simulated distillation GC analysis of diesel oil in compliance with ASTM D2887, utilizing the Shimadzu simulated distillation gas chromatograph system.

Instruments Used and Analysis Conditions

Instruments Used

Software	LabSolutions Distillation GC Analysis Software
Gas chromatograph	GC-2010 Plus AF
Direct injection unit	WBI-2010
Auto injector	AOC-20i

Analysis Conditions

Column	BPX 1-Sim Dist 0.53 mm ×10 m, 0.9 μ m
Column temperature	35 °C - 15 °C /min - 350 °C (5 °C)
Carrier gas flow rate	7 mL/min (helium)
Injection port temperature	350 °C
FID temperature	380 °C
Makeup gas flow rate	30 mL/min
Hydrogen flow rate	40 mL/min
Air flow rate	400 mL/min
Injection volume	0.4 μL

Results

1. Analysis of Standard Solutions for Calibration

Two standard solutions were measured, one a mixture of n-C5 to n-C10, and one a mixture of everything from n-C10 to n-C44.

Fig. 1 shows a chromatogram consisting of an overlay of the two data sets.

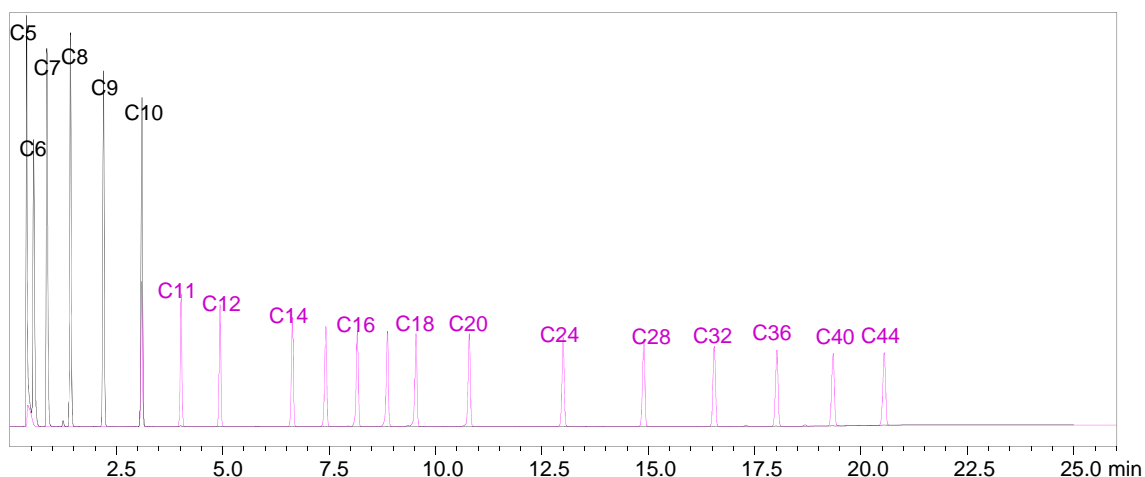


Fig. 1: Chromatogram of the Standard Solutions for Calibration

2. Analysis of the Diesel Oil Sample

Fig. 2 shows the chromatogram for the diesel oil.

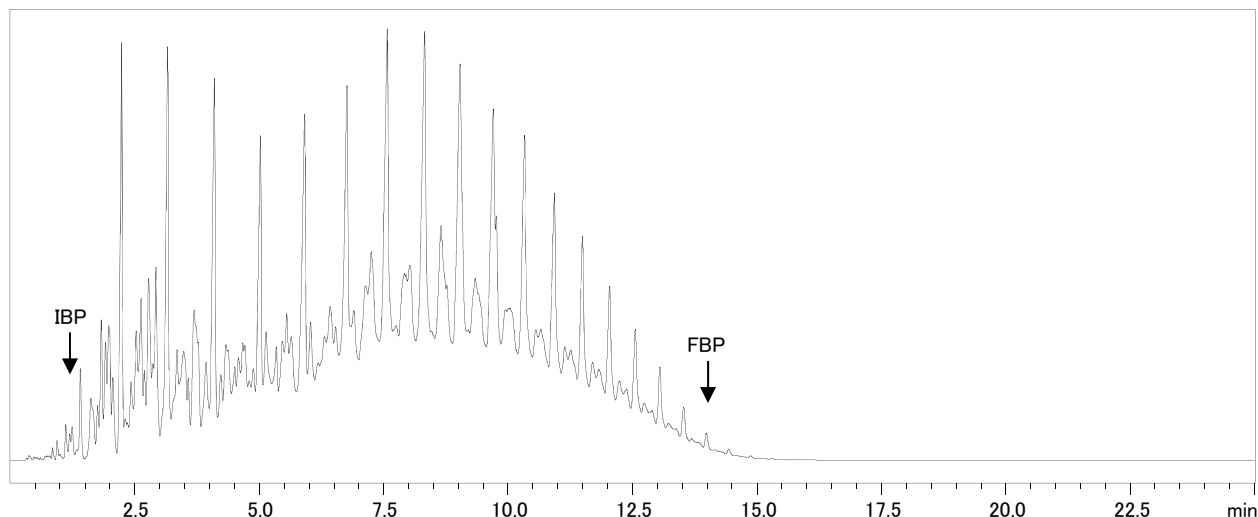


Fig. 2: Diesel Oil Chromatogram

The ASTM reference gas oil (Lot 2) was measured, the distillation characteristics were calculated, and a comparison was made with the standard values provided with the reference gas oil (Table 1). The Shimadzu distillation gas chromatograph system amply met the criterion for inter-laboratory parallel tolerance specified by ASTM D2887, and demonstrated favorable inter-laboratory repeatability.

The respective distillation characteristic curves are shown in Fig. 3. With the LabSolutions distillation GC analysis software, it is possible to display a comparison of distillation characteristic curves for up to 16 samples, simplifying everyday product data management and comparisons with previously accumulated data.

Table 1: Distillation Characteristics for ASTM D2887 Reference Gas Oil (Lot 2)

Distillate volume (mass %)	Standard Diesel Oil Standard Value	Standard Diesel Oil Measured Value	Difference (Measured Value – Standard Value)	Inter-Laboratory Parallel Tolerance
IBP	115	114	-1.3	7.6
5	151	151	0.2	3.8
10	176	175	-0.8	4.1
15	201	201	-0.5	4.5
20	224	224	0.0	4.9
25	243	244	0.5	-
30	259	260	0.7	4.7
35	275	275	0.2	-
40	289	290	0.9	4.3
45	302	304	1.7	-
50	312	313	1.2	4.3
55	321	323	1.5	-
60	332	333	1.4	4.3
65	343	344	1.1	-
70	354	355	0.8	4.3
75	365	367	1.7	-
80	378	379	1.0	4.3
85	391	393	1.5	-
90	407	408	0.7	4.3
95	428	429	1.2	5.0
FBP	475	474	-0.9	11.8

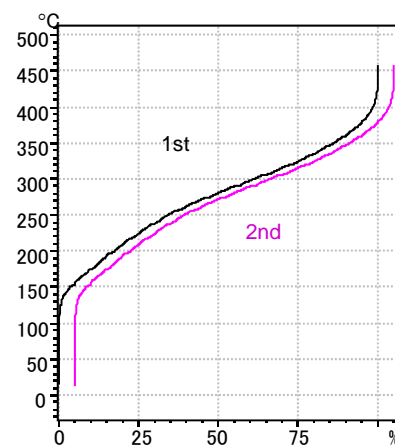


Fig. 3: Distillation Characteristic Curves
For comparison, the second is shown shifted.