

# 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.

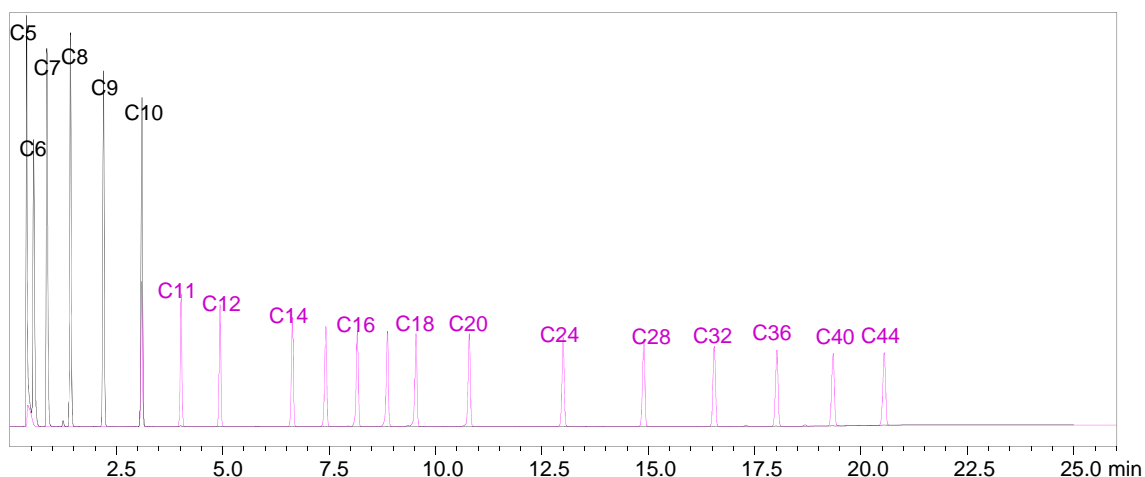


Fig. 1: Chromatogram of the Standard Solutions for Calibration

## 2. Analysis of the Diesel Oil Sample

Fig. 2 shows the chromatogram for the diesel oil.

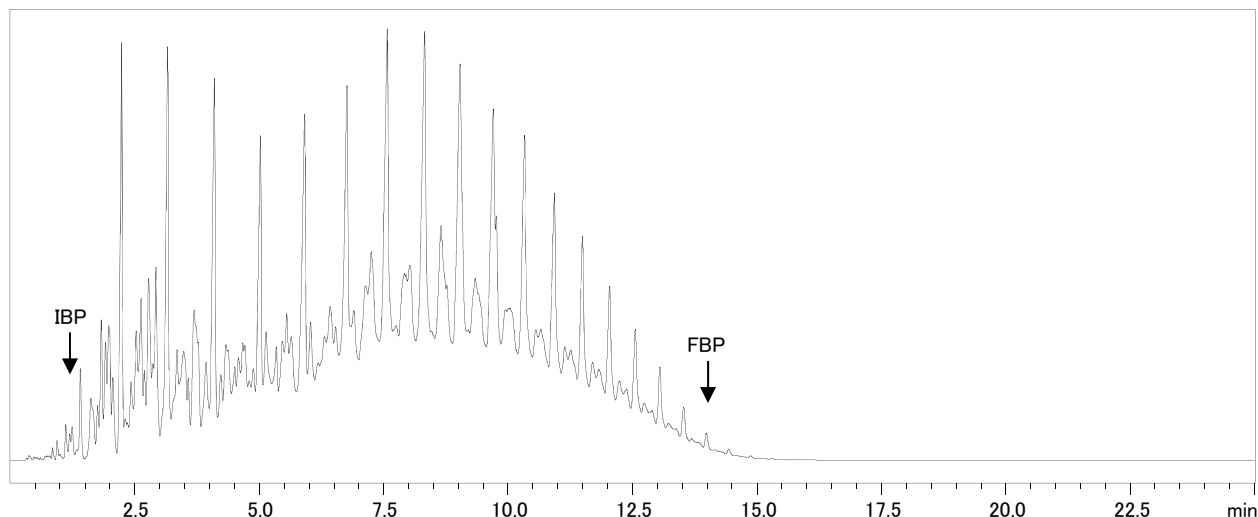


Fig. 2: Diesel Oil Chromatogram

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

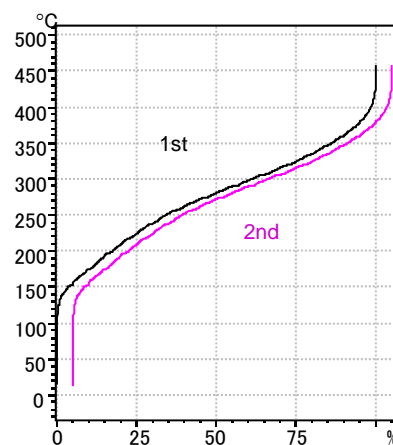


Fig. 3: Distillation Characteristic Curves  
For comparison, the second is shown shifted.