



Da Vinci
LABORATORY SOLUTIONS



DVLS SimDist Solutions



Automated Solutions for Simulated Distillation

DVLS SimDist Analyzers

Distillation is the most widely used separation process in the petroleum industry. Knowledge of the boiling point distribution of crude oils and finished products is essential for quality control, environmental compliance and refinery process control.

Conventional distillation tests such as ASTM D86, D1160, D2892 and D5236 determine the true boiling point distribution of crude oils and their products, but are time consuming and labor intensive.

The gas chromatographic simulation methods determine the boiling point distribution but require a shorter analysis time and less operator involvement. The technique of simulated distillation separates individual hydrocarbon components in the order of their boiling points.

Da Vinci Laboratory Solutions offers a range of SimDist analyzers that determine the boiling point distribution up to 750°C and report the properties of petroleum streams.



Key Benefits

- **High Quality GC Hardware**
All SimDist Analyzers are based upon the flexible, reliable Agilent 8890 GC configured with dedicated columns, inlets and detectors.
- **Complete Analyzer Range**
The SimDist analyzers comply with all standard test methods of ASTM, DIN, EN, IP and ISO to provide a boiling point distribution up to 750°C.
- **Dedicated SimDist Inlet**
The Programmable Temperature Inlet developed by Da Vinci optimizes the peak shape and makes the column/liner connection easier.
- **Proven software platform**
The analyzers include the PetroReporter software that automates the data processing and reporting of the properties of petroleum streams. PetroReporter is successfully used by a global installed base of leading oil refineries.
- **Accurate characterization of crude oils**
To improve the boiling point characterization of crude oils the DVLS PetroReporter merges the High Temp SimDist with a capillary GC (DHA) analysis.
- **Application Guarantee**
Each analyzer is tested according to the in-house testing procedures to check the system performance and to verify the analyzer specification by a reference sample test. Factory Acceptance Test will be scheduled upon request.

Complete Range of GC Solutions for Simulated Distillation

High Quality GC Hardware

Each DVLS SimDist analyzer is based upon the Agilent 8890 Gas Chromatograph (GC) with built-in intelligence and electronic pneumatic control (EPC).

The Agilent GC is configured for a test method with the required hardware and software components:

- GC programmable temperature sample inlet
- GC column
- Calibration, reference or quality control samples
- PetroReporter software

ASTM, DIN, EN, IP and ISO Compliance

The SimDist analyzers comply with all standard test methods of ASTM, DIN, EN, IP and ISO and provide a true boiling point distribution up to 750°C.



Figure One: SimDist Hardware configuration

Test Method	ASTM D7096	ASTM D2887 IP 406 ISO 3924	ASTM D5442	ASTM D7213	ASTM D7398	ASTM D 6352	ASTM D7169	ASTM D7500	ASTM D7900
Carbon #	< C16	< C44	nC17 -nC44	< C60	< C18 FAMES	< C90	< C120	< C110	C1-C9
FBP (°C)	≤ 280	≤ 545	≤ 545	≤ 615	≤ 615	≤ 700	≤ 750	≤ 735	NA
Sample Types	• Gasoline • Liquid gasoline blending components	• Jet Fuel • Diesel Fuel	• Wax • Alkane Profile	• Lube oil base stocks	• FAMES	• Lube oil base stocks	• Vacuum Residues • Crude Oil	• Distillates • Lube oil base stocks	• Crude oil

Test Method	DIN 51.435	IP 480 Type A EN 15199-1	IP 507 EN 15199-2	IP 545 EN 15199-3
Carbon #	<C60	<C120	C120	C120
FBP (°C)	≤ 615	≤ 750	≤ 750	≤ 750
Sample Types	Lube oil base stocks	• Lube oil base stocks • Mid Distillates	• Residues • Heavy Distillates	Crude Oil

Automation of Analysis Results

Universal Software Tool

The Agilent 8890 Series GC is controlled by Agilent OpenLab software. The DVLS PetroReporter software automates the data processing and reporting for various SimDist applications. After data processing PetroReporter creates the required SimDist reports. Thanks to the universal setup the analyst could also use PetroReporter to process and report data for DHA, FAME and Gas Calculation applications.

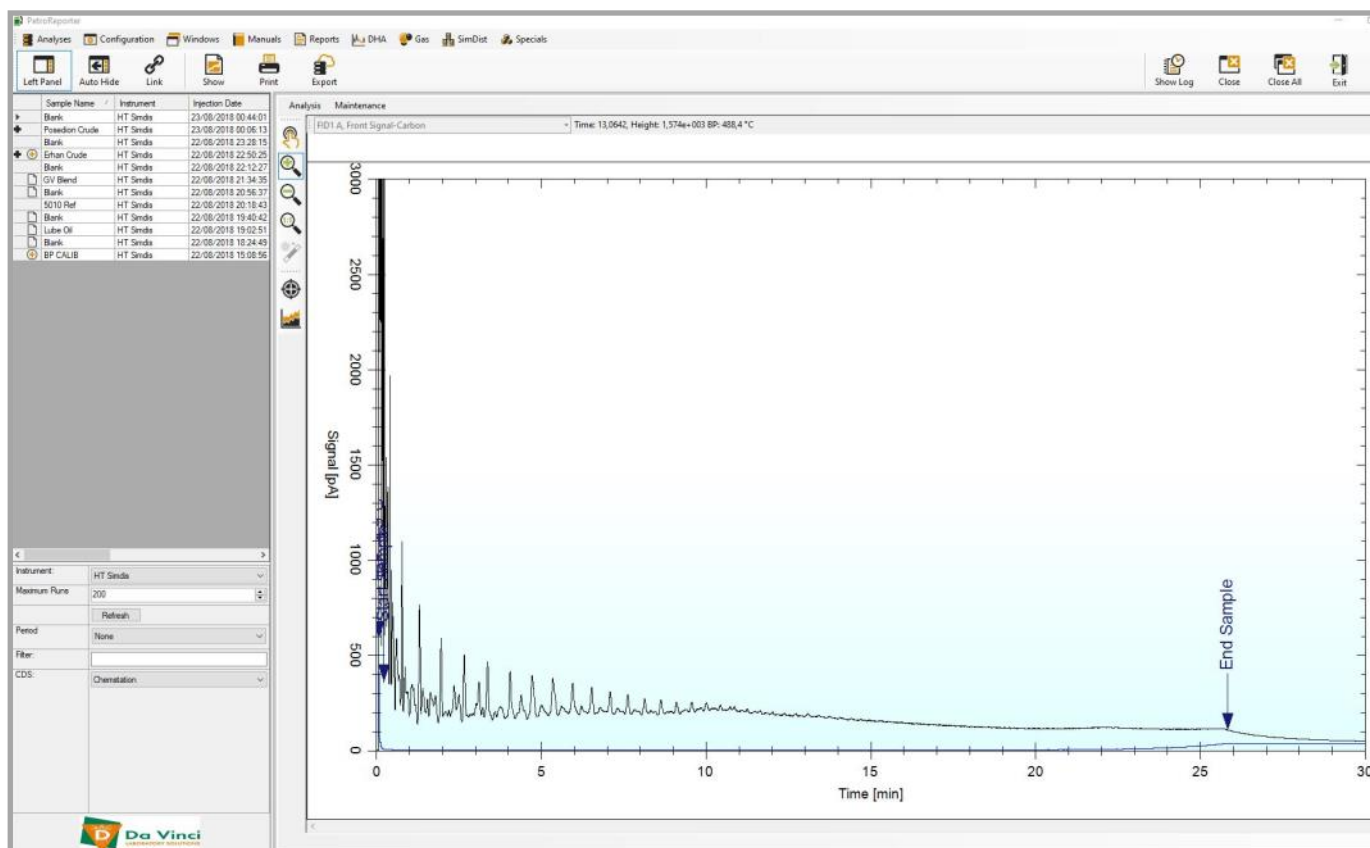


Figure Two: PetroReporter Analysis Screen of a Crude oil analysis

Multi CDS Compatibility

DVLS PetroReporter is compatible with following chromatographic data systems of major suppliers including:

- OpenLAB 2.x
- OpenLAB Chemstation
- OpenLAB EZChrom
- Other CDS interfaces on request such as:
 - Atlas
 - Chromeleon
 - Clarity
 - Compass
 - Totalchrom

Client/Server or Standalone Configuration

PetroReporter can be used either stand-alone or in a network configuration. The client/server architecture of the software allows to process the analysis data from any PC workstation.

- Method selection by application
- Selection of instruments connected to PetroReporter
- Authorization level selection



Sample Presets

Predefined settings per sample, databases and formulas optimize the identification of the petroleum samples.

User-friendly editors allow to customize the settings on-screen. Just edit the components of the calibration sample by Dragging and Dropping the components onto the chromatogram.

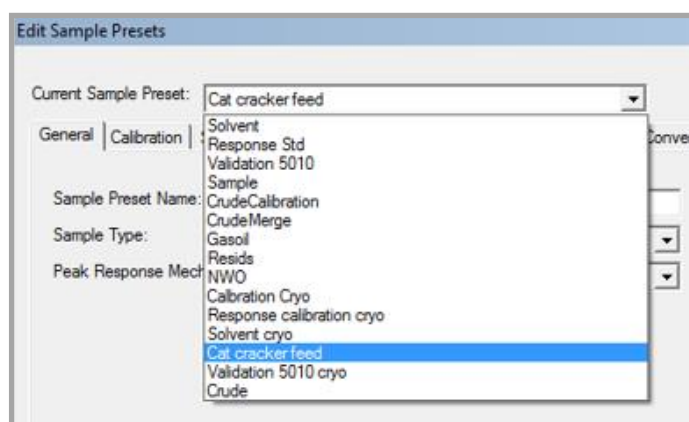


Figure Three: Sample Presets

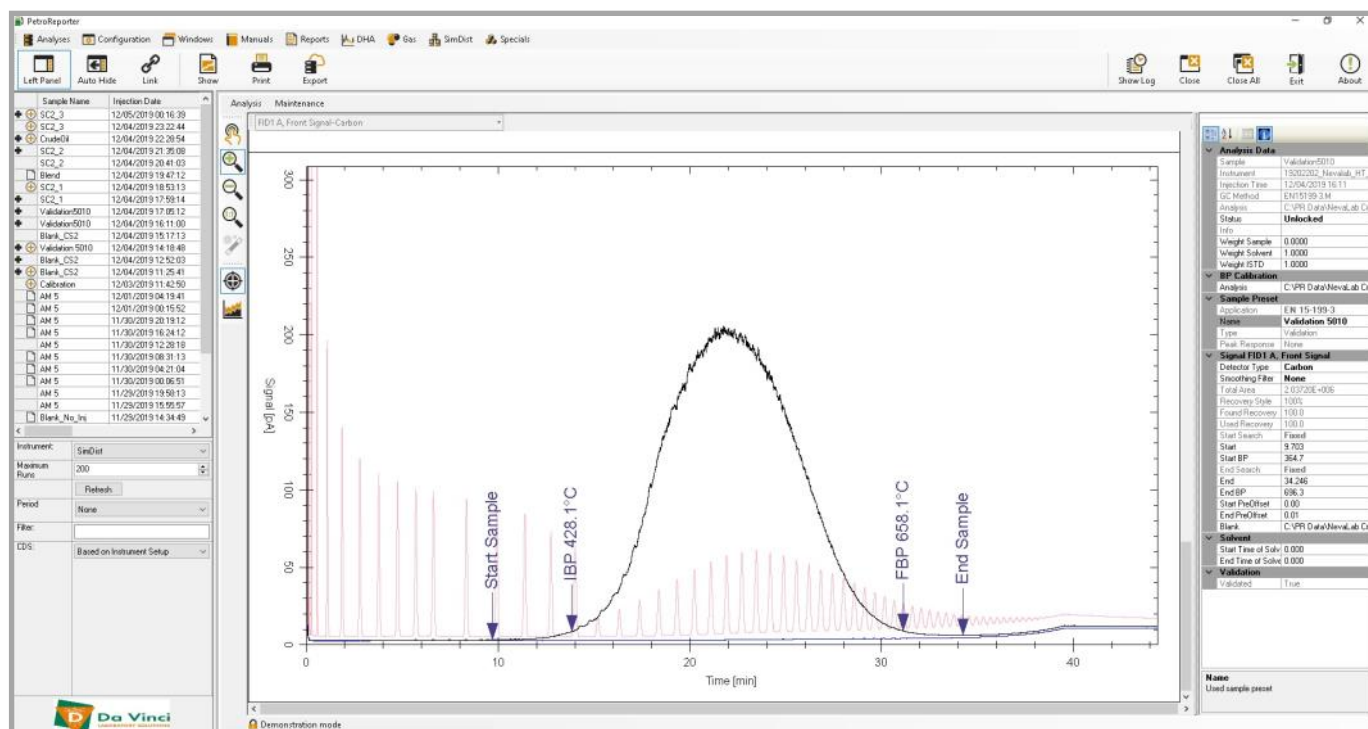


Figure Four: EN15199-3 Calibration & Validation Sample analysis

Automation of Analysis Results

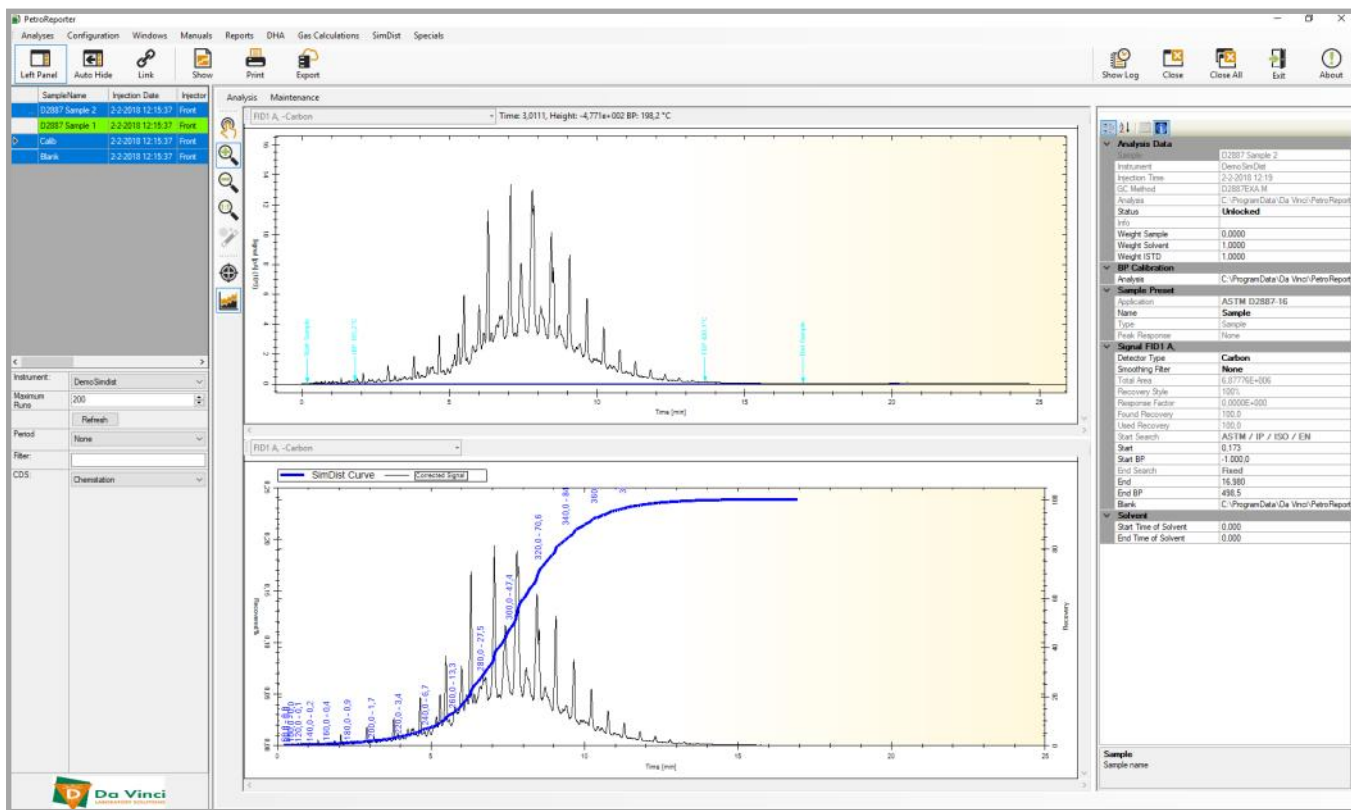


Figure Six: ASTM D2887 Analysis of Light Diesel

Extensive Report Options

The PetroReporter software assists the analysts in reporting the petrochemical properties:

- Alkane Profile report
- Chromatogram
- Cut Point Distribution report
- Flash Point Correlation report
- Motor Oil Volatility report
- Noack Evaporation Loss report
- Distillation Percent report
- Distillation Boiling Point report
- Volume Correlation report for (customizable) ASTM D86, ASTM D86/STP 577 or ASTM D1160
- Volume Correlation report (customizable)
- Volume Cut Point report (customizable)

Special Reporting Options

☐ Page Break Before

☒ Flash Point:

ASTM D56 Flashpoint
ASTM D56 Flashpoint
ASTM D93 Flashpoint
ASTM D3984 Flashpoint

☐ Motor Oil Volatility (ASTM)

Noack Evaporation loss (DIN 51.581)

☐ Report

Reference Value:

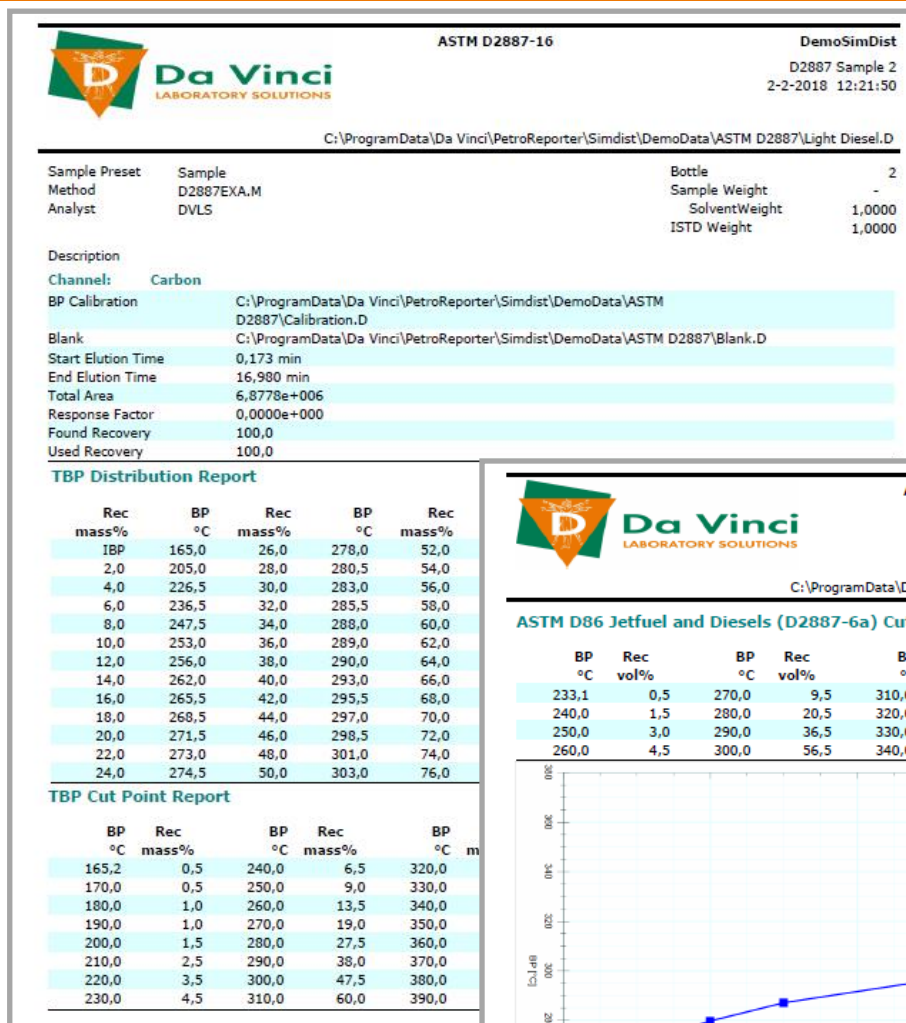
0.00

Figure Seven: Special Reporting Options

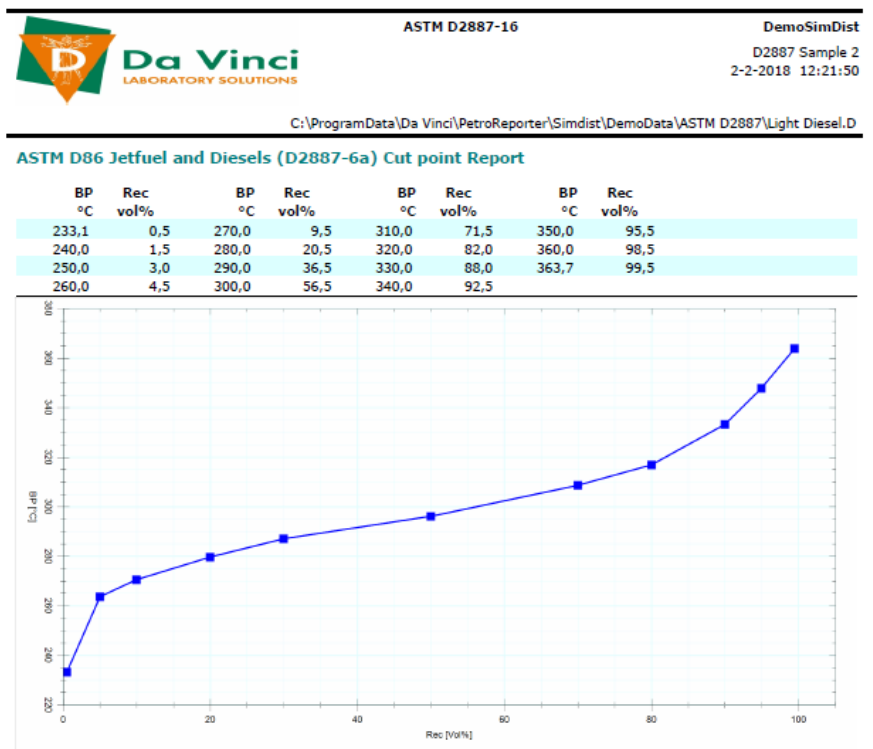
General	Calibration	Signal Processing	General Reports	Distillation Reports	Other Reports	Validation Report	Exporting
TBP Distillation Percent ☒ Show Report ☐ Page Break Before Percent Interval: 5.0				Alkane Profile ☒ Show Report ☐ Page Break Before First Carbon: 17 Last Carbon: 44 Peak Width: 0.2			
TBP Distillation Temperature ☒ Show Report ☐ Page Break Before Boiling Point Interval: 20.0				Volume Correlation ☒ Show Report ☐ Page Break Before Use Model: ASTM D86 Jetfuel and Diesels (D2887-6a)			

Figure Eight: Distillation Report Options

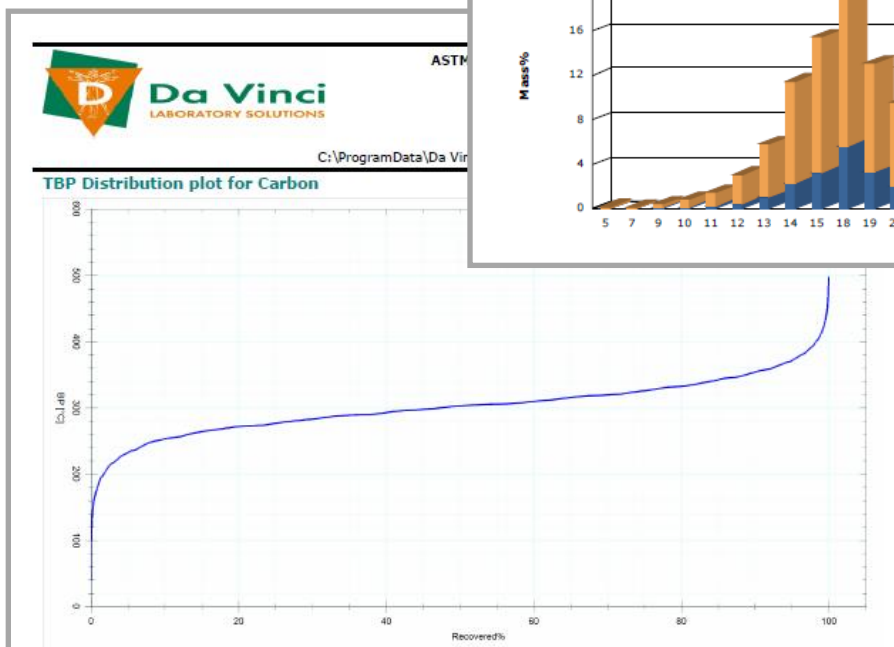
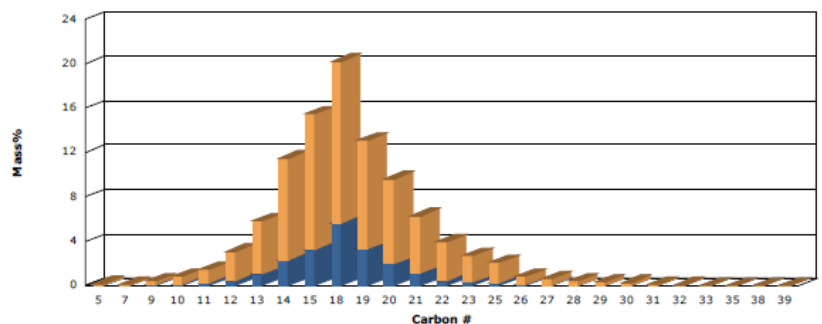
DVLS PetroReporter



Figures Nine - Eleven:
Various reports of the ASTM
D2887 analysis of a Light Diesel

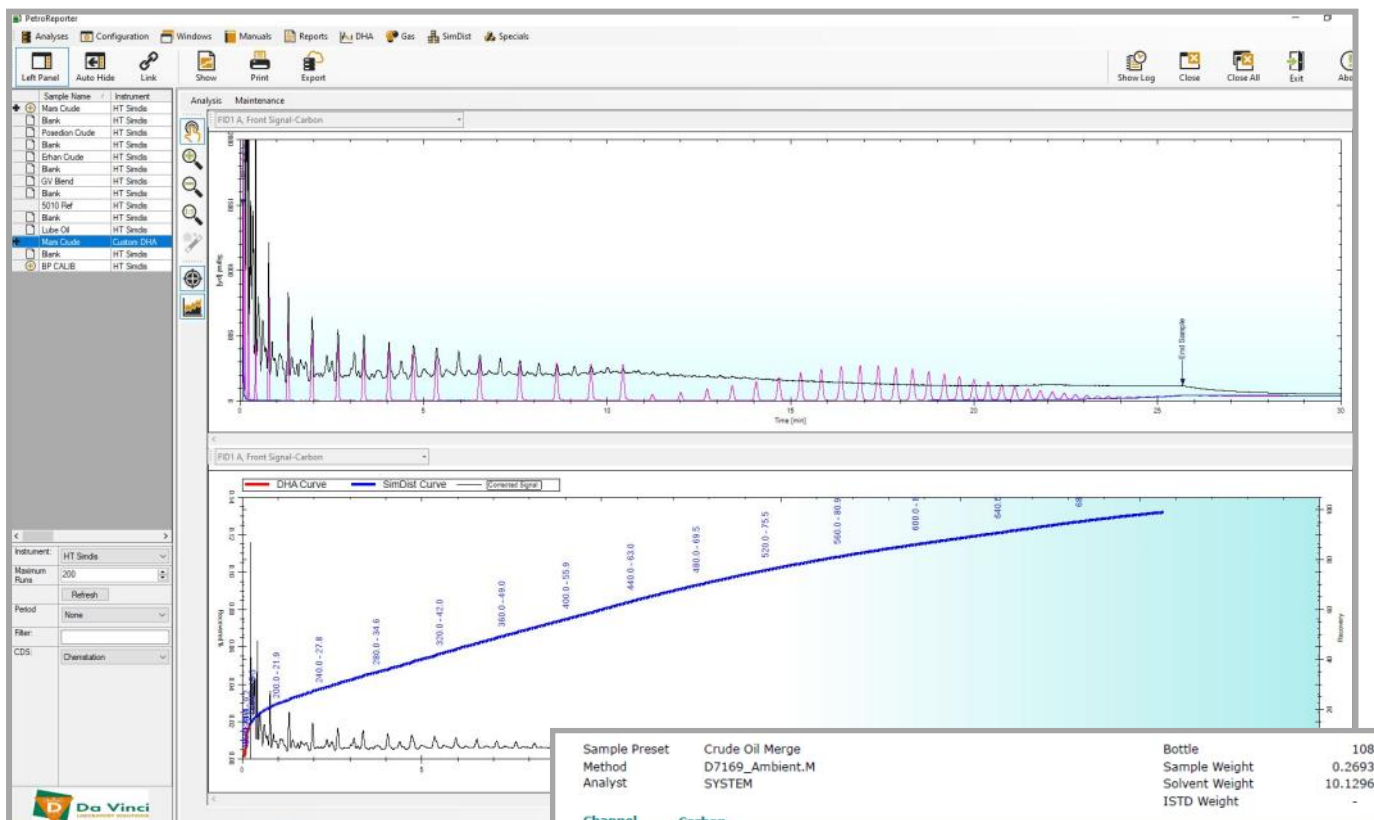


Alkane Profile Report



Improved Crude Oil Analysis

Reporting accurate SimDist data on the light hydrocarbons in crude oil is a challenge due to the quenching effects of the crude oil solvent. The solution is merging the Detailed Hydrocarbon Data (DHA) data with the SimDist results as standardized in the test method ASTM D7900. Using PetroReporter you can set the SimDist-DHA merge point and improve the front-end analysis of a crude oil.



*Figures Twelve - Thirteen:
SimDist ASTM D7169—DHA ASTM
D7900 Merge analysis of a crude oil*

The first two minutes of the SimDist D7169/IP545 analysis are used for the DHA D7900 analysis to identify the individual components up to n-Nonane.

The SimDist-DHA merge point can be chosen at the common used n-Nonane elution time or different using the PetroReporter software. The merged report lists both the SimDist, DHA and combined recoveries.

DHA Data							
TBP Distribution Report							
Rec mass%	BP °C	Rec mass%	BP °C	Rec mass%	BP °C	Rec mass%	BP °C
1.0	2.2	25.0	223.0	50.0	365.7	75.0	516.4
2.0	21.1	26.0	229.0	51.0	371.1	76.0	523.5
3.0	35.9	27.0	234.6	52.0	377.2	77.0	530.7
4.0	62.8	28.0	241.5	53.0	382.8	78.0	538.1
5.0	69.0	29.0	247.9	54.0	389.0	79.0	545.6
6.0	89.5	30.0	254.0	55.0	394.7	80.0	553.4
7.0	94.3	31.0	259.6	56.0	400.8	81.0	561.1
8.0	99.2	32.0	265.1	57.0	406.4	82.0	568.9
9.0	111.0	33.0	270.8	58.0	412.0	83.0	576.8
10.0	119.2	34.0	276.1	59.0	417.7	84.0	584.8
11.0	123.9	35.0	282.2	60.0	423.1	85.0	593.1
12.0	133.3	36.0	287.6	61.0	428.7	86.0	601.6
13.0	139.7	37.0	293.8	62.0	434.3	87.0	610.1
14.0	147.8	38.0	299.4	63.0	440.0	88.0	618.8
15.0	152.1	39.0	303.6	64.0	445.8	89.0	627.8
16.0	158.3	40.0	309.4	65.0	451.8	90.0	636.1
17.0	164.4	41.0	315.3	66.0	457.9	91.0	644.5
18.0	173.1	42.0	319.7	67.0	464.3	92.0	653.0
19.0	176.7	43.0	325.8	68.0	470.5	93.0	661.0
20.0	181.8	44.0	331.0	69.0	476.8	94.0	670.6
21.0	187.4	45.0	337.1	70.0	483.2	95.0	680.3
22.0	192.2	46.0	343.3	71.0	489.7	96.0	690.1
23.0	200.6	47.0	348.6	72.0	496.3	97.0	700.1
24.0	210.0	48.0	354.4	73.0	502.9	98.0	710.1
25.0	216.8	49.0	359.7	74.0	509.5		