# R+1/IETHEUS

# CUTS – CRUDE OIL DATA MANAGER

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#### **GENERALITIES**

**CUTS** is the tool of Prometheus DSS focused on crude oil characterization.

It handles crude oil data permitting to keep raw material information reliable and updated and builds a detailed characterization database useful for refinery processing calculations.

The information generated by this tool is used by planning and scheduling models to determine the yields and the properties of the oil fractions produced by the crude as well as by rigorous thermodynamic simulators to perform Vapour Liquid Equilibria Calculations useful for process design calculations.



#### **MULTIDIMENTIONAL REGRESSION**

For an effective planning of Refinery operation it is necessary to dispose of reliable models calculating the actual yields of refinery units as well as the chemical physical properties of the intermediates produced by crude processing: then, the good characterisation of crude oils and intermediates fed to the refinery is fundamental to reach results adherent to reality.

CUTS makes available to its users a proprietary technology (multidimensional regression) specifically developed to elaborate Crude Assay data in order to produce a library of congruent data that can be queried for all the properties of any fraction, irrespective of the original source, form and consistency of the input assay.

CUTS characterises every Crude Oil as a mix of pure components (C5 minus) and "pseudocomponents" (C6 plus), which overall cover the entire crude boiling range. Each pseudo component envelops pure components boiling in a narrow range of 10 °C.

Creating a distribution curve by multidimensional regression on assay data, CUTS calculates the values of appropriate quality characteristics for each pseudo component. The software distributes properties of the original assay, finding the best agreement between the natural curve shape and the input data. The algorithm is designed to calculate consistent values for contiguous pseudo components, while special operating parameters are available to harmonise the shape of the resulting curve, if necessary.

The multidimensional regression defines the property distribution curve accounting for the reliability assigned to each property value, applying endorsed blending rules (blending indexes are applied when necessary), considering the crude oil components yields and the shape of the resulting distribution.

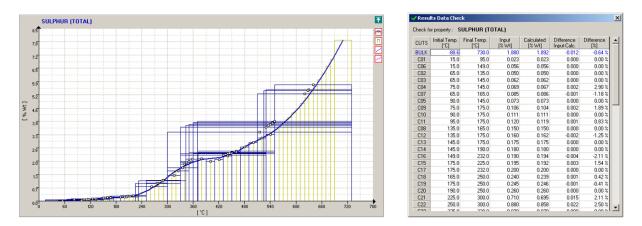


Figure 1 - Multidimensional regression of Sulphur content data



### **CHARACTERIZATION PROPERTIES**

Table 1 lists the fundamental properties (e.g. with property values estimated for each pseudo component through the above mentioned methods) managed by the current release, the relative blending rule and meaningful boiling range:

CUTS FUNDAMENTAL PROPERTIES										
PROPERTY	UNIT	Blending Rule	Boiling Range							
Weight TBP Yield	% weight	Linear weight	Whole Crude							
Volume TBP Yield	% volume	Linear volume	Whole Crude							
Density@15°C	kg/dm3	Linear volume	Whole Crude							
Sulphur Content	% weight	Linear weight	Whole Crude							
Mercaptan Sulphur Content	% weight	Linear weight	Whole Crude							
Kinematic Viscosity @50°C	cst	Index weight	Whole Crude							
Kinematic Viscosity @100°C	cst	Index weight	Whole Crude							
Acidity	mg KOH/gr	Linear weight	Whole Crude							
Aromatics Content [FIA]	% volume	Linear volume	Gasoline							
Naphthenic Content [FIA]	% volume	Linear volume	Gasoline							
Paraffin Content [FIA]	% volume	Linear volume	Gasoline							
Aromatics Content [Gas chromatography]	% weight	Linear weight	Gasoline							
Naphthenic Content [Gas chromatography]	% weight	Linear weight	Gasoline							
Paraffin Content [Gas chromatography]	% weight	Linear weight	Gasoline							
Octane Number Motor Method (MON)		Linear volume	Gasoline							
Octane Number Research Method (RON)		Index volume	Gasoline							
RON + Tetra Ethyl Lead 0.5		Index volume	Gasoline							
RON + Tetra Methyl Lead 0.5		Index volume	Gasoline							
Reid Vapour Pressure	PSIA	Index volume	Gasoline							
Cyclopentane Content	% weight	Linear weight	Gasoline							
Cyclohexane Content	% weight	Linear weight	Gasoline							
i-Hexanes Content	% weight	Linear weight	Gasoline							
n-Hexane Content	% weight	Linear weight	Gasoline							
Benzene Content	% weight	Linear weight	Gasoline							
Methylcyclopentane Content	% weight	Linear weight	Gasoline							
CC5 Content	% weight	Linear weight	Gasoline							
Freezing Point	°C	Index volume	Mid Distillates							
Cloud Point	°C	Index volume	Mid Distillates							
Pour Point	°C	Index volume	Mid Distillates							
Refraction Index @20°C		Index volume	Mid Distillates							
Refraction Index @70°C		Index volume	Mid Distillates							
Aniline Point	°C	Linear weight	Mid Distillates							
Total Nitrogen Content	ppm weight	Linear weight	Mid Distillates and Residua							
Basic Nitrogen Content	ppm weight	Linear weight	Mid Distillates and Residua							
Ash Content	ppm weight	Linear weight	Mid Distillates and Residua							
Asphaltenes Content	% weight	Linear weight	Mid Distillates and Residua							
Conradson Carbon Residue	% weight	Linear weight	Mid Distillates and Residua							
Nickel Content	ppm weight	Linear weight	Mid Distillates and Residua							
Vanadium Content	ppm weight	Linear weight	Mid Distillates and Residua							
Wax Content	% weight	Linear weight	Mid Distillates and Residua							

Table 1 - CUTS Fundamental Properties



Figure 2 shows some examples of property distribution curves calculated applying the multidimensional regression method to typical crude assay data:

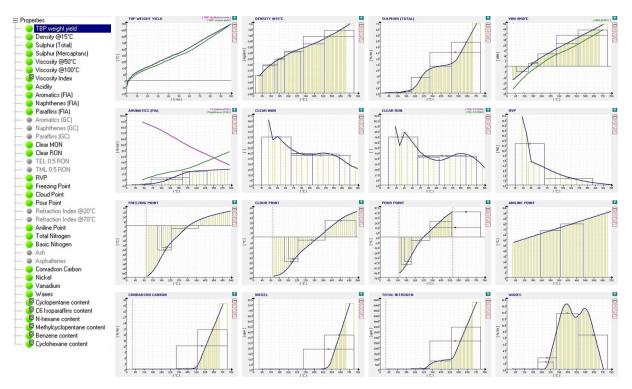


Figure 2 - Calculated distributions for various properties

The properties listed in Table 2 are estimated from the fundamental properties (through proprietary or published correlations) during the re-cutting process:

CUTS DERIVED PROPERTIES												
PROPRIETY UNIT Boiling Range												
Characterisation Factor UOPK		Whole Crude										
Molecular Weight		Whole Crude										
ASTM D86 Recovered @ 7 Test Temperatures	% volume	Whole Crude										
ASTM D86 Distillation Curve Volume Basis	°C	Whole Crude										
ASTM D2892 Distillation Curve (TBP) Volume Basis	°C	Whole Crude										
ASTM D2892 Distillation Curve (TBP) Weight Basis	°C	Whole Crude										
Refraction Index		Gasoline and Mid Distillates										
Aromatics Content [ndM Method]	% weight	Mid Distillates										
Naphthenic Content [ndM Method]	% weight	Mid Distillates										
Paraffin Content [ndM Method]	% weight	Mid Distillates										
Cetane Index		Mid Distillates										
Smoke Point	millimetres	Mid Distillates										
Viscosity Index		Mid Distillates and Residua										
Flash Point	°C	Mid Distillates and Residua										

Table 2 - CUTS Derived Properties



## **CRUDE DATA SOURCES**

CUTS foresees four alternative Crude characterization modes, depending of the type of data available:

- standard input from a crude assay;
- elaborate Field Data (recombining the analysis carried out on a distillation column of any kind);
- calculate crude blends;
- estimate crude properties from few data (applying an innovative data mining approach).

Furthermore the program can automatically import data from external databases and offers many utilities permitting to import data from other crude oils and elaborate them (for example for viscosity data elaboration and estimation).

CUTS permits to add to the database the oil fractions generated by crude re-cutting calculations (for example long residue or Vacuum Cuts). Resulting oil fractions data are therefore saved and treated like any other Crude Oil in the library.

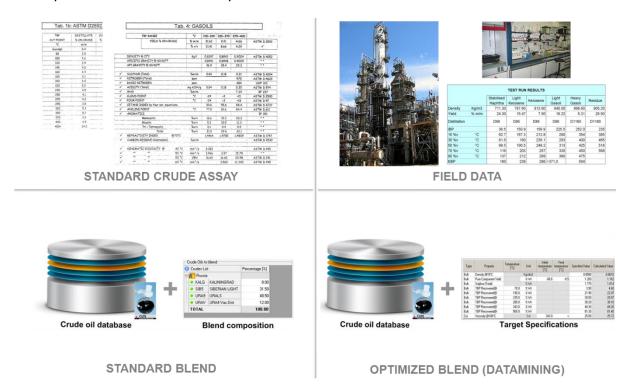


Figure 3 - Alternative Crude Oil Data Sources



## **CRUDE ASSAY ESTIMATION**

CUTS is able to generate a complete crude assay starting from a limited set of characterization data with the "Optimized Blend" feature.

The process is carried out through two steps:

- Selection of the set of crude oils contained in the database that will provide information during the data mining analysis. This step must be handled carefully since it determines the quality ranges that will be allowed for each specification during the analysis. The crude oils of the library must be properly filtered in order to assure a feasible range for any input specification and to control at the same time the degrees of freedom left to the algorithm.
- Run of the data mining analysis targeting the characterization data available (e.g. Density, Sulphur Content, TBP distillation) and production of the set of pseudo-components best representing the current feedstock.

The result is a comprehensive set of congruent data ready to reproduce exhaustively the behaviour of the feedstock in the following calculation modules (planning, scheduling, process design).

The consistency of the characterization data produced by this approach is assured by the integrity of the information associated to each crude oil (or crude oil fraction) represented in the database that has been previously pre-processed by CUTS multidimensional regression.

Figure 4 summarises the results of a test carried out to check the algorithm: the results obtained inputting few specifications of a known crude assay are compared with the crude assay itself.

The table on at the left hand side compares the estimated results with the original assays. The seven values highlighted in the "base" column (Bulk Density, Sulphur, TBP Points, Atmospheric Residue Viscosity) constitute the algorithm input. The radar chart on the right hand side shows, for each input specification the ranges of the crude oils used for the analysis, the input value and the corresponding results.

The library which have been selected to carry out this exercise based on URAL crude oil was composed of 12 components and precisely of 9 crude oils from the same country (Russia) and three oil fractions.



PROPERTY	UNIT		BASE	RESULT	
Bulk					URALS 31.4 API
Initial temperature	°C		-88.6	-88.6	
Final temperature	°C		700.0	710.0	ТВР
Density @15°C	Kg/dm3	>	0.8682	0.8679	Rec.@150°C
Sulphur (Total)	% Wt	>	1.343	1.334	-
Sulphur (Mercaptans)	ppm				100.00
Viscosity @50°C	Cst		5.62	5.59	90.00
Viscosity @100°C	Cst			1.93	30.00
Acidity	mg KOH/	g	0.170	0.169	80.00 TBP
Total Nitrogen	ppm		1804	1799	
Basic Nitrogen	ppm		500		70.00 Rec.@250°C
Ash	ppm			131.0	60.00
Asphaltenes	% Wt			0.64	
Conradson Carbon	% Wt		1.79	1.67	50.00
Nickel	ppm		18.0	17.7	40.00 db range
Vanadium	ppm		41.4	42.5	result
Waxes	% Wt		10.2	8.2	30.00
TBP Recovered@100°C			6.62	6.92	• input
TBP Recovered@150°C		>	12.73	12.95	20.00 C mput
TBP Recovered@200°C			21.58	21.78	10.00
TBP Recovered@250°C		>	30.77	31.27	VBN@50 TBP
TBP Recovered@300°C			40.15	40.53	Cut 370+
TBP Recovered@350°C			49.14	49.23	Cut 370+ Rec.@370°C
TBP Recovered@370°C		>	52.60	52.60	
TBP Recovered@420°C			61.07	60.77	
TBP Recovered@475°C			69.41	69.26	
TBP Recovered@525°C		>	76.41	76.41	
TBP Recovered@565°C	% Wt		81.33	81.59	
FR Naphtha [C5-150]			0 707	0 700	
Density @15°C	Kg/dm3		0.707	0.709	
Kerosene [150-250]	1/- /2		0.007	0.007	
Density @15°C	Kg/dm3		0.807	0.807	
Sulphur (Total)	% Wt ℃		0.22	0.22	Sulphur (Total)
Freezing Point	ι,		-52	-51	[val * 10] Rec.@525°C
Diesel [250 - 370] Density @15°C	Kg/dm3		0.866	0.866	
Sulphur (Total)	% Wt		1.03	1.04	
Cloud Point	% WL °C		-0.1	-0.4	
				-0.4	*
Viscosity @50°C Atm.Residue [370 + ]	Cst		3.95	3.94	Density @15°C
	Kg/dm3		0.961	0.960	,
Density @15°C Sulphur (Total)	% Wt		2.28	2.27	[val * 100]
	% Wt Cst	>	613.6	610.9	
Viscosity @50°C	USL	>	013.0	010.9	

Figure 4 - Estimation of Ural 31.4 API Crude Assay

#### **CRUDE RECUTTING**

The narrow cuts characterisation permits reliable re-cutting of crude assay to any requested format: during this process it is possible to set the desired degree of fractionation reproducing either the quality obtainable in the laboratory and in the real unit.

The CDU Simulation feature permits to calculate the quality of the streams produced by complex distillation systems accounting for the real fractionation capability experienced in each distillation column.

The calculation permits to consider the actual fractionation performance of the modelled fractionation system (setting the fractionation indexes) and to specify quality targets (like viscosity or cold properties) instead of End Points.

# R. METHEUS

₽ Add	ds ⊟¥ Delete	edit lightend	s' tags														Ť
NAME	Ethane [%m]	Hydrogen Sulphide [%m]	Propane [%m]	lsobuta [%m]	ane But			Normal <sup>D</sup> entane [%m]									
LPG			90.00		5.00	97.00	5.00										
FGS	100.00	100.00	0 10.00		5.00	3.00											
•		ut Delete	Load	E Save		fractionation	n indexes	1			K	Fractio	ons ———				->
Add Pl	ant Add C	ut Delete	Load	Save				Propert	Value		(C			Fractionation			Ð
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Add Pl Tree	ant Add Co	ut Delete End Point Input C	Load [°C] F	Save ractionati		Pro		Propert	y Value Calculated	Unit		Tag FRN	End Point [°C] 168.0	Index 35			5
Add Pl Tree	ant Add Co eView	ut Delete End Point Input C 740.0	Load [°C] F alculated	Save ractionati nput	on Index Calculated	Pro		· · ·		Unit	-	Tag FRN KER	End Point [*C] 168.0 230.0	Index 35 46			E
Add Pl Tree	ant Add Cu eView -	ut Delete End Point Input C 740.0 168.0	Load [°C] F alculated 168.0	Save Tractionati nput 35	on Index Calculated 35.0 •	Pro	operty	· · ·		Unit		Tag FRN KER LGO	End Point [°C] 168.0 230.0 370.0	Index 35 46 70			E
Add Pl Tree	ant Add Co eView - opping N R	ut Delete End Point Input C 740.0 168.0 230.0	Load [°C] F alculated	Save ractionati nput	on Index Calculated	Pro	operty	· · ·		Unit		Tag FRN KER LGO LVG	End Point [°C] 168.0 230.0 370.0 380.0	Index 35 46 70 30	i	i	E
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Add PI Tree	Add Co eView N R 0 Vacuum LVG VG1	ut         Delete           End Point         C           Input         C           740.0         168.0           230.0         370.0           740.0         380.0           410.0         410.0	Load ['C] F ialculated 168.0 • 230.0 • 370.0 • 380.0 •	Save iractionati nput 35 46 70 30	on Index Calculated 35.0 • 46.0 • 70.0 • 30.0 • 40.0 •	Pro	operty 	Input				Tag FRN KER LGO LVG VG1 VG2	End Point [*C] 168.0 230.0 370.0 380.0 410.0 430.0	Index 35 46 70 30 40 40	i	i	E
Add PI Tree	Add Cr Add Cr Add Cr Apping N R 0 Vacuum LVG Vacuum LVG VG1 VG2	ut         Delete           End Point         C           Input         C           740.0         168.0           230.0         370.0           740.0         380.0           410.0         430.0	Load [*C] F alculated 168.0 • 230.0 • 370.0 • 380.0 • 410.0 •	Save ractionati nput 35 46 70 30 40	on Index Calculated 35.0 • 46.0 • 70.0 • 30.0 • 40.0 •	Pro	operty 	Input	Calculated			Tag FRN KER LGO LVG VG1 VG2 VG3	End Point [*C] 168.0 230.0 370.0 380.0 410.0 430.0 500.0	Index 35 46 70 30 40 40	i		E

Figure 5 - CDU Simulation Input Panel

Basing in the fractionation indexes values CUTS calculates how pseudo component are distributed over the oil fractions produced by the distillation system and calculates yields and qualities accordingly.

This approach permits to fine tune the results of the calculation to the actual performance of existing units in order to produce more reliable planning and scheduling predictions.

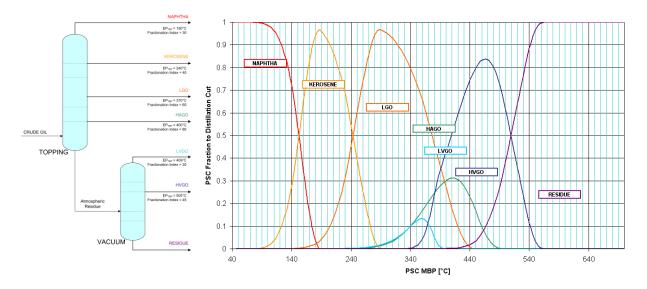


Figure 6 – Pseudo component distribution over cuts in CDU Simulation



The crude re-cutting feature permits to calculate the properties of a set of oil fractions for a group of selected crude oils. In this case the re-cutting profile is completely free and it is possible to calculate during the same run also overlapping boiling fractions.

Through the same intuitive panel (see Figure 7) the user selects the crude oils, defines the list of target cuts and the reporting options.

alculate Export 2	KLS Load Save Save		KUWA OPTB	P	LAT RE	м1 В	GDN SA	нв Г-Т	emplate
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	SA Arab.X.Light 39.1	K Export to	Library:						Group by Property
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🛔 🖌 🗹 CARM	BR Carmopolis 24.4	Crude's count Crude's date	ſŸ		Saudi Arabia 15/10/1986	Saudi Arabia 24/11/1976	Saudi Arabia 01/04/1991		
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🛕 🗹 KUWA	KW Kuwait 30.8	CUT 2TINI	CUT 2 [ 80.0 to 150.0 ][*C]		80.1				
🛔 🤌 🗹 OPTB	Det.Min.Crude 30.7	CUT 3TINI	CUT 3 [ 150.0 to 220.0 ] [*C]		150.0				
🕺 🗹 🗹 🕺	BR Plataforma 38.7	CUT 4TINI	CUT 4 [ 150.0 to 250.0 1 [*C]		150.0			÷	. UT 7 [ 250.0 to 370.0 ]
🛔 🖉 🗹 🕅 🕺	EG Belaym Res. 17.	CUT 5TINI	CUT 5 [ 220.0 to 360.0 ] [*C]		220.0	220.0	220.0		
🔏 🗹 RGDN	BR Rio Grande 29.	CUT 6TINI	CUT 6 [ 220.0 to 380.0 ] [°C]		220.0	) 220.0	) 220.0		
ă.o I SAHB	AG Ming-Sahara 44	CUT 7TINI	CUT 7 [ 250.0 to 370.0 ] [*C]		250.0	250.0	250.0		
	TU TR Zarzaitine	TFIN	Final temperature	*C					
Å• ☑ TRZR		CUT 1TFIN	CUT 1 [ 15.0 to 80.0 ] [°C]		80.1				
🍳 🗹 URAL	RU Urals 31.8	CUT 2TFIN	CUT 2 [ 80.0 to 150.0 ] [*C]		150.0				
🗛 🗹 URHV	RU Ural Heavy 27.	CUT 3TFIN CUT 4TFIN	CUT 3 [ 150.0 to 220.0 ] [*C] CUT 4 [ 150.0 to 250.0 ] [*C]		220.1				
👗 🗹 URLI	RU Ural Light 36.8	CUT 4TFIN	CUT 4 [ 150.0 to 250.0 ][*C] CUT 5 [ 220.0 to 360.0 ][*C]		250.1				
ăo 🗹 WDES	EG W.Desert Mix 42	CUT STFIN	CUT 6 [ 220.0 to 380.0 ] [*C]		380.1				
🛱 🗆 HMELF	MS Assay 01 Dic 201	CUT 7TFIN	CUT 7 [ 250.0 to 370.0 ][*C]		370.0				
🛓 🗌 AHF1	Arabian Heavy	WBAL	TBP weight yield	% ₩t					
A ALF1	Arab Light	CUT 1WBAL	CUT 1 [ 15.0 to 80.0 ] [°C]		3.76	0 4.609	9 4.643		
	-	CUT 2WBAL	CUT 2 [ 80.0 to 150.0 ] [*C]		8.00				
👸 🔲 🛛 ARM1	Arabian Medium	CUT 3WBAL	CUT 3 [ 150.0 to 220.0 ] [°C]		9.08				
		CUT 4WBAL	CUT 4 [ 150.0 to 250.0 ] [*C]		13.01	17.800	) 15.175		
Ăo □ AXL1 Ăo □ BAN1	Arab Extra Light Crux	CUT 5WBAL	CUT 5 [ 220.0 to 360.0 1[°C]		21.02	5 24,950	22.868		

Figure 7 – Crude re-cutting Input Panel



#### REPORTING

Either program Input (Crude Assay) and Output data (Distribution Curves, Re-Cutting Results, Crude Oil Mixtures Characterisation) can be exported to MS Excel workbooks and used for further elaboration; the format of the output is fully customizable in order to release data in the format required by the client application.

	SSAY DATA															
Crude's des				Light 33.	4											
Crude's con			Saudi Ar													
Crude's dat	te		24/11/1													
Last calcul	ation date		14/03/2	003												
PROPER	TIES VALUES															
PROPERT	Y DESCRIPTION	UNIT	Bulk	LPG	FGS I	FRN	KER L	.GO	LVG VG	1 VG2 V	33 VCR					
TINI	Initial temperature	°C	1	-42.1	-42.1	27.9	168.0	230.0	180.0	380.0 390.9	462.8 47	73.4				
TFIN	Final temperature	°C		27.9	-0.5	168.0	230.0	370.0	380.0	390.9 462.8	473.4 72	20.0				
w/BAL	TBP weight yield	% Wt		1.165	0.055	17.562	11,107	24.819	3.789	0.971 9.044	1.520 29.	968				
VBAL	TBP volume vield	% Vol		1.762	0.087	21.006	12.006	25.079	2.722	0.033 0.400	1 207 26	004				
ISPG	Density @15°C	Kg/dm3	0.8580	0.5672	0.5460	0.7173	0.7937	0.8491	PROPERTY		UNIT	VALUE	PROPERT		UNIT	VALUE
IARV	Aromatics (FIA)	% Vol		0.00	0.00	10.01	21.01			SSAY DATA				SSAY DATA		
INPV	Naphthenes (FIA)	% Vol		0.00	0.00	14.65	23.74		Crude's desc	cription		SA Arab Light 33.4	Crude's des	cription		SA Arab Light 33.4
IPAV	Paraffins (FIA)	% Vol		100.00	100.00	75.34	55.25		Crude's cour	ntry		Saudi Arabia	Crude's cou	intry		Saudi Arabia
ARG	Aromatics (GC)	2 Wt		0.00	0.00				Crude's date			24/11/1996	Crude's dat	e		24/11/1996
INAG	Naphthenes (GC)	2 Wt		0.00	0.00				Last calculat	tion date		14/03/2003	Last calcula	ation date		14/03/2003
IPAG	Paralfins (GC)	2 Wt		100.00	100.00				Bulk			No. of Concession, Name of Street, or other	Bulk			
IARW/	Aromatics Content (NDM)	%m		0.00	0.00		8.86	17.98	ISPG	Density @15*C	Kg/dm3	0.8580	ISPG	Density @15*C	Kg/dm3	0.858
INAW	Naphtenes Content (NDM)	20		0.00	0.00		22.56	17.65	ITNT	Total Nitrogen	ppm	765.0	ITNT	Total Nitrogen	ppm	765
PAW	Paraffins Content (NDM)	%m	1	100.00	100.00		68.58	64.37	IBNT	Basic Nitrogen	ppm	250.0	IBNT	Basic Nitrogen	ppm	250.
ITNT	Total Nitrogen	ppm	765.0		0.0	0.0	1.3	66.8	ICON	Conradson Carbon	% Wt	3.600	ICON	Conradion Carbon	2 Wt	3.60
IBNT	Basic Nitrogen	ppm	250.0		0.0	0.0	0.4	37.9	INIK	Nickel	ppm	3.3	INIK	Nickel	ppm	3
ASH	Ash	ppm		0.0	0.0				IVAN	Vanadium	ppm	13.5	IVAN	Vanadium	ppm	13
ICTI	Cetane Index								1/50	Viscosity @50°C	Cat	6.04	IV50	Viscosity @50°C	Cat	6.0
ICLD	Cloud Point	*C					-42.1	3.4	1//99	Viscosity @100°C	Cat	2.32	IV99	Viscosity @100°C	Cat	23
CON	Conradson Carbon	% Wt	3.600	0.000	0.000	0.204	0.227	0.227	ISUL	Sulphur (Total)	2 W1	1,770	ISUL	Sulphur (Total)	2 WR	1.77
FLSH	Flash Point	°C	0.000	0.000	0.000	0.604	58.8	113.5	IACI	Acidity	mg KOH/g		IACI	Acidity	mg KOH/g	0.06
FRE	Freezing Point	°C					-45.0	0.7	IASP	Asphaltenes	% Wt	1.000	IASP	Asphaltenes	2 Wt	1.00
INIK	Nickel	ppm	33	0.0	0.0	0.0	0.0	0.0	TW/AX	Waxes	%Wt	3.90	IW/AX	Waxes	2 Wt	3.9
IPOR	Pour Point	°C		0.0	0.0	0.0	-46.1	-2.5	CUTS SEC				CUTS SE			
IRON	Clear BON			96.93	99.53	45.09	-40.1	2.0		1-88.6 to -0.511*C			TINI	Initial temperature	*C	
MON	Clear MON			92.02	94.03	45.66			FGSTINI	[-88.6 to -0.5]['L.	°C	-42.1	FGSTINI		L	-42
IRVP	BVP	PSI		75.78		3.79			FGSTFIN	Final temperature	10	-421	LPGTINI	FGS [-88.6 to -0.5 ]["C]		-42
IVAN	Vanadium	pom	135			0.0	0.0	0.0						LPG [-42.1 to 27.9 ][*C]		-42-27.5
		- Denn	10.0		0.0	0.0		0.0	FGSWBAL	TBP weight yield	% Wt	0.055	FRNTINI	FRN [-42.1 to 168.0]["C]		168
										[-42.1 to 27.9][°C		10.1	KERTINI	KER [ 168.0 to 230.0 ] ["C]		
									LPGTINI	Initial temperature	2° 2'	-42.1 27.9	LGOTINI	LGO [ 230.0 to 370.0 ]["C]		230.0
									LPGTFIN LPGWBAL	Final temperature	1 % W1	1.165	LVGTINI	LVG [ 720.0 to 380.0 ][*C]		180.
										TBP weight yield		1.165	VG1TINI VG2TINI	VG1 [ 380.0 to 410.0 ] ["C] VG2 [ 410.0 to 430.0 ] ["C]		380
									FRNTINI	[-42.1 to 168.0]]	10	27.9	VG2TINI VG3TINI			462
									FRINTINI	Final temperature	10	168.0	VG3TINI	VG3 [ 430.0 to 500.0 ] [*C]		462
									FRNUFIN		2 W1	158.0	TEIN	VCR [ 500.0 to 720.0 ] [*C]	°C	4/3.
										TBP weight yield					L	
									FRNVBAL	TBP volume yield	% Vol	21.006	FGSTFIN	FGS [-88.6 to -0.5 ]["C]		-0.
									FRNISPG	Density @15°C	Kg/dm3	0.7173	LPGTFIN	LPG [ -42.1 to 27.9 ][*C]		
									FRNIARV	Aromatics (FIA)	% Vol	10.01	FRNTFIN	FRN [-42.1 to 168.0 ] [*C]		168.
									FRNINPV	Naphthenes (FIA)	% Vol	14.65	LEATEN	KER [ 168.0 to 230.0 ] [*C]		230.0
									PPENIDAO	Paration (EIA)	17 VA	75.24	TISTIFIN	11411 24111 IA 370.01PC1		370

Figure 8 - Customized report example