Sarir Crude Oil

Evaluation of Sarir Crude Oil

This assay is a part of a series of crude oil evaluation reports have been prepared for Crude oil marketing department of National Oil Corporation. A bout 60 Liters of Crude oil sample was collected from Sirt oil Company. A homogenous sample has been collected on 10 th July 2008 from pipeline coming from Sarir field and passing through Messla field, the sample was collected according to standard method ASTM D4057.

The analysis of crude oil sample was carried out using well recognized standard procedures given in ASTM, IP and UOP methods. The distillation of crude oil was carried out using a batch fractionation unit made according to ASTM D-2892 method & ASTM D-1160 method.

The crude oil was distilled under atmospheric and vacuum pressure and the atmospheric residue was further distilled to obtain distillate fractions. Distillate fractions corresponding to true boiling point up to 550+^{0}C were collected.

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TABLE (1)

CRUDE OIL GENERAL TESTS

DESCRIPTION		***METHOD***
Density@ 15 ºC, g/ml	*0.8415*	*ASTM D-4052*
Specific gravity@60/60 ^{0}F	*0.8421*	*Calculation*
API gravity	*36.5*	*Calculation*
Flash point (PMCC), ºC	*-43*	*ASTM D-93*
Reid vapour pressure, psi	*5.20*	*ASTM D-323*
Hydrogen sulphide, ppm	*4.60*	*IP 103*
Water and sediment content, vol.%	*0.05*	*ASTM D-4007*
Sulphur content, wt.%	*0.120*	*ASTM D-4294*
Pour point, ºC	*+21*	*ASTM D-97*
Kinematic viscosity @ 70 ºF, cSt	*-*	*ASTM D-445*
@ 100 ºF, cSt	*10.6298*	*ASTM D-445*
Asphaltenes content, wt.%	*0.20*	*IP 143*
Conradson carbon residue, wt. %	*3.10*	*ASTM D-189*
Ash content, wt.%	*0.012*	*ASTM D-482*
Characterisation factor	*12.1*	*UOP 375*
Salt content (as Nacl) mg/l	*5.0*	*IP 77*
Vanadium, ppm	*0.146*	*ASTM D 5708*
Nickel, ppm	*3.954*	*ASTM D 5708*
Calcium, ppm	*0.552*	*Dry ashing*
Potassium, ppm	*0.19*	*Dry ashing*

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Continued Table-1

Distillation Characteristics	***ºC***	***METHOD***
IBP @ 760mmHg	*51*	
5%	*91*	
10%	*113*	
20%	*159*	
30%	*172*	
40%	*266*	
50%	*314*	
60%	*336*	*ASTM D-86*
70%	-	
80%	-	
FBP	*337*	
Recovery % vol.	*69*	
Residue % vol.	*9*	
Loss % vol.	*21*	

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Table (2) TBP Distillation of Crude Oil

	Yield		Cumulative Yield		Specific Gravity @ Cut Temp
°C	wt.%	vol.%	wt.%	vol.%	60/60°F
Condensate	1.11	1.68	1.11	1.68	0.5556
C5 - 70	4.52	5.76	5.63	7.44	0.6607
70 - 90	2.60	3.03	8.23	10.47	0.6918
90 - 110	2.96	3.36	11.19	13.83	0.7218
110 - 130	3.31	3.75	14.50	17.59	0.7425
130 - 150	3.18	3.57	17.68	21.16	0.7501
150 - 175	3.70	4.09	21.38	25.24	0.7620
175 - 195	3.04	3.28	24.42	28.52	0.7808
195 - 215	2.82	3.02	27.24	31.54	0.7868
215 - 235	3.00	3.19	30.24	34.73	0.7929
235 - 255	3.14	3.30	33.38	38.03	0.8016
255 - 275	3.61	3.74	36.99	41.76	0.8137
275 - 295	2.84	2.92	39.83	44.68	0.8200
295 - 315	3.62	3.70	43.45	48.38	0.8229
315 - 335	3.55	3.59	47.00	51.97	0.8323
335 - 350	3.04	3.03	50.04	55.00	0.8454
350 - 370	4.25	4.19	54.29	59.19	0.8538
370 - 400	4.43	4.31	58.72	63.50	0.8658
400 - 440	6.12	5.90	64.84	69.40	0.8733
440 - 460	3.27	3.11	68.11	72.52	0.8843
460 - 480	3.27	3.09	71.38	75.61	0.8920
480 - 500	3.26	3.05	74.64	78.66	0.8996
500 - 520	2.58	2.39	77.22	81.05	0.9095
520 - 550	2.89	2.65	80.11	83.70	0.9174
550+	19.89	16.85	100.00	100.55	0.9941

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Table (3) Detailed Hydrocarbon Analysis of 70-175 °C Fraction (ASTM D5134) PIONA Analysis (Identified Compounds Listed in Chromatographic order)

Compounds	Wt%	Vol.%	Mol.%	Compounds	Wt%	Vol.%	Mol.%
n-C4	0.309	0.387	0.566	2,4DMC6	0.307	0.319	0.286
Isopentane	0.703	0.823	0.1036	ctc-1,2,4TMCC5	0.585	0.569	0.555
n-C5	1.580	1.831	2.329	3,3DMC6	0.079	0.081	0.073
CC5	0.259	0.252	0.392	ctc-1,2,3TMCC5	0.765	0.738	0.725
2,3DMC4	0.246	0.269	0.303	2,3,4-TMC5	0.174	0.177	0.162
2MC5	1.823	2.026	2.249	Toluene	1.255	1.052	1.448
3MC5	1.438	1.571	1.774	2,3DMC5	0.485	0.495	0.452
n-C6	5.492	6.048	6.777	2M3EC5	0.128	0.131	0.120
2,2DMC5	0.131	0.141	0.138	2MC7	2.681	2.792	2.495
MCC5	2.331	2.262	2.946	4MC7	0.655	0.676	0.610
2,4DMC5	0.286	0.309	0.302	3,4DMC6(L)	0.078	0.079	0.072
Benzene	0.502	0.415	0.683	C8 Olefin?	0.082	0.085	0.078
3,3DMC5	0.080	0.084	0.084	cis-1,3DMCC6	3.847	3.672	3.646
CC6	2.439	2.276	3.082	trans-1,4DMCC6	0.848	0.808	0.804
2MC6	1.976	2.115	2.086	1,1 DMCC6	0.303	0.284	0.288
2,3DMC5	0.857	0.896	0.905	trans-1,3EMCC5	0.215	0.201	0.203
1,1DMCC5	0.544	0.524	0.589	cis-1,3EMCC5	0.207	0.194	0.196
3MC6	2.396	2.396	2.533	trans1-,2EMCC5	0.544	0.507	0.516
cis-1,3DMCC5	0.946	0.923	1.025	1E1MCC5	0.073	0.068	0.069
trans-1,3DMCC5	0.889	0.863	0.963	trans-1,2DMCC6	1.266	1.186	1.200
3EC5	0.210	0.218	0.221	n-C8	8.050	8.328	7.494
trans-1,2DMCC5	1.938	1.874	2.099	C9 Naphthene 1?	0.124	0.116	0.104
n-C7	7.752	8.236	8.182	C9 Naphthene 2?	0.079	0.074	0.067
MCC6	6.219	5.875	6.735	cis-1,2EMCC5	0.067	0.062	0.064
1,1,3-TMCC5	0.682	0.667	0.647	2,2DMC7	0.104	0.106	0.087
ECC5	0.419	0.397	0.454	Vinylcyclohexene-1	0.228	0.214	0.222
2,5DMC6	0.246	0.258	0.229	2,4DMC7	0.378	0.387	0.313

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Continued Table-3

Compounds	*Wt%*	*Vol.%*	*Mol.%*	*Compounds*	*Wt%*	*Vol.%*	*Mol.%*
ccc-1,3,5TMCC6+n-PCC5	*2.126*	*2.010*	*1.791*	*3,3,5TMC7*	*0.188*	*0.185*	*0.140*
2,6DMC7	*1.019*	*1.051*	*0.845*	*2,2DMC8*	*0.228*	*0.229*	*0.170*
1,1,3TMCC6	*1.937*	*1.819*	*1.632*	*C9?*	*0.095*	*0.096*	*0.079*
1,1,4TMCC6	*0.093*	*0.088*	*0.078*	*C9?*	*0.740*	*0.690*	*0.624*
2,5DMC7+3,5DMC7(D)	*0.449*	*0.452*	*0.372*	*Sec-BCC5 ?*	*0.740*	*0.690*	*0.624*
3,3DMC7+3,5DMC7(L)	*0.098*	*0.098*	*0.081*	*2,6DMC8*	*0.182*	*0.182*	*0.136*
C8?	*0.118*	*0.122*	*0.110*	*n-BCC5*	*0.178*	*0.165*	*0.150*
C9 Naphthene 3?	*0.201*	*0.189*	*0.169*	*C9?*	*0.121*	*0.123*	*0.100*
C9 Naphthene 4?	*0.133*	*0.106*	*0.095*	*C9?*	*0.078*	*0.079*	*0.065*
Ebenezene	*0.307*	*0.257*	*0.308*	*C9?*	*0.094*	*0.095*	*0.078*
2,3,4-TMC6	*0.310*	*0.316*	*0.257*	*3,3DMC8*	*1.003*	*0.987*	*0.750*
Ctt-1,2,4TMCC6	*0.824*	*0.755*	*0.695*	*n-Pbenzene*	*0.209*	*0.176*	*0.185*
m-Xylene	*1.153*	*0.970*	*1.155*	*C9?*	*0.191*	*0.193*	*0.158*
p-Xylene	*0.293*	*0.248*	*0.249*	*C9?*	*0.107*	*0.109*	*0.089*
2,3DMC7	*1.322*	*1.324*	*1.097*	*1M3Ebenzene*	*0.609*	*0.512*	*0.539*
3,4DMC7(L)	*0.359*	*0.357*	*0.297*	*1M4Ebenzene*	*0.318*	*0.269*	*0.281*
4EC7	*0.123*	*0.124*	*0.102*	*C9?*	*0.129*	*0.130*	*0.107*
4MC8	*0.684*	*0.694*	*0.567*	*C9?*	*0.166*	*0.168*	*0.138*
2MC8	*1.121*	*1.143*	*0.930*	*1,3,5TM benzene*	*0.197*	*0.166*	*0.175*
Ctc-1,2,4TMCC6	*0.275*	*0.254*	*0.231*	*2,3DMC8*	*0.222*	*0.219*	*0.166*
3EC7	*0.147*	*0.148*	*0.122*	*C9?*	*0.118*	*0.120*	*0.098*
3MC8	*1.303*	*1.315*	*1.080*	*1M2Ebenzene*	*0.115*	*0.095*	*0.102*
O-xylene+1,1,2TMCC6	*0.997*	*0.824*	*0.998*	*3,3,4TMC7*	*0.467*	*0.472*	*0.349*
Cis-1,4EMCC6	*1.181*	*1.084*	*0.995*	*2MC9*	*0.392*	*0.392*	*0.293*
TMC6(2)?	*0.471*	*0.472*	*0.391*	*3EC8*	*0.097*	*0.095*	*0.073*
cis-3-Nonene	*0.068*	*0.068*	*0.057*	*3MC9*	*0.253*	*0.251*	*0.189*
C8?	*0.103*	*0.106*	*0.096*	*1,2,4TMbenzene*	*0.423*	*0.351*	*0.374*

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Continued Table-3

Compounds	***Wt%***	***Vol.%***	***Mol.%***	***Compounds***	***Wt%***	***Vol.%***	***Mol.%***
n-C9	*7.597*	*7.697*	*6.299*	*C10 Paraffin 3?*	*0.073*	*0.073*	*0.055*
IsoPbenzene	*0.094*	*0.080*	*0.083*	*IsoBCC6*	*0.100*	*0.092*	*0.076*
Tert-BCC5	*0.461*	*0.429*	*0.388*	*n-C10*	*0.948*	*0.944*	*0.708*
IsoPCC6	*0.201*	*0.182*	*0.169*	*1,2,3TMEbenzene*	*0.114*	*0.093*	*0.101*
				Total	***100.00***	***100.00***	***100.00***

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Table (4) Detailed Hydrocarbon Analysis of 70-175°C Fraction (ASTM D5134) PIONA Analysis (Hydrocarbon totals by group types)

Group Types		***Vol.%***	***Mol.%***
Total Aromatics	***Wt%***	*5.507*	*6.725*
Total Iso-Paraffins	*6.585*	*26.804*	*24.753*
Total Naphthenes	*25.719*	*32.252*	*34.459*
Total Olefins	*34.019*	*0.366*	*0.357*
Total n-Paraffins Total	*0.378*	*33.728*	*32.591*
Unknowns	*31.981*	*1.342*	*1.117*
Total	*1.320*	***100.00***	***100.00***
	100.00		

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Table (5) Detailed Hydrocarbon Analysis of 70-175 °C Fraction (ASTM D5134)

PIONA Analysis (Totals by Carbon Number)

Group	*Wt%*	*Vol.%*	*Mol.%*	*Ave. Mw.*	*Ave. Sp.Gr*
Butanes	0.309	0.387	0.566	58.100	0.584
Pentanes	2.542	2.906	3.757	71.939	0.640
Hexanes	14.270	14.868	17.814	85.187	0.702
Heptanes	25.897	26.039	27.760	99.206	0.727
Octane's	25.565	25.115	24.163	112.512	0.744
Nonane's	27.265	26.566	126.836	126.964	0.750
Decanes	4.153	4.121	3.105	142.230	0.737
Total	***100.00***	***100.00***	***100.00***	**106.342**	**0.731**

Table (6) GC-Carbon Distribution of Crude Oil

Compounds	*Wt.%*	*Mol.%*	*Fraction MW*	*MW Calculation*
C3	*0.37*	*1.15*	*44.10*	*0.51*
iC4	*1.50*	*3.56*	*58.12*	*2.07*
nC4	*5.35*	*12.73*	*58.12*	*7.40*
iC5	*1.49*	*2.85*	*72.15*	*2.06*
nC5	*2.10*	*4.02*	*72.15*	*2.90*
C6	*5.04*	*8.09*	*86.18*	*6.97*
C7	*6.97*	*9.61*	*100.21*	*9.63*
C8	*8.96*	*10.85*	*114.23*	*12.39*
C9	*7.51*	*8.10*	*128.26*	*10.39*

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C10	*6.87*	*6.68*	*142.29*	*9.50*
C11	*5.76*	*5.09*	*156.30*	*7.96*
C12	*4.18*	*3.39*	*170.30*	*5.78*
C13	*4.68*	*3.51*	*184.40*	*6.47*
C14	*4.45*	*3.10*	*198.40*	*6.15*
C15	*3.94*	*2.56*	*212.40*	*5.45*
C16	*3.21*	*1.96*	*226.40*	*4.44*
C17	*3.90*	*2.24*	*240.50*	*5.39*
C18	*3.11*	*1.69*	*254.50*	*4.30*
C19	*3.00*	*1.54*	*268.50*	*4.15*
C20	*2.18*	*1.06*	*282.60*	*3.01*
C21	*2.43*	*1.13*	*296.58*	*3.36*
C22	*2.22*	*0.99*	*310.61*	*3.06*

Continued Table-6

Compounds	***Wt.%***	***Mol.%***	***Fraction MW***	***MW Calculation***
C23	*1.99*	*0.85*	*324.64*	*2.75*
C24	*1.68*	*0.69*	*338.66*	*2.32*
C25	*1.35*	*0.53*	*352.69*	*1.87*
C26	*1.16*	*0.44*	*366.72*	*1.61*
C27	*1.13*	*0.41*	*380.74*	*1.56*
C28	*0.85*	*0.30*	*394.77*	*1.17*
C29	*0.83*	*0.28*	*408.80*	*1.15*
C30	*0.64*	*0.21*	*422.82*	*0.89*
C31	*0.61*	*0.19*	*436.85*	*0.84*

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C32	*0.58*	*0.18*	*450.88*	*0.80*
C33	*0.04*	*0.01*	*464.91*	*0.06*
Total	***100.00***	***100.00***		138.34

TABLE (7)

Yield and Inspection of Light Naphtha Cut

TBP Cut Points	***C_5-70 ^0C***	***METHOD***
Vol. % on Crude	*5.76*	
Wt. % on Crude	*4.52*	
Density@15°C, g/ml	*0.6455*	*ASTM D-4052*
Specific gravity@ 60/60 °F	*0.6460*	*ASTM D-4052*
API gravity	*87.5*	*Calculation*
Reid vapour pressure@37.8 °C, psi	*15.5*	*ASTM D-323*
Volume Average Boiling Point, (VABP), °C	*53.4*	
Sulphur content, wt. %	*0. 002*	*ASTM D-4294*

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Octane Number; Research method		*77.1*	*ASTM D-2699*
Octane Number; Motor method		*76.2*	*ASTM D-2700*
Distillation,	*IBP ºC*	*37*	
	5%	*42*	
	10%	*43*	
	20%	*44*	
	30%	*46*	
	40%	*48*	
	50%	*50*	
	60%	*53*	*ASTM D-86*
	70%	*57*	
	80%	*62*	
	90%	*71*	
	95%	*90*	
	FBP	*98*	
	Residue,vol.%	*2.0*	
	Losses, vol.%	*2.0*	
Molecular weight		*76.5*	*Calculation*
Lead content, ppm		*<0.03*	*ICP-OES*

TABLE (8) Yield and Inspection of Heavy Naphtha

TBP Cut Points	***70-175 ^{0}C***	***METHOD***
Vol. % on Crude	*17.80*	
Wt. % on Crude	*15.75*	
Density@15ºC, g/ml	*0.7365*	*ASTM D-4052*
Specific gravity@ 60/60 ºF	*0.7371*	*Calculation*
API gravity	*60.5*	*Calculation*
Reid vapour pressure, psi	*2.59*	*ASTM D-323*
Volume Average Boiling Point, (VABP), ºC	*124.0*	*Calculation*
Sulphur content, wt. %	*0.013*	*ASTM D-4294*
Characterization factor	*12.1*	*UOP 375*

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Octane Number; Research method		*69.1*	*ASTM D-2699*
Octane Number; Motor method		*68.7*	*ASTM D-2700*
Distillation,	*IBP ºC*	*77*	
	5%	*96 99*	
	10%	*105*	
	20%	*110*	
	30%	*116*	
	40%	*120*	
	50%	*127*	
	60%		*ASTM D-86*
	70%	*137*	
	80%	*143*	
	90%	*154*	
	95%	*160*	
	FBP	*166*	
	Residue % vol.	*0.5*	
	Loss% vol.	*0.5*	
Molecular weight		*111.7*	*Calculation*
Lead content, ppm		*<0.03*	*ICP-OES*

TABLE (9) Yield and Inspection of Kerosene Cut

TBP Cut Points	***175-235^{0}C***	***METHOD***
Vol. % on Crude	*9.48*	
Wt. % on Crude	*8.86*	
Density15 ºC, g/ml	*0.7860*	*ASTM D-4052*
Specific gravity@ 60/60 ºF	*0.7867*	*Calculation*
API gravity	*48.4*	*Calculation*
Characterisation factor	*12.0*	*UOP 375*
Volume Average Boiling Point, (VABP) , ºC	*201.6*	*Calculation*

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Sulphur content. wt.%	*0.025*	*ASTM D-4294*
Aniline point, ºC	*65*	*ASTM D-611*
Aromatic, vol.%	*10.7*	*ASTM D-1319*
Paraffin's+ Naphathenes, vol.%	*88.5*	*ASTM D-1319*
Olefins, vol.%	*0.80*	*ASTM D-1319*
K. Viscosity at -20 ºC, cSt	*4.7782*	*ASTM D-445*
K. Viscosity at 37.8 ºC, cSt	*1.4807*	*Calculation*
K. Viscosity at 50 ºC, cSt	*-*	*Calculation*
Flash point Tag, ºC	*62.0*	*ASTM D-56*
Freezing point , ºC	*-48*	*ASTM D-2386*
Cold filter plugging point, ºC	*<-20*	*IP 309*
Pour point, , ºC	*<-36*	*ASTM D-97*
Saybolt colour	*+30*	*ASTM D-156*
Copper corrosion	*1*	*ASTM D-130*
Molecular weight	*160.2*	*Calculation*
Smoke point, mm	*27*	*ASTM D-1322*

Continued Table-9

TBP Cut Points	***175-235^{0}C***	***METHOD***
Distillation,	***ºC***	
IBP	*177*	
5% *185* *10%* *189*		
20%	*193*	
30%	*195*	
40%	*198*	

Sarir Crude Oil

50%			*200*	*ASTM D-86*
60%			*203*	
70%			*207*	
80%	*213 90%*	*217*		
95%	*221 FBP*	*237*		
Residue % vol.			*0.5*	
Loss % vol.			*0.5*	

TABLE (10) Yield and Inspection of Atmospheric Gas Oil Cut

TBP Cut Points	***235-350 ^{0}C***	***METHOD***
Vol. % on Crude	*20.28*	
Wt.% on Crude	*19.80*	
Density15 ºC, g/ml	*0.8274*	*ASTM D-4052*
Specific gravity@ 60/60 ºF	*0.8281*	*Calculation*
API gravity	*39.4*	*Calculation*
Characterization factor	*12.1*	*UOP 375*
Volume Average Boiling Point, (VABP), ºC	*292*	*Calculation*
Sulphur content, wt. %	*0.064*	*ASTM D-4294*

Sarir Crude Oil

Aniline point, ºC		*78*	*ASTM D-611*
K. Viscosity at 37.8 ºC, cSt		*3.1323*	*ASTM D-445*
K. Viscosity at 50 ºC , cSt		*2.4468*	*ASTM D-445*
Pour point, ºC		*-9*	*(ASTM D-97)*
Molecular weight		*226.5*	*Calculation*
Calculated cetane index		*58.5*	*ASTM D-976*
Distillation, ºC	*IBP*	*230*	
	5%	*262*	
	10%	*267*	
	20%	*273*	
	30%	*276*	
	40%	*278*	
	50%	*285*	
	60%	*298*	*ASTM D-86*
	70%	*305*	
	80%	*314*	
	90%	*327*	
	95%	*-*	
	FBP	*346*	
	Residue % vol.	*1.0*	
	Loss% vol.	*0.5*	

Continued Table-10

TBP Cut Points	***235-350^{0}C***	***METHOD***
Vanadium, ppm	*<0.005*	*ASTM D 5708*
Nickel, ppm	*<0.010*	*ASTM D 5708*
Calcium, ppm 0.148 Dry ashing Potassium, ppm <0.040 Dry ashing		
Sodium, ppm	*0.928*	*Dry ashing*

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Sarir Crude Oil

TABLE (11) Yield and Inspection of Vacuum Gas Oil Cut

Boiling Range	***350-550^{0}C***	***METHOD***
Vol. % on Crude	*28.70*	
Wt. % on Crude	*30.07*	

Sarir Crude Oil

Density15 °C, g/ml		*0.8816*	*ASTM D-4052*
Specific gravity@ 60/60 °F		*0.8822*	*Calculation*
API gravity		*28.9*	*Calculation*
Characterisation factor		*12.4*	*UOP 375*
Volume Average Boiling Point, (VABP), °C		*466.8*	*Calculation*
Sulphur content, wt. %		*0. 172*	*ASTM D-4294*
Aniline point, °C		*102.7*	*ASTM D-611*
K. Viscosity at 37.8 °C, cSt		*-*	*ASTM D-445*
K. Viscosity at 50 °C, cSt		*22.4112*	*ASTM D-445*
K. Viscosity at 100 °C, cSt		*6.2742*	*ASTM D-445*
Pour point, °C		*+42*	*(ASTM D-97)*
Molecular weight		*439.6*	*Calculation*
Distillation, °C	*IBP*	*359*	
	5%	*379*	
	10%	*387*	
	20%	*405*	
	30%	*423*	
	40%	*442*	
	50%	*461*	
	60%	*483*	*ASTM D-1160*
	70%	*508*	
	80%	*546*	
	90%	*555*	
	95%	*-*	
	FBP	*573*	
	Residue % vol.	*17*	
	Loss% vol.	*Nil*	
Vanadium, ppm		*<0.005*	*ASTM D 5708*
Nickel, ppm		*<0.010*	*ASTM D 5708*
Calcium, ppm		*0.375*	*Dry ashing*
Potassium, ppm		*<0.04*	*Dry ashing*
Sodium, ppm		*1.181*	*Dry ashing*

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TABLE (12) Atmospheric Residue 350+ 0C

Boiling Range	***350+ 0C***	***METHOD***
Vol. % on Crude	45.00	
Wt.% on Crude	49.96	
Density@ 15 ºC, g/ml	*0.9226*	*ASTM D-4052*
Specific gravity@60/60 ºF	*0.9233*	*Calculation*
API gravity	*21.8*	*Calculation*
Asphaltenes content, wt. %	*1.02*	*IP 143*
n-Heptane Insolubles, wt. %	*5.14*	*ASTM D893*
Sulphur content, wt. %	*0.223*	*ASTM D-4294*
Pour point, ºC	*+45*	*ASTM D-97*
K. Viscosity @ 37.8 ºC, cSt	-	*ASTM D-445*
K. Viscosity @ 50 ºC, cSt	-	*ASTM D-445*
K. Viscosity @100 ºC, cSt	*21.2107*	*ASTM D-445*
Ash content ,wt.%	*0.0214*	*ASTM D-482*
Conradson carbon residue, wt. %	*7.01*	*ASTM D-189*
Calorific value, MJ/Kg gross	*44.5*	*Calculation*
Calorific value, Kcal/Kg gross	*10612*	*Calculation*
Vanadium, ppm	*0.301*	*ASTM D 5708*
Nickel, ppm	*6.24*	*ASTM D 5708*
Calcium, ppm	*1.013*	*Dry ashing*
Potassium, ppm	*0.202*	*Dry ashing*
Sodium, ppm	*4.227*	*Dry ashing*

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TABLE (13) Vacuum Residue 550^{+0}C

Boiling Range	*550^{+0}C*	*METHOD*
Vol. % on Crude	16.85	
Wt. % on Crude	19.89	
Density@ 15 ºC, g/ml	*0.9934*	*ASTM D-4052*
Specific gravity@60/60 ºF	*0.9941*	*Calculation*
API gravity	*10.8*	*Calculation*
Asphaltenes content wt. %	*4.22*	*IP 143*
n-Heptane Insolubles, wt. %	*6.87*	*ASTM D893*
Sulphur content , wt. %	*0.325*	*ASTM D-4294*
Pour point, ºC	*+78*	*ASTM D-97*
K. Viscosity at 50 ºC, cSt	*-*	*ASTM D-445*
K. Viscosity at 100 ºC, cSt	*-*	*ASTM D-445*
Ash content ,wt.%	*0.041*	*ASTM D-482*
Conradson carbon residue, wt. %	*22.79*	*ASTM D-189*
Calorific value, MJ/Kg gross	*43.3*	*Calculation*
Calorific value, Kcal/Kg gross	*10327*	*Calculation*
Vanadium, ppm	*0.677*	*ASTM D 5708*
Nickel, ppm	*12.505*	*ASTM D 5708*
Calcium, ppm	*3.732*	*Dry ashing*
Potassium, ppm	*0.396*	*Dry ashing*
Sodium, ppm	*10.042*	*Dry ashing*

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Appendix

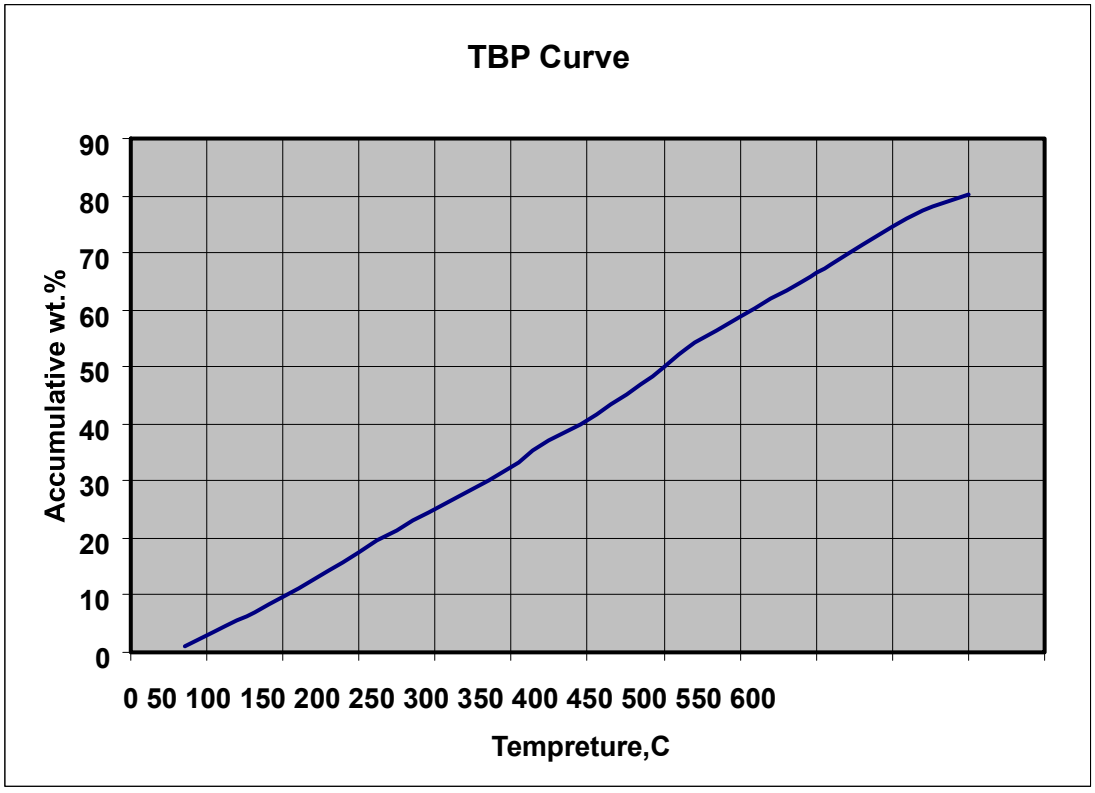

Fig.1 TBP versus cumulative yield (wt. %) on crude