

## **Study and evaluation for different types of Sudanese crude oil properties**

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**Abstract:** Sudanese crude oil is regarded as one of the sweet types of crude in the world, Sulphur containing compounds are undesirable in petroleum because they deactivate the catalyst during the refining processes and are the main source of acid rains and environmental pollution.(Mark Cullen 2001), Since it contains considerable amount of salts and acids, it negatively impacts the production facilities and transportation lines with corrosive materials. However it suffers other problems in flow properties represented by the high viscosity and high percentage of wax. Samples were collected after the initial and final treatment at CPF, and tested for physical and chemical properties. Wax content is in the range 23-31 weight % while asphalt content is about 0.1 weight%. Resin content is 13-7 weight % and deposits are 0.01 weight%. The carbon number distribution in the crude is in the range 7-35 carbon atoms. The pour point varies between 39°C-42°C and the boiling point is in the range 70 °C - 533 °C.

**Keywords:** Sudanese crude oil, evaluation, properties.

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### **I. Introduction**

Sudanese crude oil is waxy in character, has an average API degree of 32 and possesses no sulfur. Crude oil and high-boiling crude oil fractions are composed of many members of a relatively few homologous series of hydrocarbons. Petroleum is essentially a mixture of hydrocarbons, but containing small quantities of oxygen, sulfur, nitrogen, vanadium, nickel, and chromium. The hydrocarbons present in crude petroleum are classified into three general types: paraffin's, naphthenic, and aromatics. In addition, there is a fourth type, olefins, that is formed during processing by the cracking or dehydrogenation of paraffin's and naphthenic. There are no olefins in crude oil. Crude oil appears as liquids of varying viscosities. Their color can range from green to dark brown, and there are many properties that can be tested for crude oil: density, API gravity, specific gravity, wax content, pour point, TAN, water content, sulfur content, asphalt content, nitrogen content, salt content, viscosity, vapors, pressure and flash point.

### **II. Material and methodology**

The samples of crude oil tested for properties study were supplied by Greater Nile Petroleum Company (GNPOC) Petroleum Operating Company and Petroleum Training And Research Centre. The main sources were Nile blend, Full light, Sargas and Star oil fields. The samples were tested for density, kinematic viscosity, specific gravity, Total acid number (TAN), pour point, asphalt content, sulphur content and wax content. Density and specific gravity were measured by the density meter analyser (DMA) according to (ASTM D5002), API was calculated from specific gravity equation. Total acid number (TAN) was tested by TAN titration equipment (ASTM D664). Pour point was measured according to ASTM D97-04. Kinematic viscosity was measured with 400 and 450 universal viscometers. Asphalt content was tested according to IP143 method and lastly Wax content was measured according to UOP46 method.

### **III. Results and discussions**

The TBP (True Boiling Point) distillation gives an almost exact picture of a crude petroleum by measuring the boiling points of the components making up the crude.

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Table (1) true boiling points(TBP) of the components

component	Boiling point range C°
Gas	C3-C4
Light debutanized gasoline	C5 -70 C5-80 C5-100
Heavy gasoline	70 -140 80 -180 100 -180
kerosene	160 -260 180 -260
Gas oil	160 -360 260 -325 260 -360 260 -370
residue	T > 325 T > 360 T > 370

Table (2) Density of crude oil

Sample type	Density @15C°
Dar blend	913.6
Fulla light	881.3
Sargas	927.8
Nile blend	878.4
B.of fulla+staroil	836.3

Table (3) Specific Gravity of tested oil

Sample type	S.G
Dar blend	914.5
Fulla light	882.1
sargas	928.6
Nile blend	872.9
B.of fulla+staroil	836.9

Table (4) Wax content

Sample type	Wax content %
Dar blend	19.28
Fulla light	21.68
Sargas	20.99
Nile blend	29.95
B.of fulla+staroil	36.88

Table (5) Pour point for samples

Sample type	Pour point C°
Dar blend	39
Fulla light	12
Sargas	12
Nile blend	30
B.of fulla+staroil	42

Table (6) Total acid number (TAN) for samples

Sample type	TAN mg KOH/g
Dar blend	4.47
Fulla light	0.35
Sargas	1.64
Nile blend	0.66
B.of fulla+staroil	0.12

Table (7) water content of crude oil

Sample type	Water content wt%
Dar blend	0.4
Fulla light	3.0
Sargas	0.05
Nile blend	0.20
B.of fulla+staroil	2.8

Table (8) sulfur content of crude oil

Sample type	sulfur content wt%
Dar blend	0.1272
Fulla light	0.0813
Sargas	0.1227
Nile blend	0.0745
B.of fulla+staroil	0.0885

Table (9) The Kinematic viscosity

Sample type	k. Viscosity @50 C <sup>o</sup>	k. Viscosity @60C <sup>o</sup>	k. Viscosity @70C <sup>o</sup>
Dar blend	440.5	233.4	139,8
Fulla light	32,54	21,34	16.06
Sargas	499.4	278.7	170.6
Nile blend	39.03	25.06	17.88
B.of fulla+staroil	12.97	7.761	6.696

Table (10) Asphalting content of the tested oil

Sample type	Asphaltin g content wt%
Dar blend	0.12
Fulla light	0.1
Sargas	0.08
Nile blend	0.14
B.of fulla+staroil	0.04

Table (11) The Percentages and the products yield of crude oil

Crude oil	Naphtha	Kerosene	Atmospheric gasoil	Vacuum gasoil	Residue
	Vol %	Vol %	Vol %	Vol %	Vol %
Nile blend	2.99	6.89	2.16	8.24	65.07
Sargas	2.46	4.55	1.45	8.84	77.54
Fulla light	6.34	6.33	3.11	4.39	69.65
Blend of fulla+staroil	12.43	8.48	11.10	8.29	52.63

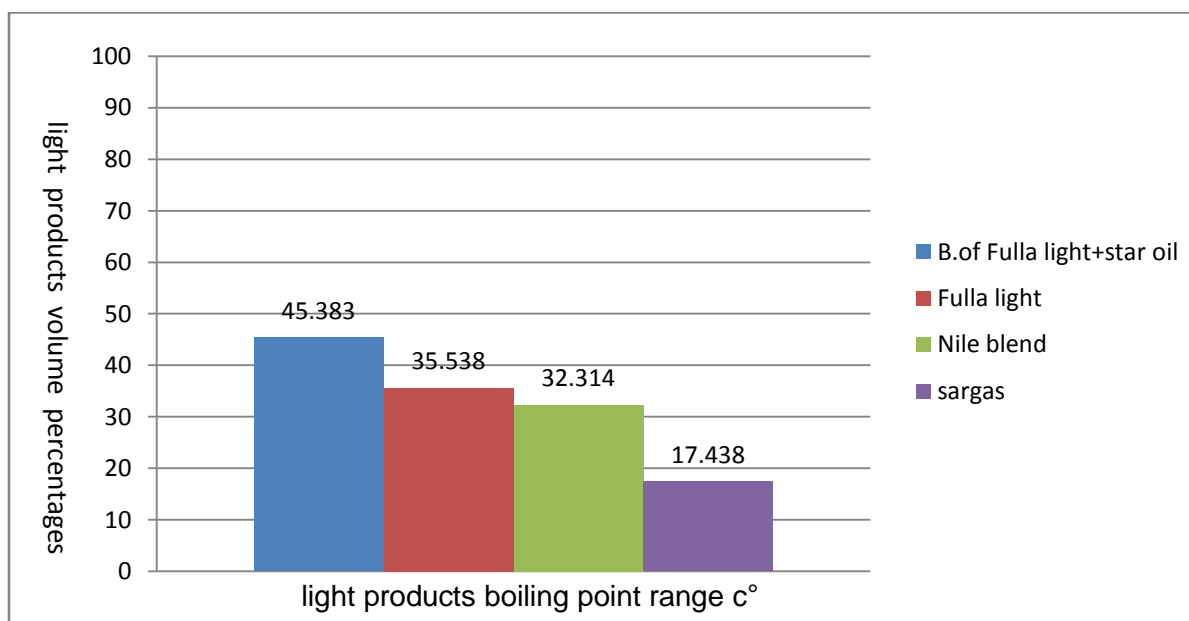


Figure (1) : percentages of products yield for crude oil

#### IV. CONCLUSION

From the tests and results in tables (2,3,4,5,6,7,8,9,10) we found that Dar blend oil is a heavy crude based on API, low asphalt content (only 0.12%) and high TAN value (4.47).

And from the tests the optimum crude oil is star oil because it has low viscosity, low total acid number (TAN), low sulfur content, low asphalt content, low wax content and high API. Because of high API the crude oil produced light products more than heavy products. This crude oil does not need a lot of treatments specially for wax, water and sulfur content. Star oil and full blend give an ideal crude with low total acid number and pour point for refining.

It is quite evident that star oil and Nile blend are scarce resources since any increase in these resources will improve process and petroleum light products quality.

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