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# STUDYING THE PROPERTIES OF DISTILLATE USING DIFFERENT CRUDE OILS AND THEIR FRACTIONS UNDER ATMOSPHERIC DISTILLATION

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**ABSTRACT**
This research study the properties of two different crude oils . Two samples of crude oil were used, which were ( Al – Dora and Al - Ahdab )crude oil. Atmospheric distillation used to separate these two crude oils into their fractions according to boiling point. This research introduced most important characteristics and information's about these samples of crude oils and their products. ASTM distillation was converted to TPB distillation curve. It was found that the preliminary boiling point is lower than the cease point is higher than ASTM distillation for the two crude oils. Most important properties of the products of the two crude oils were calculated. These properties are API, gravity, Watson characterization factor (k), viscosity, molecular weight and refractive index. It was found that the API gravity for Al-Dora crude oil cuts is less than that of the Al-Ahdab crude oil cuts. Also , Al-Dora and Al-Ahdab crude oils cuts having more naphthenic or aromatic components since the characterization factor is less than 12.5. it was concluded that the characterization factor (K) for Al-Ahdab crude oil is less than Al-Dora crude oil for gasoline only. While the opposite happens with Kerosene and gas oil. Finally , It was conclude that the viscosity, molecular weight and refractive index of Al-Dora crude oil products were higher than that of the products of Al-Ahdab crude oil. It was found also that the viscosity of cuts for Al-Dora and Al- Ahdab crude is increase because kerosene is more viscous (heavy cut) than gasoline. Also gas oil is more viscous than gasoline and kerosene. Finally , it was concluded that the viscosity of gasoline, kerosene and gas oil for Al-Dora crude is higher than gasoline, kerosene and gas oil for Al-Ahdab crude oil. It was concluded that the molecular weights of gasoline, kerosene for Al-Dora crude is higher than gasoline, kerosene for Al-Ahdab crude oil but the gas oil is on the contrary. It was concluded that the refractive index for Al-Dora crude is higher than Al-Ahdab crude oil.

**Key words: Atmospheric Distillation , Crude oil , Naphthenics and aromatics**

# دراسة خصائص المقطر باستخدام انواع مختلفة من النفط الخام

**دعاء حسين علي مهند عبد الرزاق محمود**

**الخلاصة:**
يتضمن هذا البحث دراسة مميزات نوعين من النفوط الخام وهي نفط خام الدورة ونفط خام الاحدب وكذلك دراسة مميزات منتجات هذه النفوط الخام . تم استخدام التقطير الجوي لهذين النوعين من النفوط الخام وكذلك تقطير جوي لمنتجاتهم لاعطاء معلومات دقيقة عن هذين النوعين من النفوط الخام ومنتجاتهم. تم تحويل منحني تقطير ASTM الى منحني تقطير TBP.وجد ان نقطة الغليان الابتدائية هي اقل في منحني TBP بينما نقطة نهاية الغليان هي اعلى. معظم خواص منتجات هذه النفوط الخام تم حسابها , واهمها API , عامل تميز واتسن , اللزوجة , الوزن الجزيئي ومعامل الانكسار. وجد ان API لنفط الخام الدورة اقل من نفط خام الاحدب. وكذلك ان منتجات كلا من نفط خام الدورة والاحدب ذات مركبات نفثية او اروماتية لان معامل تمييز واتسن اقل من 12.5. تم استنتاج أن عامل توصيف (K) لنفط الأحدب أقل من نفط الدورة الخام للبنزين فقط. في حين أن العكس يحدث مع الكيروسين وزيت الغاز.واخيرا تم استنتاج ان اللزوجة والوزن الجزيئي ومعامل انكسار منتجات نفط خام الدورة اعلى من منتجات نفط خام الاحدب. وقد وجد أيضًا أن لزوجة المقاطع بالنسبة

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لخام الدورة والأحدب تزداد لأن الكيروسين يكون أكثر لزوجة (مقطع ثقيل) من البنزين. أيضا زيت الغاز هو أكثرلزوجة من البنزين والكيروسين. أخيرًا ، تم استنتاج أن لزوجة البنزين والكيروسين وزيت الغاز بالنسبة لخام الدورة أعلى من البنزين والكيروسين وزيت الغاز بالنسبة إلى نفط الأحدب الخام. تم استنتاج أن الأوزان الجزيئية للبنزين والكيروسين لخام الدورة أعلى من البنزين والكيروسين لنفط الأحدب الخام ، لكن زيت الغاز على العكس. تم استنتاج أن معامل الانكسار لخام الدورة أعلى من النفط الخام في الأحدب.

## ABBREVIATIONS

| | |
|---|---|
| TBP | True Boiling Point |
| ASTM | American Society for Testing and Material |
| Sp.gr | Specific gravity |
| K | Watson characterization factor |
| MABP | Mean Average Boiling Point |
| MW | Molecular Weight |
| N | Refractive Index |
| I | Hung characterization parameter |
| IBP | Initial Boiling Point |
| EBP | End Boiling Point |
| ATE | Atmospheric equivalent temperature |
| μ | Viscosity |

## INTRODUCTION

Crude oil is often obtained from numerous elements of the globe and has totally different physical and chemical specifications. The crude characteristics properties type the vary of product that made by the processes. (Watkins, 1979) Crude oil may be ready, unrefined crude oil output possessed of organic component deposits and various organic substances. A kind of fuel, fossil oil may be refined to provide applicable output such petrol, diesel and many styles of petrochemicals. it's un renewable riches, who suggests that it cannot be replaced at the rapidity we head for to expend it and is thus a limited riches. (James,2019)Crude oil is usually obtained through drilling wherever it's sometimes found aboard different resources, like fossil fuel (which is lighter, and thus sits higher than the crude oil) and salty water (which is thick). it's then refined and processed to a spread of forms, like fuel, lamp oil, asphalt, and marketed to shoppers. (James,2019)

## THEORY

Petroleum crude oils are liquid mixture of hydrocarbons that is found in certain rock strata and can be extracted and refined to produce fuels. Hydrocarbons got it in crude oils usually also contain the elements nitrogen and sulfur. Many crude oils as well imbibed grade of toxic gas hydrogen sulfide ($H_2S$). In addition to crude oils might include dribble quantities of minerals like vanadium and nickel, also salts.(Mohamad, 2010)

### Properties Of Crude Oil

### Distillation Curves

The distillation domain of the crude allows a designation of the amounts of the different products present. The distillation of petroleum is executed according to standard technique in procedure of evaluating percentage of distilled with identical temperature. The results of this distillation experiments are plotted and called distillation curves. The most beneficial kind of distillation is known as true boiling TBP. In addition to TBP there are at least three main types (Peter,2007) , and major types are

**True Boiling Point Distillation Curve**

It could be a wide applied batch distillation method for the characterization of crude oils, historically primarily for promoting and processing functions. The TBP curve is gained by plotting the accumulative volume or mass distillation fraction when the temperature was increasing. The form of those curves is relying on the dispersal of elements during a presented crude oil. As such, these curves provide a "footprint" of the structure of crude oils. A modern technique of characterizing crude oils supports the form of TBP distillation curves is suggested which was a gamma distribution. It is found to explain experimental knowledge fine with simply two parameters, and in and of itself offers a really sensible way in terms of distinguish crude oils. Values extent for the description parameters for various varieties of crude oil are known for an oversized set of TBP knowledge. The description parameters will be correlate with variety of crude oil characteristics. They will even be accustomed portend the crude fractions which will be made from a specified crude oil and therefore correlate to the worth of that crude. (Peter,2007)

**ASTM Distillation Curve :**

It was wont to separate vast industrial fractions such as fuel lubricant fractions, gasoline fractions into define boiling range fractions or cuts. It gives the employer all the information that will be want to proceed the distillation process such as method parameters, model parameters and experimental conditions. (ASTM international,2012)

It includes a fast distillation procedure experiment, this procedure advanced by American society for testing and material (ASTM). It is executed in a simple tool include a flask which is controlling on the sample linked to condenser which was inclined, which condensed the rising vapors. The distilled fractions from the crude oil are collected in a cylinder which should be well-known size .(Ali,2017).

**Classification Of Crude Oil** :

Crude oil should be classified by :

**Specific Gravity and API Gravity :** they are defined as the density or weight of a unit volume of material . (James and Gray, 1984)

$$Sp.gr=141.5/(API+131.5)$$

Table (1) Classification of crude depending on API gravity.

| **Quality Classifications** | **API Gravity Range** |
|---|---|
| Crude is light | API > 37 |
| Crude is medium | 37 > API > 28 |
| Crude is heavy | 28 > API > 8.5 |
| Crude is very heavy | API < 8.5 |

**Characterization Factor ( k )**

There are many correlations between the aromaticity and paraffin city and yield of crude oils, but the most widely common is "Watson Characterization Factor" (K)**.** The k Factor vary from less than 10 for aromatic compound to 15 for paraffinic elements . [James and Gray, 1984] Calculations of Watson Characterization Factor (K) is determined by using the below equations :

$$K= \sqrt[3]{MeABP} \ / \ sp.gr$$

$$MeABP = VABP - \Delta$$

$$VABP = \frac{T10+T30+T50+T70+T90}{5}$$

$$Ln\ \Delta = -0.94402-0.00865*(VABP-32)^{0.6667}+2.99791\ *(SL^{0.333})$$

$$SL = \frac{T90-T10}{90-10}$$

**Molecular weight of crude oil:**

For many functions in chemical engineering, there is necessary to understand the molecular weight (MW) of the fluids in method streams, and for mixtures of many completely different compounds a median relative molecular mass may be useful. But, precise analysis of the composition of complicated mixtures of hydrocarbons, which might encompass many thousand completely different compounds, is troublesome to urge. Direct activity of molecular weight is time tightened and offers inexact results. However, there are many models determining average molecular weight**,** supported gravity and data distillation. [Eng. Tool box, 2017] **.** The Molecular Weight ( M ) can be calculated from the following equation :

M=42.965[exp((2.097*(10^-4)* MeABP) –( 7.78712*sp.gr) +( 2.08476* (10^-3) * MeABP*sp.gr))]*[( MeABP^1.26007)*(sp.gr^4.98308)]

Where , MeABP is the mean average boiling point in degree Kelvin, and sp.gr is the specific gravity. [Riazi,2005]

**Refractive Index of crude oil**

It has been shown to represent varied necessary properties of multicomponent natural crude, processed fuels, further of the various elements . Values of RI are often measured terribly accurately and are wont to correlate density and different properties of hydrocarbons with high reliableness. [Hassan,1997]

The refractive index (N) can be calculated from the following equation :

$$N = \left(\frac{1+2*I}{1-I}\right)^{0.5}$$

Where I may be calculated from :

I = A exp[(B* MeABP C*sp.gr+D* MeABP*sp.gr)]*( MeABP^E)*(sp.gr^F)

Where, A , B , C , D , E , and F are constants from table below ,(I) is the Huang characterization parameter, MeABP is the mean average boiling point, and sp.gr is the specific gravity. [Hassan,1997]

Table(2) constants of Huang characterization parameter

| | |
|---|---|
| A | 0.02266 |
| B | 0.0003905 |
| C | 2.468 |
| D | 0.0005704- |
| E | 0.0572 |
| F | -0.720 |

## EXPERIMENTAL WORK

### Introduction

Crude oils which have been used is from Al-Ahdab refinery in Wasit and Al-Dora refinery in Baghdad . The distillation method which has been used is ASTM D86. This take a look at approach covers the technique for the outpouring of stabilized crude petroleum to a closing cut heat of 400 ˚C Atmospheric Equivalent Temperature (AET). This take a look at approach employs a fractionating column abject an effectively of 14 in conformity with 18 theoretical plates sliced at a manifestation ratio regarding 5:1. Performance standards because the vital

tools are specified. This take a look at approach details procedure for the manufacturing of a liquefied gas , distillate fractions and residuum over measuring exorcism regarding which analytical information can remain obtained, and the dedication regarding yields about the above fractions by both mass and volume. From the preceding information, a diagram concerning temperature versus mass% distilled do remain produced. This is corresponds to a laboratory technique, who is described at 15/5 (15 theoretical plate column, 5:1 reflux ratio ) or TBP (true boiling point) **.**[Engler,2003]

**Apparatus**

The apparatus which has been used to distillated crude oil called ( Koehler k45000 ) [labequep,2019] as shown in figure below which consist of : heater unit, condenser unit and control unit .

**Figure (1)** Koehler k45000 for distillate crude oil

**Preparation of apparatus:**

The distillation column and all glass apparatus must be clean and dry before the distillation starts . Ensure so much the regulation is leak-free and all heaters, rule devices, then contraptions are of yet with in assignment system . A timing machine must stand geared up for makes use of .

**Crude oil distillation**

Distillation is the principal separation method obtain the different petroleum products (cuts) at various boiling ranges. The primary atmospheric distillation takes place in the distillation .

**Products of atmospheric distillation :** Gasoline ( naphtha ), kerosene and Gas oil .

**Experimental Procedure**

Take a crude oil and put in the flask, then weigh the crude oil with flask by electronic balance, after that joined the flask to distillation column, then reading atmospheric temperature by thermometer and open cold water to cool condenser, then heating crude oil by heater, after that set temperature of heater by switch in control unit and reading it of each cut and reading the temperature of first drop (initial boiling point IBP), then set temperature of each cut and collect the cuts by glass tank each cut in glass, finally measured the volume of each cut .

## RESULT AND DISCUSSION

**API of crude oil cuts distillate**

Table (3) calculations of API of Al - Ahdab and Al- Dora crudes oil

| type of crude oil cuts | specific gravity of Al - Ahdab crude oil cuts | API of Al - Ahdab crude oil cuts | specific gravity of Al – Dora crude oil cuts | API of Al – Dora crude oil cuts |
|---|---|---|---|---|
| Gasoline | 0.7679 | 52.7688 | 0.7735 | 51.43471 |
| Kerosene | 0.8126 | 42.6324 | 0.8281 | 39.37308 |
| gas oil | 0.8176 | 37.4351 | 0.8551 | 33.97772 |

From the above calculations it was found that the sp.gr of kerosene and gas oil for Al-Ahdab crude is higher than gasoline because it is heavy cuts. But API gravity of kerosene and gas oil decrease because the API proportional reversibly with sp.gr .

From the above calculations it was found also that the sp.gr of kerosene and gas oil for Al-Dora crude is higher than gasoline because it is heavy cuts. But API gravity of kerosene and gas oil decrease because the API proportional reversibly with sp.gr .

Finally , it was concluded that the API gravity of gasoline, kerosene and gas oil for Al-Dora crude is less than gasoline, kerosene and gas oil for Al-Ahdab crude oil.

**ASTM D86 AND TPB distillation of crude oil cuts distillate**

The ASTM D86 can be converted to TPB by using the equation : TPB = a* ( ASTM D86 )^b Where a and b are constant from table below, [Riazi,2005].

Table (4) a and b are constants

| Vol% distilled | a | B |
|---|---|---|
| 0 | 0.917 | 1.002 |
| 10 | 0.528 | 1.090 |
| 30 | 0.743 | 1.043 |
| 50 | 0.892 | 1.018 |
| 70 | 0.871 | 1.023 |
| 90 | 0.949 | 1.011 |
| 95 | 0.801 | 1.036 |

**A- Al - Ahdab crude oil**

**ASTM D86 and TPB of gasoline**

Table (5) ASTM D86 and TPB distillation of gasoline

| **Vol %** | **ASTM D86 T($^o$C)** | **ASTM D86 T($^o$R)** | **TPB T($^o$R)** | **TPB T($^o$C)** |
|---|---|---|---|---|
| 0 | 35 | 555 | 514.9136 | 12.72978 |
| 10 | 50 | 582 | 544.6947 | 29.27483 |
| 30 | 78 | 632.4 | 617.9657 | 69.98095 |
| 50 | 95 | 663 | 663.0359 | 95.01992 |
| 70 | 115 | 699 | 705.5554 | 118.6419 |
| 90 | 160 | 780 | 796.4781 | 169.1545 |
| 95 | 175 | 807 | 819.5805 | 181.9892 |

**ASTM D86 and TPB of kerosene**

Table (6) ASTM D86 and TPB distillation of kerosene

| Vol % | ASTM D86 T(°C) | ASTM D86 T(°R) | TPB T(°R) | TPB T(°C) |
|---|---|---|---|---|
| 0 | 170 | 798 | 740.8733 | 138.2629 |
| 10 | 180 | 816 | 787.2803 | 164.0446 |
| 30 | 198 | 848.4 | 839.4533 | 193.0296 |
| 50 | 218 | 884.4 | 888.9444 | 220.5247 |
| 70 | 234 | 913.2 | 927.3496 | 241.8609 |
| 90 | 244 | 931.2 | 952.7274 | 255.9597 |
| 95 | 254 | 949.2 | 969.5674 | 265.3152 |

**ASTM D86 and TPB of gas oil**

Table (7) ASTM D86 and TPB distillation of gas oil

| Vol % | ASTM D86 T(°C) | ASTM D86 T(°R) | TPB T(°R) | TPB T(°C) |
|---|---|---|---|---|
| 0 | 240 | 924 | 858.0922 | 203.3846 |
| 10 | 250 | 942 | 920.667 | 238.1483 |
| 30 | 265 | 969 | 964.2128 | 262.3404 |
| 50 | 270 | 978 | 984.7674 | 273.7597 |
| 70 | 282 | 999.6 | 1017.164 | 291.7579 |
| 90 | 310 | 1050 | 1075.694 | 324.2742 |
| 95 | 315 | 1059 | 1085.935 | 329.9639 |

For Al-Ahdab crude and from above calculation it was found that the TBP was give higher fractionation. And it was found that in ASTM test the IBP is higher and the EP is lower than TBP test.

**Al - Dora crude oil**

**ASTM D86 and TPB of gasoline**

Table (8) ASTM D86 and TPB distillation of gasoline

| Vol % | ASTM D86 T(°C) | ASTM D86 T(°R) | TPB T(°R) | TPB T(°C) |
|---|---|---|---|---|
| 0 | 50 | 582 | 540.0122 | 26.67344 |
| 10 | 75 | 627 | 590.7568 | 54.86488 |
| 30 | 120 | 708 | 695.1684 | 112.8713 |
| 50 | 150 | 762 | 763.9101 | 151.0611 |
| 70 | 165 | 789 | 798.5824 | 170.3235 |
| 90 | 185 | 825 | 842.9487 | 194.9715 |
| 95 | 190 | 834 | 847.9915 | 197.7731 |

**ASTM D86 and TPB of kerosene**

Table (9) ASTM D86 and TPB distillation of kerosene

| Vol % | ASTM D86 T(°C) | ASTM D86 T(°R) | TPB T(°R) | TPB T(°C) |
|---|---|---|---|---|
| 0 | 170 | 798 | 740.8733 | 138.2629 |
| 10 | 190 | 834 | 806.2284 | 174.5713 |
| 30 | 205 | 861 | 852.4544 | 200.2524 |
| 50 | 225 | 897 | 901.8337 | 227.6854 |
| 70 | 235 | 915 | 929.2188 | 242.8993 |
| 90 | 245 | 933 | 954.5893 | 256.994 |
| 95 | 250 | 942 | 961.9528 | 261.0849 |

**ASTM D86 and TPB of gas oil**

Table (10) ASTM D86 and TPB distillation of gas oil

| Vol % | ASTM D86 T(°C) | ASTM D86 T(°R) | TPB T(°R) | TPB T(°C) |
|---|---|---|---|---|
| 0 | 220 | 888 | 824.5978 | 184.7766 |
| 10 | 235 | 915 | 891.9409 | 222.1894 |
| 30 | 250 | 942 | 936.2211 | 246.7895 |
| 50 | 270 | 978 | 984.7674 | 273.7597 |
| 70 | 285 | 1005 | 1022.784 | 294.8798 |
| 90 | 310 | 1050 | 1075.694 | 324.2742 |
| 95 | 330 | 1086 | 1114.617 | 345.8986 |

For Al-Dora crude and from above calculation it was found also that the same way of Al-Ahdeb crude .

**Watson Characterization Factor( K ) of crude oil cuts distillate**

Table (11) calculations of Characterization factors of Al – Ahdab and Al -Dora crudes oil

| Cuts | K of Al - Ahdab crude oil | K of Al -Dora crude oil |
|---|---|---|
| Gasoline | 11.30517 | 11.3458 |
| Kerosene | 11.7542 | 11.56844 |
| gas oil | 11.8898 | 11.60642 |

Characterization factors are useful due fact that remain reasonably steady for chemically comparable hydrocarbons. A characterization factor of 12.5 or increased shows that is paraffinic . and for less than this range it shows that is naphthenic. So for Al-Ahdab crude it was concluded that all cuts having more naphthenic or aromatic components. Because the characterization factor (K) is less than 12.5. [Riazi,2005]

For Al-Dora crude it was concluded also that all cuts having more naphthenic or aromatic components. Because the characterization factor (K) is less than 12.5 .
Finally , it was concluded that the characterization factor (K) for Al-Ahdab crude oil is less than Al-Dora crude oil for gasoline only. While the opposite happens with Kerosene and gas oil.

**Viscosity of crude oil cuts distillate**

The viscosity of cuts ( gasoline , kerosene and gas oil ) were measured by viscometer and it can be calculated by the following equation :

$$\mu_1 = \mu_2 \cdot \frac{\rho 1 t 1}{\rho 2 t 2}$$

where $\mu_1$ and $\mu_2$ are viscosity coefficients of the crude oil cut and water, and $\rho_1$ and $\rho_2$ are the densities of crude oil cut and water, respectively, and t1 and t2 are time of crude oil cut and water, respectively.[Oremusov,2014**]**

**Al - Ahdab crude oil**

Table (12) calculations of viscosity for Al- Ahdab crude oil

| Trial | *t water* | *t gasoline* | *t kerosene* | *t gas oil* |
|---|---|---|---|---|
| 1 | 1.43 | 0.91 | 2.56 | 5.13 |
| 2 | 1.42 | 0.90 | 2.60 | 5.10 |
| 3 | 1.40 | 0.95 | 2.62 | 5.09 |
| 4 | 1.38 | 0.91 | 2.59 | 5.01 |
| Average | 1.4075 | 0.9175 | 2.5925 | 5.0825 |

Apply the above equations to find the viscosity of cuts where viscosity of water is 0.8937

$\mu_{gasoline}$ = 0.4474 mPa s, $\mu_{kerosene}$ = 1.3377 mPa s, $\mu_{gas\ oil}$ = 2.7031 mPa s

**Al - Dora crude oil**

Table (13**)** calculations of viscosity for Al- Dora crude oil cuts

| Trial | *t water* | *t gasoline* | *t kerosene* | *t gas oil* |
|---|---|---|---|---|
| 1 | 1.43 | 1.05 | 2.59 | 5.28 |
| 2 | 1.42 | 1.00 | 2.56 | 5.20 |
| 3 | 1.40 | 0.99 | 2.60 | 5.25 |
| 4 | 1.38 | 1.09 | 2.55 | 5.22 |
| Average | 1.4075 | 1.0325 | 2.575 | 5.2375 |

Apply the above equations to find the viscosity of cuts where viscosity of water is 0.8937 mPas

$\mu_{gasoline}$ = 0.5071 mPa s, $\mu_{kerosene}$ = 1.3539 mPa s, $\mu_{gas\ oil}$ = 2.8437 mPa s

From the above calculations it was found also that the viscosity of cuts for Al-Dora and Al-Ahdab crude is increase because kerosene is more viscous (heavy cut) than gasoline. Also gas oil is more viscous than gasoline and kerosene .
Finally , it was concluded that the viscosity of gasoline, kerosene and gas oil for Al-Dora crude is higher than gasoline, kerosene and gas oil for Al-Ahdab crude oil.

**Molecular Weight ( MW ) of crude oil cuts distillate**

Table (14) calculations of Molecular Weight for Al- Ahdab and Al-Dora crude oil cuts

| Cuts | MW of Al-Ahdab crude oil | MW of Al-Dora crude oil |
|---|---|---|
| Gasoline | 94.70632 | 100.5449 |
| Kerosene | 165.575 | 171.118 |
| gas oil | 216.013 | 208.0661 |

It was concluded that the molecular weights of gasoline, kerosene for Al-Dora crude is higher than gasoline, kerosene for Al-Ahdab crude oil but the gas oil is on the contrary.

**Refractive Index ( N ) of crude oil cuts distillate**

Table (15) calculations of refractive index for Al- Ahdab and Al-Dora crude oil cuts

| Cuts | N of Al-Ahdab crude oil | N of Al- Dora crude oil |
|---|---|---|
| Gasoline | 1.425827 | 1.430149 |
| Kerosene | 1.452819 | 1.461731 |
| gas oil | 1.465857 | 1.476201 |

It was concluded that the refractive index for Al-Dora crude is higher than Al-Ahdab crude oil.

**Atmospheric distillation curve of crude used :**

At atmospheric distillation the crude oil having same boiling point range of cuts distilled but dissimilar in initial boiling point ( IBP ), where each crude oil have special ( IBP ) depending on ( API ), IBP increase when API increase and volume of cuts different from crude to another, the ratio light to heavy of atmospheric distillation cuts determined price and quality of crude oil , where increased with fractions increased . From experiment work it was found that the initial boiling point of each crude and from calculation found ( Vol % ) and temperature range of each cuts and plot the distillation curve. The distillation curve at atmospheric pressure ( 760 mm Hg ) shows the ratio of cuts and boiling point for Al-Ahdab and Al-Dora crudes oil as shown from figures (2)to(5).

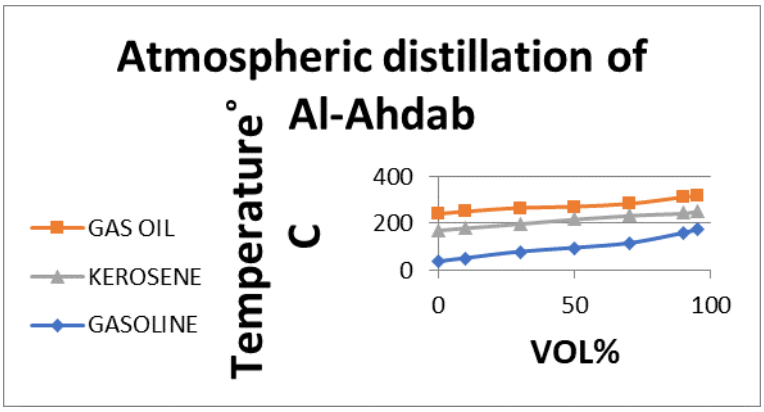


**Figure (2)** Distillation curve of Al-Ahdab crude

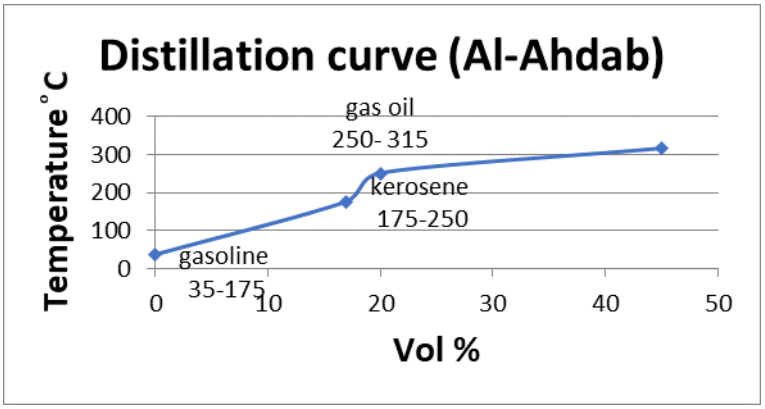


**Figure (3)** Distillation curve of Al-Ahdab crude

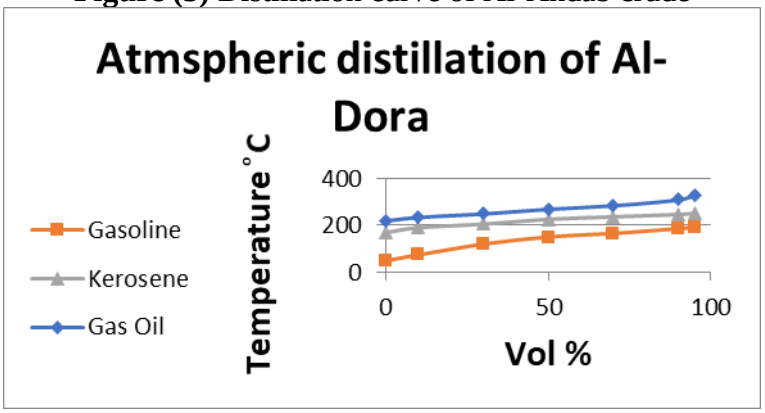


**Figure (4)** Distillation curve of Al-Dora crude

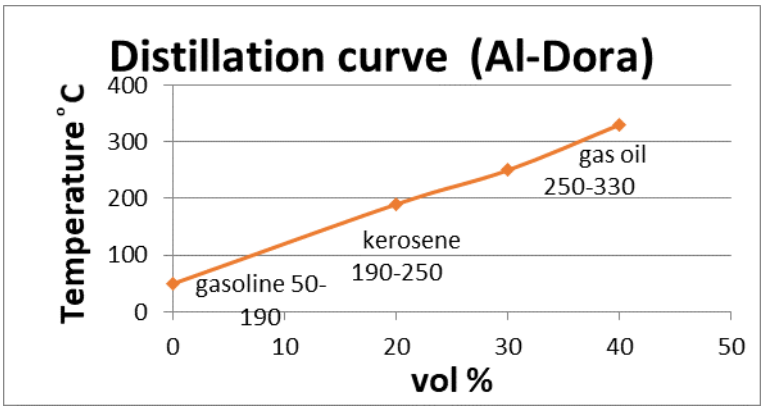


**Figure (5)** Distillation curve of Al-Dora crude

**API effect on value of crude oil :**

API is a major factor for crude pricing, where the crude oil classified into: heavy, medium and light .where Light Crude Oil > 31,Medium Based 22 – 31 and Heavy Crude Oil < 22

**API effects :** Ratio light product to heavy products, ratio atmospheric to vacuum residue, sulfur and nitrogen contents increase with API decrease as shown in figure below :

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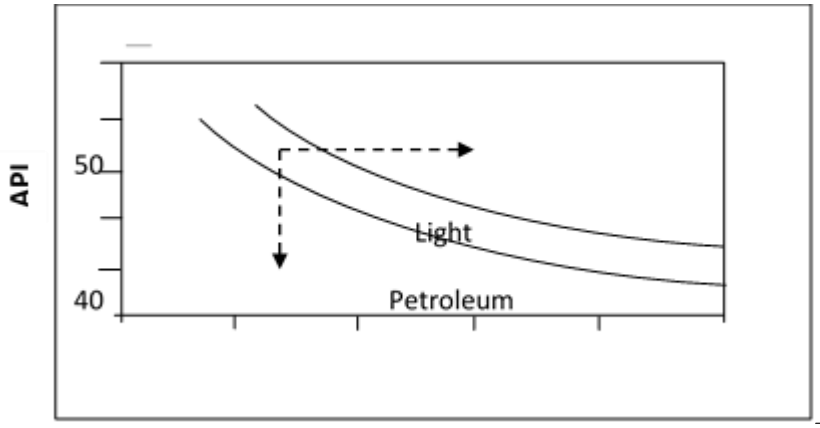


**Fig. (6)** API and Sulfur content

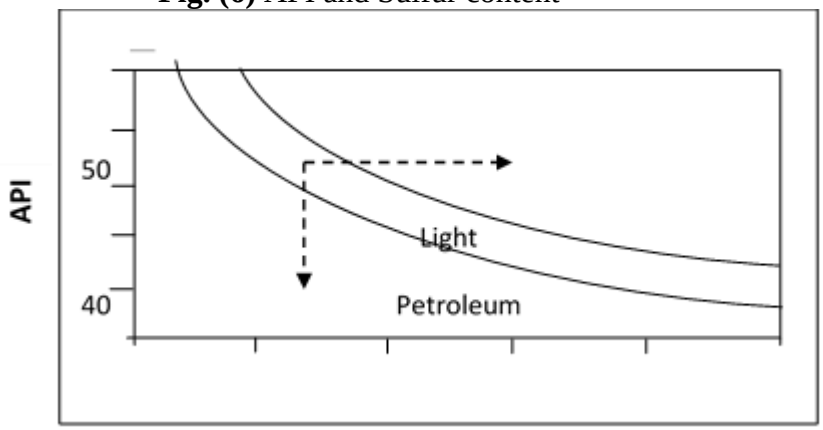


**Fig. (7)** API and Nitrogen content

## CONCLUSIONS

The following conclusions were drawn from the experimental work:

1- Distillation curve give information about nature of distillation and ratio of distilled cuts . Initial boiling point of Al-Ahdab crude oil is less than Al-Dora crude .
2- Ratio of light to heavy cuts or petroleum fractions is dissimilar between Al-Ahdab crude oil and Al-Dora crude .
3- Atmospheric residue ratio for same crude feed to distillation ratio different in Al-Ahdab to Al-Dora crude, where in Al-Dora crude is less than Al-Ahdab crude .
4- Vol. % of light products or distillation cuts in Al-Ahdab crude is less than Al-Dora crude. API effects on the Vol. % of atmospheric distillation cuts.
5- The sulfur content , nitrogen content and asphaltic content appeared in more in medium and heavy crude oil so that this types of cruds needed to more treatment before distillation .
6- It was found that the API gravity for Al-Dora crude oil cuts is less than that of the Al-Ahdab crude oil cuts. Also, Al-Dora and Al-Ahdab crude oils cuts having more naphthenic or aromatic components since the characterization factor is less than 12.5.
7- it was concluded that the characterization factor (K) for Al-Ahdab crude oil is less than Al-Dora crude oil for gasoline only. While the opposite happens with Kerosene and gas oil.
8- It was found also that the viscosity of cuts for Al-Dora and Al- Ahdab crude is increase because kerosene is more viscose (heavy cut) than gasoline. Also gas oil is

more viscous than gasoline and kerosene. Finally , it was concluded that the viscosity of gasoline, kerosene and gas oil for Al-Dora crude is higher than gasoline, kerosene and gas oil for Al-Ahdab crude oil.

9- It was concluded that the molecular weights of gasoline, kerosene for Al-Dora crude is higher than gasoline, kerosene for Al-Ahdab crude oil but the gas oil is on the contrary.

10- It was concluded that the refractive index for Al-Dora crude is higher than Al-Ahdab crude oil.

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