Journal of Petroleum Research and Studies

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

DOI: http://doi.org/10.52716/jprs.v11i4.560

Petroleum Hydrocarbon Quarterly Boiling Range Distribution of Iraqi Crude Oil by Simulated Distillation Method

Aliaa K. Alhead[1,*], Shatha F. Khaleel[2]

Ministry of Oil/ Petroleum Research and Development Center/ BaghdadL Iraq.

[1,*]Corresponding Author E-mail: a_ k_alhead @yahoo.com

[2]E-mail: shatha_khaleel@yahoo.com

Received 18/2/2021, Accepted 6/6/2021, Published 20/12/2021

Abstract

This study includes analysis of different crude oil stock for various field Iraqi oil by gas chromatography instrument, using simulated distillation technique for determining the initial and final boiling point distribution and specified compound distillation information (normal paraffins) (Recovery W/W) for (nC_5 – nC_{44}), ASTM-D5307 becomes the analytical method. This method need tow samples; the first one spiked with internal standard and the second without internal standard. This analysis for quantitative and qualitative oil characterization which is often useful for evaluating the range of hydrocarbons in crude oil using Simulated Distillation. The study was performed using:

- Quarterly analysis of SIMDIS GC Distillation for three field (East Baghdad, Badra, Amara)
- Comparison of analyzes of SIMDIS GC Distillation with Different API (light, intermediate, heavy) with Initial boiling point (IBP).
- Finding experimental relationship between API and Initial boiling point (IBP):

$$\text{IBP} = 1873.8\, API^{-1.28}$$

The result of this study shows that the boiling point increase as the number of carbon is increase, the values of n-Pentane (nC5) to n- Tetratetracontane (nC44) (w/w) changes from winter and summer (difference in temperatures), Positive correlation between C6 and C5 with API, where their percentages increase with increasing API for crude oil and C6 and C5 are lower in summer than in winter due to the evaporation of light components of the samples in summer. Initial boiling point increase as the API is decrease that mean in crude oil have heavy component increases and light component decrease (inverse relationship).

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

توزيع معدل الغليان للهيدروكربونات البترولية للنفط الخام العراقي بطريقة محاكاة التقطير

الخلاصة:

تضمن هذا البحث تحاليل للنفوط الخام العراقية عن طريق التحليل الكمي والنوعي للنفط الخام وتقييم مجموعة الهيدروكربونات باستخدام تقنية محاكاة التقطير Simulation Distillation هي احد تقنيات كروماتوغرافيا الغاز GC وتستخدم لمراقبة عملية التكرير لضمان المنتجات التي يتم إنتاجها كما هو متوقع.وباستخدام تقنية محاكاة التقطير حددت توزيع نقاط الغليان الأولية والنهائية للمكونات النفط بالاضافة الى النسب الوزنية لهذه المكونات (n-C5 إلى n-C44) وباتباع الطريقة القياسية ASTM-D5307 والتي تتطلب تحليل كل عينة بحقنها مرتين؛ المرة الأولى مع المحلول القياسي (internal standard) والمرة الثانية بدونه.

تم تنفيذ البحث بالمحاور:-

- مقارنة نتائج التحليل الفصلي بتقنية محاكاة التقطير Simulation Distillation لثلاثة حقول (شرق بغداد، بدرة، العمارة) والتغيير الحاصل في قيم النسب الوزنية (w/w) للمركبات (n-C5 ,n-C6) فصليا" وزيادتها مع درجات الـ API العالية.
- مقارنة نتائج محاكاة التقطير مع درجات الـ API المختلفة (الخفيفة والمتوسطة والثقيلة) و نقاط الغليان الأولية (IBP) والعلاقة العكسية بينهم.
- العلاقة العملية بين API ونقطة الغليان الأولية (IBP).
- $\mathrm{IBP} = 1873.8\,API^{-1.28}$

بينت النتائج:

- التغيرالحاصل في درجات الغليان الاولية بتغيير عدد ذرات الكاربون من (n-C5 إلى n-C44) نتيجة تغيرفي درجات الحرارة بين فصلي الشتاء والصيف.
- العلاقة العكسية بين AIP ودرجات الغليان الاولية.
- التغير الواضح في النسب الوزنية للمكونات (nC5- nC44) بالنسبة لفصلي الشتاء والصيف.

1. Introduction:

Petroleum hydrocarbons have large number of compounds found in crude oil, natural gas, coal, and peat. They consist of three major groups of compounds, the alkanes (paraffins), alkenes (olefins), and aromatics. Researchers have increased the need for sophisticated techniques in analyses for excellent hydrocarbon profiling and characterization. Gas chromatographic technique was successfully in the determination of hundreds of hydrocarbons and other organic compounds. It is an ideal tool in analyzing gas and liquid samples, thus allowing the researcher to identify both the type of molecular species present, their concentrations, and also obtain

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

information from hydrocarbon samples (free product) by determining the composition of the hydrocarbons present. Crude oil varies widely in appearance and viscosity from field to field, characterization and source identification of oils from various fields is necessary. One of such ways of doing this is by analyzing the hydrocarbon fractions, Gas Chromatography analysis for quantitative and qualitative oil characterization which is often used for evaluating the range of hydrocarbons in crude oil or rock extract. [1, 2]

Gas Chromatography requires analyzing entire oil for hydrocarbon range in a gas chromatograph while certain hydrocarbon ratios were employed in evaluating such things as maturity, source, biodegradation and evaporative fractionation. [3] Fingerprinting technology was developed which allows the oil a new well for each reservoir, and allows the oil from multiple wells to commingle and the respective contributions identified by source and proportion. [4]

1.1 Petroleum Hydrocarbons Analysis:

Crude oil sample can be analysis by injecting a small portion of the sample into a gas chromatograph. Once injected [1], the product was heated and vaporized and carried into a column by a flow of inert gas. After injection the temperature of the column is slowly raised, as the temperature increases the compounds begin to move through the column, in general the more volatile and lower boiling compounds start moving first. A flame ionization detector connected to the end of the column detects the components of the product as they elute from the column. The time that it takes for individual components to go through the column depends on:

- Temperature
- Length of column
- Column characteristics
- The character of the compound

Crude oil consists of a very large number of compounds that, by defined, as stoke tank oil, as well as other sources of petroleum such as coal, and peat. Petroleum hydrocarbons consist of three major groups of compounds:

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

- Alkanes (paraffins)
- Alkenes (olefins),
- Aromatics.

Hydrocarbon products such as gasoline, diesel fuel, and asphalts are all derived from crude oil by a variety of refining and distillation processes. Each product is produced by the combination of multiple individual hydrocarbon compounds all of which have different vaporization and boiling temperatures. The middle boiling range compounds are used in differing proportions to create products such as kerosene, diesel, and heating oil. These products predominantly contain C_{10} to C_{24} alkanes, and polynuclear aromatics with little to no olefins. [1]

1.2 Simulated Distillation (SD) by Gas Chromatography

The methods (ASTM D-5307) the distribution of crude oil and determining the boiling points used Simulated Distillation is a GC technique method .This data very useful to refinery engineers in determining the process and to monitor the refining process to ensure the products produced are as expected. ASTM D5307 analytical method Simulated Distillation, Results are good agreement with the physical distillation. Simulated distillation (SimDis) is a gas chromatography (GC) technique which separates individual hydrocarbon components in the order of their boiling points. Simulated distillation is a GC method used to characterize petroleum fractions and Specified Compound Distillation information (Normal Paraffins) (Recovery W/W) for (C_5 – C_{44}) and their boiling range distribution. A correlation was reported between the boiling points and the percentages of the sample. [5, 6]

The methods (ASTM D-5307) of simulated distillation for crude oil and petroleum fractions by gas chromatography shown in Table (1) below, according to the device (Shimadzu Simulated Distillation Gas Chromatograph GC-2014) a suitable method is (ASTM D5307) used for this study.

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

Table (1) Summary of Simulated Distillation Test Methods

ASTM Method	Maximum Carbon #	Sample Type	Boiling Point Range (BP)	
			Initial (IBP)	Final (FBP)
ASTM D3710	Up to C15	Gasoline, Naphtha	~ -20°C to 30°C	<260°C/500°F
ASTM D7096	C3 to C16	Gasoline, Naphtha	~ -20°C to 30°C	<280°C/536°F
ASTM D2887, IP 404, ISO 3924, DIN 51435	C3 to C44	Jet Fuel, Diesel, Biodiesel Blends	~ 40°C to 80°C	<538°C/1000°F
ASTM D5442	C17 to C44	Petroleum derived waxes		<538°C/1000°F
ASTM D5307	C3 to C44	Crude Oil	-30°C to 100°C	<538°C/1138°F
ASTM D7398	C8 to C70	Biodiesel, B100	>100°C/212°F	<615°C/1139°F
ASTM D7213	C5 to C70	Lube Oil, Base Oil	>100°C/212°F	<615°C/1139°F
ASTM D6352	C5 to C90	Lube Oil, Base Oil	>100°C/212°F	<700°C/1292°F
IP 480, EN 15199-1	C10 to C120	Lube Oil, Base Oil	>100°C/212°F	<750°C/1382°F
ASTM D7169	C3 to C100	Residues, Crude Oil	-30°C to 100°C	<720°C/1328°F
IP 507, IP 545, EN 15199-2, EN 15199-3	Up to C120	Heavy Distillate Residues, Crude Oil	>100°C/212°F	<750°C/1382°F
ASTM D7500	C5 to C110	Lube Oil, Base Oil	>100°C/212°F	<735°C/1355°F
ASTM D7900, IP 601	C1 to C10	Stabilized Crude Oil	~ > -30°C	Fraction < 170°C
ASTM D6417	C5 to C22	Volatility of Crude Oil	IBP to 371°C/ 700°F	<700°C/1292°F

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

2. Experimental Work:

2.1 ASTM D5307 Using the Shimadzu Simulated Distillation Gas Chromatograph System:

This method need to two samples was injected twice, first one with internal standard and the second one without. Two runs to determine an initial and final boiling point), ASTM D5307 test max carbon (C_5 to C_{44}) and sampling type crude oil, initial boiling point (IBP) (-30^{o}C to 100^{o}C), final boiling point (FBP) (<538^{o}C). Boiling point distribution graph is created for the fraction with boiling points lower than 538°C. The fraction with boiling points above 538°C is calculated as a residual percentage (mass %). The Shimadzu simulated distillation gas chromatograph system, consisting of the GC-2014 and the LabSolutions distillation GC analysis software, is compliant with ASTM D5307, and combines comfortable operability with high-level functionality ,specified compound distillation information (Normal Paraffins) (Recovery W/W) for (C_5 – C_{44}).

2.2 Instruments Analysis Conditions (Gas chromatograph GC-2014)

labSolution Software included: Real time analysis program, Post run analysis program and Browser program.

- **Analysis Conditions:**

Column temperature injection port temperature were [40 °C (10 °C/ min) - 350 °C (30 min)] and (375°C) and FID temperature (380 °C).Carrier gas flow rate and Hydrogen flow rate were (40 mL/min (nitrogen){ 40 mL/min (55 kPa)}.Air flow rate (400 mL/min (40 kPa)), Injection volume (1 µL).

To calibration used two samples standard solutions were measured, one of them a mixture of n-C_5 to n-C-$_9$, and another mixture from nC_{10} to n-C_{44}) to determination of the initial and final boiling points.

This test method cover the determination of the boiling point rang distribution include:

1. SIMDIS GC Distillation Graph (is the resulting distillation curve plot between recovery (%) and the boiling point.

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

2. SIMDIS GC Result Table starting at initial boiling point and listing % distilled in 5^{o}C increments up to the Final boiling point and can be defined this results as:
- Initial boiling point (IBP)-definition as the point at which a cumulative volume count first drop of the total volume count under the chromatogram is obtained.
- Final boiling point (FBP) - definition as the point at which a cumulative volume count equal to 99.5% of the total volume count under the chromatogram is obtained.
3. Specified Compound Distillation information (Normal Paraffins) (Recovery W/W) for (C_5 – C_{44}).

3. Result and Discussion

3.1 SIMDIS GC Distillation Result:

The crude oil samples was collected from different production Iraqi fields (North, South and Midland) at different periods of time than stored at low temperature (in refrigerator), all samples were measured API and Shimadzu Simulated Distillation Gas Chromatograph information for the samples. The results from Instruments Gas chromatograph (GC-2014) of SIMDIS GC Distillation for samples shown in Tables (2 to 4).

Table (2) Result of SIMDIS GC Distillation for South Iraqi Fields (Initial boiling point (IBP) and Final boiling point (FBP)

Field	Sampling Date	API	Boiling Point Distillation Initial (IBP)	Boiling Point Distillation Final (FBP)
Amara	22/2/2018	28.21	29	538
	/4/2018	22	42	200
	22/6/2018	22.23	41	247
	18/2/2019	23	40	273
Buzargan: Well No. 60	9/12/2018	11.73	84.5	473
Well No. 40	9/12/2018	6.1	138	538
Well No. 14	13/5/2019	23.6	39	468
Well No. 19	13/5/2019	22.9	42	476
Well No. 54	13/5/2019	17.86	52	478
Al rtawi	2017	40.08	13	538
Abu Gharb	9/12/2019	7.9	113.5	537
	9/12/2019	8	108	538

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

Halfaya :CPFN195A	9/12/2018	18	42	538
Halfaya	26/7/2019	22.51	36	480
Halfaya :CPF1HF7	9/12/2018	41.44	12	537
Lahas	26/7/2019	31.99	22	538
Nahar Omar	23/7/2019	26.48	31	537
Majnoon	25/7/2019	32.34	20	538
Saba	26/7/2019	28.88	20	538
Tuba	26/7/2019	24.68	19	537
West Qurna 1	26/7/2019	24.97	36	538
West Qurna 2	25/7/2019	22.003	28	538
Rumila DS1	25/7/2019	27.82	24	537
Rumila DS2	25/7/2019	29.43	25	538
Zubair	24/7/2019	29.54	34	538

Table (3) Result of SIMDIS GC Distillation for Middle Iraqi Fields (Initial boiling point (IBP) and Final boiling point (FBP)

			Boiling Point Distillation	
Field	Sampling Date	API	Initial (IBP)	Final (FBP)
Badra	2/3/2018	30	25	537
	/6/2018	33.5	28	446.5
	1/11/2018	34.11	34.1	356
	23-4-2019	33.9	34.5	352
	1/8/2019	35.03	27	520
East Baghdad	6/2018	22.06	33	537
	16/10/2018	20.16	36.5	537
	2/4/2019	21.73	30	538
	8/7/2019	22.17	48	538
Neft Khana	9/12/2018	40.88	13	536
	8/7/2019	40.96	32	537
Ahadab	27/3/2018	22.5	30	334.5
	1/8/2019	25.29	41	363

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

Table (4) Result of SIMDIS GC Distillation for North Iraqi Fields (Initial boiling point (IBP) and Final boiling point (FBP)

Field	Sampling Date	API	Boiling Point Distillation Initial (IBP)	Boiling Point Distillation Final (FBP)
Khabaz	6/2018	35	12	420.5
	9/12/2018	33.7	13	525
Bai-Hassan (South)	9/12/2018	25.64	27	537.9
Bai- Hassan (North)	9/12/2018	26.9	34.5	486.5
Jambour(North)	9/12/2018	36.53	15	537.3
Qiaruh	18/6/2019	15.4	31	538
		16	39	538

3.2 Comparison of Analyzes of SIMDIS GC Distillation with Different API (light, Intermediate, Heavy) with Initial Boiling Point (IBP)

There are three types of crude oil according to API gravity (light, intermediate, heavy) [7], Table (5) below show the range of API crude oil with initial boiling point (result from SIMDIS GC Distillation).

Result of initial boiling point from SIMDIS Distillation with different API in Figure (1) shown at high API low initial boiling point that mean inverse relationship, initial boiling point increase as the API is decrease that mean in crude oil have heavy component increase and light component decrease (inverse relationship). Table (6) shows the Specified Compound Distillation Information Recovery (W/W) (Normal Paraffins) for Different API that there is a positive correlation between C6 and C5 with API, where their percentages increase with increasing API for crude oil.

Table (5) Crude Type, Based on API gravity and Initial Boiling Point (IBP)

Crude Type	API Gravity	API Range	Initial Boiling Point (IBP) Range °C
Light	>30	30-41	≤15
Intermediate	20–30	20.16 - 30	>35
Heavy	<20	6.1 – 20.16	138-30

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

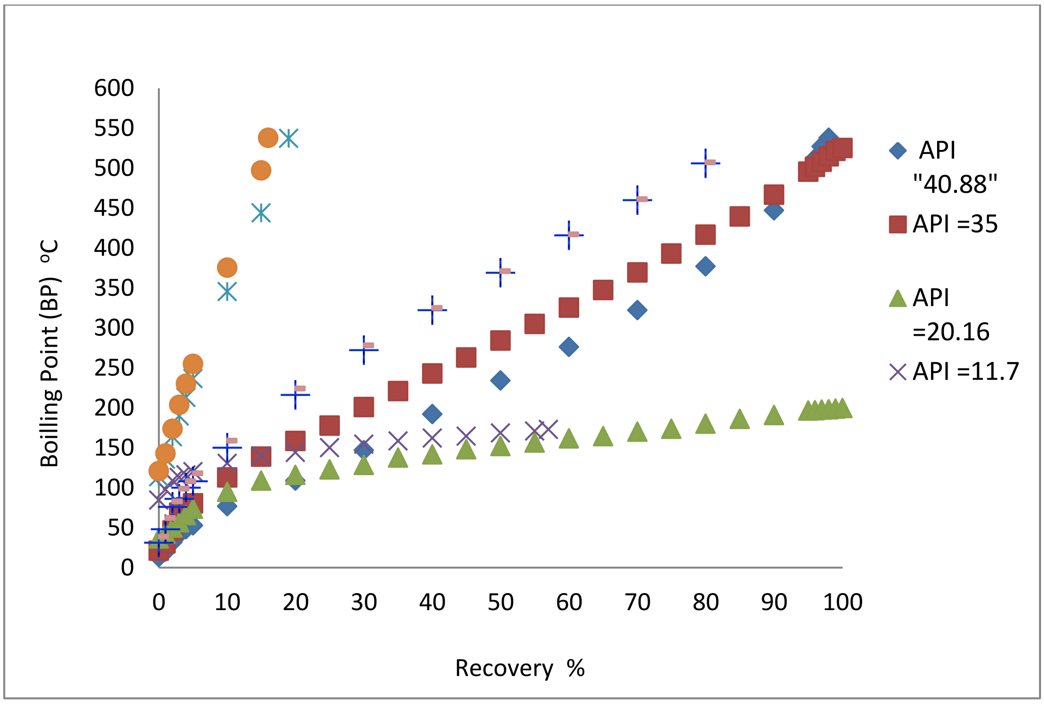

Fig. (1) SIMDIS Distillation Graf with Different API

Table (6) Specified Compound Distillation Information Recovery (W/W) (Normal Paraffins) for Different API

API	40.88	35	20.16	11.73	7.9	6.1
Initial Boiling Point(IPB)	16	18	36.5	84.5	112	183
Specified Compound Distillation Information Recovery (Normal Paraffins) (W/W)						
n- Pentane -C_5	7.6	5.7	1.4	1.0	1	0.6
n- Hexane -C_6	5.3	2.8	1.1	1.0	0	0.9
n - heptane -C_7	7.9	5	3.3	3.1	0.7	3
n- Octane -C_8	6.7	5.5	4.2	3.5	2.3	3.8
n-Nonane -C_9	5.5	4.9	3.7	3.3	3	3.9
n-Deecane -C_{10}	4.9	4.6	3.8	3.3	3.8	4.1
n- Undecane -C_{11}	5.2	4.7	3.5	3.2	3.7	4
n- Dodecane -C_{12}	5	4.3	3.3	3.1	3.7	4
n- Tridecane - C_{13}	4.6	4	3.2	2.9	3.6	3.7
n- Tetradecane -C_{14}	3.9	3.7	3.2	3	3.7	3.9
n- Pentadecane -C_{15}	4	3.7	3.2	2.9	3.7	3.8
n- Hexadecane -C_{16}	3.5	3.3	2.9	2.7	3.4	3.4
n- Heptadecane -C_{17}	3.2	3.1	2.8	2.6	3.3	3.3
(C_{18}-C_{19})	4.4	4.5	4.1	3.8	4.7	4.7
(C_{20}-C_{23})	6.7	7.3	7.3	6.8	8.4	8.4
(C_{24} –C_{27})	7.1	8.4	8.6	7.8	9.8	9.3
(C_{28} – C_{31})	4.8	6.5	7.8	7.4	9	8.1

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

(C_{32} –C_{35})	3.3	4.9	6.7	6.7	7.2	6.5
(C_{36} –C_{39})	2.3	3.7	5.5	6.4	5.7	5.3
(C_{40} – C_{43})	1.6	2.9	4.6	6.1	4.6	4.3
n- Tetratetracontane -C_{44}	2.3	6.5	15.8	19.4	14.7	11
Total	100	100	100	100	100	100

3.3 Relationship between API and Initial Boiling Point

Finding experimental relationship between API and Initial boiling point (IBP) Plot of experiment results of API and initial boiling point Figure (2) to obtain experimental equation according to best-fit line are:

$$\text{IBP} = 1873.8\, API^{-1.28}$$

$R^2 = 0.93$

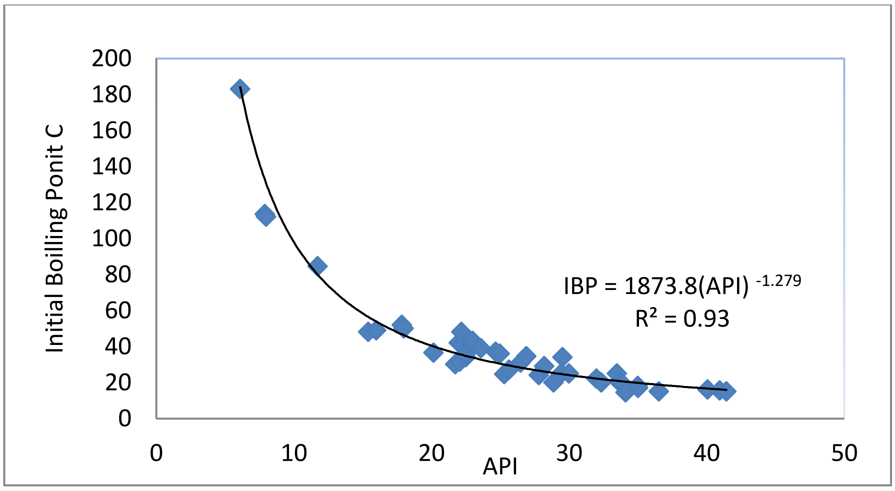

Fig. (2) Relationship between Initial Boiling Point and API

3.4 Quarterly Analysis for Three Iraqi Fields (East Baghdad, Badra, Amara)

Tables (7, 8 and 9) Showed different samples were took in different time (Winter, Summer) and analysis SIMDIS GC Distillation {Specified Compound Distillation Information Recovery (Normal Paraffins) (W/W)} and API at each sampling date for three Iraqi fields (East Baghdad, Badra, and Amara) by the Shimadzu Simulated Distillation Gas Chromatograph System (using ASTM D5307).

The results of the tables below show that:

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

- Boiling point increase as the number of carbon is increase when the temperature increases.
- The values of n-Pentane (nC5) and n- Tetratetracontane (nC44) (w/w) changes in winter and summer.
- Positive correlation between C6 and C5 with API, where their percentages increase with increasing API for crude oil.
- nC6 and nC5 are lower in summer than in winter due to the evaporation of light components of the samples in summer (change in temperature).

Table (7) Specified Compound Distillation Information Recovery (Normal Paraffins) for Quarterly Analysis for East Baghdad Iraqi Field

Field	East Baghdad			
Sampling Date	2-2018	16-10-2018	2-4-2019	8-7-2019
API	22.06	20.16	21.73	22.17
Initial Boiling Point (IPB)	33	36.5	30	48
	Specified Compound Distillation Information Recovery (Normal Paraffins) (W/W)			
n- Pentane -C_5	1.6	1.4	1.6	1.7
n- Hexane -C_6	1	1.1	1.3	1.4
n - heptane -C_7	3	3.3	3.8	3.8
n- Octane -C_8	3.8	4.2	4.7	4.3
n-Nonane -C_9	3.4	3.7	4	3.8
n-Deecane -C_{10}	3.7	3.8	4	3.8
n- Undecane -C_{11}	3.4	3.5	3.7	3.5
n- Dodecane -C_{12}	3.3	3.3	3.5	3.6
n- Tridecane - C_{13}	3.2	3.2	3.3	3.4
n- Tetradecane -C_{14}	3.3	3.2	3.3	3.3
n- Pentadecane -C_{15}	3.2	3.2	3.2	3.2
n- Hexadecane -C_{16}	3.9	2.9	2.9	2.9
n- Heptadecane -C_{17}	2.8	2.8	2.8	2.9
(C_{18}-C_{19})	4.2	4.1	4.1	4.2
(C_{20}-C_{23})	7.5	7.3	7.2	7.5
(C_{24} –C_{27})	8.6	8.6	8.3	8.6
(C_{28} – C_{31})	7.8	7.8	7.5	7.8
(C_{32} –C_{35})	6.7	6.7	6.7	6.5
(C_{36} –C_{39})	5.6	5.5	5.2	5.4
(C_{40} – C_{43})	6.6	4.6	4.3	4.6
n- Tetratetracontane-C_{44}	13.4	15.8	14.6	13.8
Total	100	100	100	100

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

Table (8) Specified Compound Distillation Information Recovery (Normal Paraffins) for Quarterly analysis for Amara Iraqi field

Field	Amara		
Sampling Date	22/2/2018	4/2018	18/2/2019
API	28	22	23
Initial Boiling Point(IPB)	29	42	40
Specified Compound Distillation Information Recovery (Normal Paraffins) (W/W)			
n- Pentane -C_5	2.2	1.5	1.1
n- Hexane -C_6	1.7	1.3	1.4
n - heptane -C_7	4.8	4.3	3.6
n- Octane -C_8	5.2	5.3	4.9
n-Nonane -C_9	4.7	4.5	4.2
n-Deecane -C_{10}	4.6	4.6	4.1
n- Undecane -C_{11}	4.2	4	4.3
n- Dodecane -C_{12}	4.1	3.7	4.2
n- Tridecane - C_{13}	3.8	3.6	4
n- Tetradecane -C_{14}	3.8	3.7	3.7
n- Pentadecane -C_{15}	3.6	3.6	3.6
n- Hexadecane -C_{16}	3.3	3.3	3.4
n- Heptadecane -C_{17}	3.1	3.1	3.3
(C_{18}-C_{19})	4.7	4.4	4.8
(C_{20}-C_{23})	7.8	8	7.8
(C_{24} –C_{27})	8.5	8.9	9.3
(C_{28} – C_{31})	7.2	8.1	7.6
(C_{32} –C_{35})	5.7	7.3	5.9
(C_{36} –C_{39})	4.5	7.1	4.6
(C_{40} – C_{43})	3.6	2.3	3.6
n- Tetratetracontane -C_{44}	8.9	7.4	11.1
Total	100	100	100

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

Table (9) Specified Compound Distillation Information Recovery (Normal Paraffins) for Quarterly Analysis for Badra Iraqi Field

Field	Badra				
Sampling Date	2/3/2018	5/2018	1/11/2018	23/4/2019	8-7-2019
API	30	33.5	34.11	33.9	35.03
Initial Boiling Point(IPB)	25	28	34-33	34.5	17
	Specified Compound Distillation Information Recovery (Normal Paraffins) (W/W)				
n- Pentane -C_5	2	1.9	1.3	1.8	1.7
n- Hexane -C_6	1.7	1.4	1.8	1.5	1.8
n - heptane -C_7	4.9	4.1	4.8	4.7	5.1
n- Octane -C_8	5.8	5.2	5.8	5.6	5.6
n-Nonane -C_9	4.8	4.7	5	5.0	5
n-Deecane -C_{10}	5	5	5	5.0	4.9
n- Undecane -C_{11}	4.3	4.3	3.4	4.4	4.3
n- Dodecane -C_{12}	3.9	3.9	3.9	4	4.1
n- Tridecane - C_{13}	3.7	3.7	3.7	3.8	3.8
n- Tetradecane -C_{14}	3.7	3.7	3.7	3.7	3.8
n- Pentadecane -C_{15}	3.5	3.5	3.5	3.5	3.6
n- Hexadecane -C_{16}	3	3.1	3.1	3.2	3.2
n- Heptadecane -C_{17}	2.9	3.0	2.9	3.1	3.1
(C_{18}-C_{19})	4.2	4.3	4.2	4.2	4.5
(C_{20}-C_{23})	7	7.2	7.2	7.4	7.5
(C_{24} –C_{27})	7.6	7.9	7.8	7.7	8.1
(C_{28} – C_{31})	6.4	6.7	6.6	7.6	6.8
(C_{32} –C_{35})	5.1	5.3	5.2	5.4	5.4
(C_{36} –C_{39})	4.1	4.2	4	4	4.3
(C_{40} – C_{43})	3.2	3.5	3.2	3.3	3.4
n-Tetratetracontane-C_{44}	13.2	13.4	13.9	11.1	10
Total	100	100	100	100	100

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

4. Conclusion:

- Petroleum Hydrocarbons Analysis by gas chromatograph using SIMDIS GC Result is valuable in planning the development of the fields.
- Specified Compound Distillation Recovery (W/W) from Hydrocarbon Distillation accumulated assist to prediction of the type of components will be change (like heavy hydrocarbons).
- Changing in the result starting at initial boiling point(IBP) up to the Final boiling point(FBP) and, Specified compound distillation information (Normal Paraffins) (Recovery W/W) for (nC_5 –n C_{44}) between Winter and Summer.
- Boiling point increase as the number of carbon is increase.
- The values of n- Pentane -C5 and n- Tetratetracontane -C44 (w/w) changes from Winter and Summer for example C6 and C5 are lower in Summer than in winter due to the evaporation of light components of the samples in summer.
- Positive correlation between C6 and C5 with API, where their percentages increase with increasing API for crude oil and the percentages.
- Inverse experimental relationship between API and initial boiling point (IBP).

Open Access
No. 33, December 2021, pp.1- 16

P- ISSN: 2220-5381
E- ISSN: 2710-1096

Reference

1. John W. Wigger, Bruce E. Torkelson, " Petroleum Hydrocarbon Fingerprinting - NumericalInterpretation Developments", P.E. Environmental Liability Management, Torkelson Geochemistry. Inc., Tulsa, Oklahoma.
2. Hunt, J.M., "Petroleum Geochemistry and Geology", Freeman and company, New York, USA p. 231 – 238, 1996.
3. www.scholarsresearchlibrary.com,http://scholarsresearchlibrary.com/archive.html Scholars Research Library Archives of Applied Science Research, 2012, 4 (1):246-253.
4. Leag Oil .com Information, Paper No.2, December 2003.
5. Dan C. Villalanti, Joseph C. Raia, and Jim B. Maynard, " High-temperature Simulated Distillation Applications in Petroleum Characterization", Encyclopedia of Analytical Chemistry, R.A. Meyers (Ed.), pp. 6726–6741, John Wiley & Sons Ltd, Chichester, 2000.
6. Mark W. Frye and William E. Harriso, "Petroleum Hydrocarbon Fingerprinting Quantitative Interpretation: Development and Case Study for Use in Environmental Forensic Investigations", Environmental Geosciences, 1999.