Improvement of Octane Number of Naphtha Cut of Taq-Taq Crude Oil and Khormala Crude Oil Wells by Using Additives.

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Abstract— Gas condensate from khor-Mhor field and Naphtha cuts from Taq-Taq crude oil and Khormala crude oil have been fully analyzed and evaluated using ASTM standard test methods.
Two Types of additives and pyrolysis gasoline have been blended with naphtha samples in different volumetric ratios. Octane number of each blend has been measured using three different octane analyzers.

Index Terms—Additive , ASTM , Gasoline , Gas condensate , Naphtha, Octane analyzer , Octane number .

1 INTRODUCTION

Gasoline is a complex mixture of hundreds of volatile and combustible compounds derived from petroleum, with 5-12 carbon atoms and boiling points in the range of 30-220 °C[1] .
The properties of commercial gasoline are influenced by the origin of the crude oil, the refinery processes and the presence of additives, which are added with the purpose of improving the performance and reducing the emissions of automotive vehicles [2],[3],[4],[5]. The addition of oxygenates to gasoline became widespread after the elimination of the tetra ethyl lead compounds [6].
Specifications for gasoline properties were re – evaluated when a major change accured in the oil – automobile industry system. For example , the "oil crisis " in the 1970 s and the planned phase – out of tetra ethyl lead prompted studies of the optimum octane rating new unleaded - gasoline in the united states and Europe [7],[8],[9],[10] .
Octane number is one of the main parameters used in quality control of gasoline and provides information about the resistance to auto – ignition - this phenomenon occurs when the temperature of the fuel – air mixture under the effect of compression , leading to sufficiently increased self – detonation of the mixture without the help of a spark [11] .
Octane rating is measured at two different operational conditions, the rating measured at the more severe operating conditions (inlet temp. and RPM) is called Motor octane number (MON) and the rating measured at the mild conditions is called the research octane number, (RON), the spread between the two numbers (MON & RON) is known as the fuel sensitivity and pump octane number (PON) or Anti Nock index (AKI) is the arithmetic average of RON and MON [12].
Currently both RON and MON are still measured in a standardized single cylinder, internal combustion engine (cooperation research fuel – CFR engine), following the standard methods ASTM D2699 (RON) and ASTM D2700 (MON), respectively. As all the standard methods are time consuming , complicated , relatively expensive and of poor environmental performance , fast , easy and accurate determination of octane numbers is important for refiners and quality inspectors as optimization of refining process and quality control at a reasonable cost is ever – increasing requirement , very soon scientists began to look for a correlation between the tendency of hydrocarbon – based fuels to knock and the composition of these fuels to calculate the octane numbers indirectly and rapidly , such as using gas chromatography and FTIR spectroscopy [13], by distillation curves and partial least squares regression [14], and methods depend on dielectric spectroscopy [15].
This work describes the use of automatic analyzer based on mid – infrared spectroscopy (zeltex 101C), and (shatox SX – 100M) which operates by measuring. The sample's dielectric properties, as well as the Ukrainian device called octane meter OKM - 2.

2 Experimental:

2.1 Materials used:

(i) Gas condensate from khor – mhor field, near Kirkuk with properties and specifications shown in table (1)
(ii) Naphtha produced from taq – taq crude and khormalla crude oil with specifications and properties shown in table (2)
(iii) Additive (A): EPT octane Enhancer from: Enviro petro technologies pty LTD, Sydney, NSW, Australia.
Composition: Xylene, toluene, vegetable oil fatty acid, Diethyl malonate, trimethyl benzene, N- Methyl aniline, and Dimethyl carbonate.
(iv) Additive (B): octane Enhancer from: UKRZEMRESOURCE, Kyiv, Ukraine.
Composition: N – methyl aniline, MTBE, Toluene and unknown composition component.
2.2 Motor and research octane numbers of prepared samples were measured by the following devices:-
(i) octane Meter type OKM – 2 : equivalent to motor (EN ISO 5163 : 2005) and research (EN ISO 5164 : 2005) methods : from Ukraine ,
(ii) octane meter – type Zeltex 101 C : portable , battery

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powered octane analyzer for gasoline from : (Zeltex , Inc , Hagerstown , MD .USA) provides accuracy and repeatability equivalent to ASTM – approved CFR engines .

(iii) Octane meter type shatox Sx – 100 M: portable octane / cetane Analyzer for gasoline, diesel fuel and other petroleum products; from: SHATOX research organization for developing and manufacting of instrument in cooperation with the Petroleum chemisorptions institute of Siberian Branch of Russian Academy of science. Equivalent to ASTM D 2699 – 86, ASTM D 2700 – 86 Methods.

2.3 procedures and Methods:

The physical and chemical properties of gas condensate, and both Naphtha sample have been determined according to specific ASTM and IP standard methods. Specific gravity and API gravity by hydrometer methods (ASTM D 1298) , sulfur-total (ASTM D 4294) , sulfur mercaptan (ASTM D 3227) , Reid vapor pressure (ASTM D 323) , salt content (ASTM D 3230) , Kinematic viscosity (ASTM D 445) , wax content (UOP 46) , pour point (ASTM D 97) , Ash content (ASTM D 482) , Total acid number (ASTM D 664) , Water content (ASTM D 4928) , Total nitrogen (ASTM D 3228) , metals (IP 470) .

PIONA (ASTM D 6293), Distillation (ASTM D 86), asphaltenes (IP 143).

3 Results and Discussion:

Some of physical and chemical properties of both Naphtha samples and gas condensate measured according to specific ASTM methods are illustrated in Table (1) (naphtha from khormala), table (2) (naphtha from taq – taq), and table (3) (gas condensate from khor – mhor)

Table (1) some physical and chemical properties of naphtha produced from khormala crude.

TEST	UNIT	METHOD	RESULT		
			C5-80	80-150	150-193
Yield on crude	% Volume	ASTM D2892	6.3	0.5	7.3
Yield on crude	% mass	ASTM D2892	8.3	1201	7.8
Specific gravity@15.6 °C	Kg/L	ASTM D1298	0.6536	0.7395	0.7871
API Gravity	° API	ASTM D1298	84.3	59.8	48.3
Sulpher – total	PPm Wt	ASTM D3120	278	884	0.2(%W)
Total Nitrogen	PPm Wt	ASTM D3228	-	‹ 1	‹ 1
PIONA (*)					
Total Paraffins	% Volume	ASTM D6293	92.9	60.9	51.4
Total olefins	% Volume	ASTM D6293	‹ 0.01	0.1	0.3
Total Naphthenes	% Volume	ASTM D6293	6.8	31.3	26.1
Total Aromatics	% Volume	ASTM D6293	0.3	7.9	22.5
Distillation					
IBP	° C	ASTM D86	30.5	96.3	157.1
5%	° C	ASTM D86	41.3	102.7	160.8
10%	° C	ASTM D86	43.4	104.4	161.6
20%	° C	ASTM D86	45.8	106.5	162.5
30%	° C	ASTM D86	48.2	109.3	163.8
40%	° C	ASTM D86	51.0	112.5	165.1
50%	° C	ASTM D86	53.4	115.9	166.2
60%	° C	ASTM D86	56.4	120.4	168.0
70%	° C	ASTM D86	59.5	124.5	169.8
80%	° C	ASTM D86	63.0	130.5	173.5
90%	° C	ASTM D86	66.9	136.1	176.6
95%	° C	ASTM D86	73.2	145.6	182.7
E.P	° C	ASTM D86	75.6	149.1	184.8

(*) with compliments of NRG – GLOBAL LLC.

Table (2) some physical and chemical properties of naphtha produced from Taq – Taq crude.

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TEST	UNIT	METHOD	RESULT		
			C5-80	80-125	125-175
Yield on crude	% Volume	ASTM D2892	10.5	13.5	13.9
Yield on crude	% mass	ASTM D2892	12.5	15.0	14.6
Specific gravity@15.6 °C	Kg/L	ASTM D1298	0.6536	0.7111	0.7541
API Gravity	° API	ASTM D1298	85.0	67.5	56.1
Sulpher – total	PPm Wt	ASTM D3120	10	25	133
Total Nitrogen	PPm Wt	ASTM D3228	‹ 1	‹ 1	‹ 1
PIONA (**)					
Total Paraffins	% Volume	ASTM D6730	95.2	77.8	68.5
Total olefins	% Volume	ASTM D6730	‹ 0.001	0.165	0.402
Total Naphthenes	% Volume	ASTM D6730	4.7	20.0	12.5
Total Aromatics	% Volume	ASTM D6730	0.07	1.6	16.3
Distillation					
IBP	° C	ASTM D86	30.1	89.0	134.1
5%	° C	ASTM D86	41.1	94.5	140.8
10%	° C	ASTM D86	43.6	95.9	141.3
30%	° C	ASTM D86	50.0	99.8	145.9
50%	° C	ASTM D86	56.5	104.1	150.6
70%	° C	ASTM D86	63.7	109.6	156.4
80%	° C	ASTM D86	67.9	113.3	160.3
90%	° C	ASTM D86	73.2	119.1	165.9
95%	° C	ASTM D86	79.5	123.6	170.9
E.P	° C	ASTM D86	87.9	149.0	178.4

(**) with compliments of intertek, Fujairah.

Table (3) some physical and chemical properties of gas condensate produced in khor – mhor field.

TEST	UNIT	METHOD	RESULT
Specific gravity@15.6 °C	Kg/L	ASTM D 1298	0.7073
API Gravity	° API	ASTM D 1298	68.6
Total sulfur	%	ASTM D 4294	0.0618
Sulfur- Mercaptan	mg/Kg	ASTM D 3227	119
Reid vapour pressure@100 °C	psi	ASTM D 323	11.4
Salt content	PTB	ASTM D 3230	0
Characterization factor	-	ASTM D 375	12.2
Kinematic Viscosity at 40 °C	Cst	ASTM D 445	0.53
Kinematic Viscosity@100 °C	Cst	ASTM D 445	N/A
Pour point	° C	ASTM D 97	‹ -24
Wax content	% mass	ASTM D 46	‹ 0.05
Ash content	% mass	ASTM D 482	‹ 0.001
Total acid number	mgkoH/g	ASTM D 664	0.011
Asphaltenes	% mass	IP 143	0.06
Water content	ppm wt	ASTM D4928	0.014
Total Nitrogen	ppm wt	ASTM D3228	126
Metals			
Nickel (Ni)	mg/ kg	IP 470	‹ 0.1
Vanadium (V)	mg/ kg	IP 470	‹ 1
Sodium (Na)	mg/ kg	IP 470	1.006
Lead (P3)	mg/ kg	IP 470	‹ 0.5
Iron (Fe)	mg/ kg	IP 501	0.224

As it is very clear from the tables above , naphtha produced from Taq-Taq crude oil is more paraffinic and lighter than naphtha produced from khormala crude oil , also its sulfur content is much less while nitrogen content of both naphtha samples are identical . The sulfur content of gas condensate is also low (0.06%) and it is very light (API = 68.6), and highly paraffinic (K_w = 12.2). Table (4) lists the general properties of full range naphtha samples and gas condensate, octane numbers (clear) are low and close to each other , RON of the two naphtha samples are little bit higher than RON of gas condensate sample, (77.5 for khormala, 74.5 for Taq-Taq , and 65.6 for gas condensate). Fractionation of gas condensate shows that it contains some kerosene and gas oil fractions, these amounts differ depending on the boiling range of the chosen condensate fraction, for example if these two different break downs were chosen ; [16],[17] then different amounts of kerosene & gas oil will be obtained as shown below :-

IBP – 194 °C	Naphtha = 82.0%v
194 – 232 °C	Kerosene = 9.1%v
232 – 310 °C	Gas oil = 2.7%v
Fuel and loss	6.2%v
IBP – 150 °C	Naphtha = 70%v
150 – 232 °C	Kerosene = 20%v
232 – 310 °C	Gas oil = 5%v
Fuel and loss	5%v

Table (4) general properties of full range naphthas and gas condensate samples.

TESTS	UNITS	METHOD	RESULTS		
			Naphtha (Taq-Taq)	Naphtha (khormala)	Gas condensate (Khor-mhor)
Specific gravity @ 15.6 °C	-	ASTM D1298	0.7121		0.7073
A.P.I Gravity	° API	ASTM D1298	67.2		68.6
Sulfur	%wt	ASTM D4294	0.030		0.0618
Viscosity @ 40°Ckg $^{-1}$	Cst	ASTM D445	0.670		0.535
Distillation @ 100 °C (%v)	Cst	ASTM D86	32		58
Distillation @ 14.5 (%v)	%	ASTM D-86	81		70
Final b.p °C		ASTM D-86	166		315
Octane number		(Zeltex. 101C			
RON	-	-	74.5	77.5	65.6
MON	-	-	70.5	72.7	63.2
$\frac{R+M}{2}$	-	-	72.6	74.8	64.4

<u>Enhancements of octane number:</u>

The RON , MON, and AKI ($\frac{R+M}{2}$) Values for both naphtha's and gas condensate measured by zeltex 101C , shatox , and OKM -2 instruments without additives are shown in table (5).

Table (5) octane number of naphtha's and gas condensate by zeltex 101C, shatox, and OKM – 2 instruments.

Fuel	By zeltex 101C			By shatox			By OKM -2		
	RON	MON	AKI	RON	MON	AKI	RON	MON	AKI
Naphtha from Taq-Taq	74.5	70.5	72.6	78.0	75	76.4	77.6	62.1	69.8
Naphtha from khormala	77.5	72.5	74.8	80	77	78.5	79	68.8	74
Gas condensate	65.6	63.2	64.4	72.1	67.4	69.7	-	-	-

<u>Addition of additive (A): EPT octane Enhancer:</u>

According to data shown in table (6) and fig (1) the addition of additive (A) (EPT octane Enhancer) is not suitable for naphtha by measuring octane number with zeltex 101C, but by measuring shatox, the ONS increased suitably for naphtha samples.

Table (6) EPT octane Enhance effect on the ONS value of naphtha sample from Taq-Taq crude oil by using zeltex 101C and shatox instruments.

Additive %V	Measuring by zeltex	Measuring by shatox

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	RON	MON	AKI	RON	MON	AKI
0	75.5	71.5	73.5	79.6	76.6	78.1
0.1	75	71.7	73.8	80.0	77	78.5
0.5	75.4	71.6	73.5	81.1	77.5	79.3
1	75.6	71.2	73.4	83.4	78.5	80.9
1.5	75.9	71.5	73.7	87.0	80.1	80.7
2	75.7	71.1	74.4	88.3	80.7	84.5

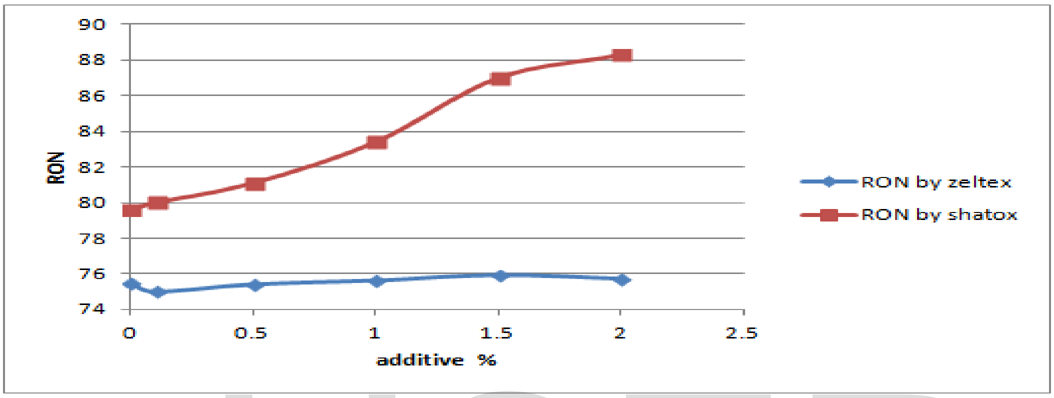

Fig. (1) Effect of EPT Ocatane Enhancer on naphtha RON s using Zeltex and shatox instruments.

According
Enhance c
pyrolysis gasoline to meet national fuel determination therefore we blended our naphtha with pyrolysis gasoline of (RON = 98) and general properties shown in table (7), in deferent ratios,

erent volume ratios and
e two instruments zeltex 101C, and shatox. These results are shown in tables (8 – 14) and figs. (2 - 9).

Table (7) general properties of pyrolysis gasoline

Tests	Method	Units	Results
Specific gravity @ 15.6 °C	ASTM D1298	-	0.8036
API Gravity	ASTM D1298	°API	44.5
IBP	ASTM D – 86	°C	30 (Min)
FBP	ASTM D – 86	°C	200 (Max)
RVP	ASTM D – 323	Psi	9 (Max)
RON	ASTM D 2699	-	98
Total sulfur	ASTM D5453	Wtppm	300
Aromatic content	G .C	wt%	40
Benzene content	G .C	wt%	15
Existed Gum	-	mg/100ml	3816

Table (8) octane number of blended naphtha and pyrolysis gasoline (P.G) using zeltex 101C instrument.

Octane No.	Pyrolysis gasoline	naphtha	20% P.G	21%	22%	25%	30%	40%

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			80% Nap.	79%	78%	75%	70%	60%
RON	98.3	74.1	78.6	79.5	79.3	80.1	81.7	83.7
MON	84.1	78	72.9	73.6	73.5	73.6	74.9	75.9
$\frac{R+M}{2}$	91.2	72.4	75.8	76.6	76.4	76.6	78.3	79.8

Table (9) octane number of blended naphtha and pyrolysis gasoline (P.G) using shatox instrument.

ON	P.G	Nap.	20%	21%	22%	25%	30%	40%
			80%	79%	78%	75%	70%	60%
RON	96.6	78.2	83.5	83.9	84.3	85.3	87.4	90.0
MON	86.6	75.2	78.5	78.7	78.9	79.3	80.2	81.8
$\frac{R+M}{2}$	91.6	76.6	81.0	81.3	81.6	82.3	83.8	85.9

Table (10) ONS of blended naphtha (80%) and P.G 20% with different doses of EPT octane Enhancer by zeltex 101C , and shatox instrument.

EPT additive %V	Measurement by zeltex			Measurement by shatox		
	RON	MON	AKI	RON	MON	AKI
0.1	78.9	73.1	76	84.8	79.1	82.1
0.5	79.4	73.3	76.4	86.5	79.9	83.2
1	78.7	72.8	75.8	89.4	81.5	85.4
1.5	79	72.6	75.8	90.4	82.1	86.2
2	79.2	72.6	75.9	-	-	-

Table (11) ONS of bended naphtha 78% and P.G 22% with different doses of EPT octane Enhancer by zeltex 101C and shatox instruments.

EPT additive %V	Measurement by zeltex			Measurement by shatox		
	RON	MON	AKI	RON	MON	AKI
0.1	79.3	73.5	76.4	86.5	79.9	83.1
0.5	79.5	73.2	76.4	86.9	80.0	83.5
1	80.0	73.5	76.8	88.8	81.0	84.9
1.5	79.5	73.2	76.3	89.9	81.8	85.9
2	59.5	72.8	76.1	91.0	82.5	86.7

Table (12) ONS of bended naphtha 75% and P.G 25% with different doses of EPT octane Enhancer by zeltex 101C and shatox instruments.

EPT additive %V	Measurement by zeltex			Measurement by shatox		
	RON	MON	AKI	RON	MON	AKI

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0.1	79.4	73.5	76.5	88	80.5	84.3
0.5	79.6	73.3	76.5	88.5	80.8	84.7
1	80.6	74	77.3	-	-	-
1.5	80.1	73.5	76.8	90.9	82.4	86.6
2	80.5	73.1	76.8	91.6	82.9	87.2

Table (13) ONS of bended naphtha 70% and P.G 30% with different doses of EPT octane Enhancer by zeltex 101C and shatox instruments.

EPT additive %V	Measurement by zeltex			Measurement by shatox		
	RON	MON	AKI	RON	MON	AKI
0.1	82.2	75	78.6	88.7	81	87.2
0.5	81.5	74.8	78.2	-	-	-
1	81.4	74.2	77.8	90.7	82.3	86.5
1.5	81.7	74.5	78.1	91.6	82.9	87.2
2	81.4	74.1	77.8	92.2	83.3	87.8

Table (14) ONS of bended naphtha 60% and P.G 40% with different doses of EPT octane Enhancer by zeltex 101C and shatox instruments.

EPT additive %V	Measurement by zeltex			Measurement by shatox		
	RON	MON	AKI	RON	MON	AKI
0.1	83.9	75.8	79.9	90.3	82.0	86.1
0.5	84.3	76	80.1	91.1	82.5	86.8
1	83.6	75.6	79.6	92.5	83.5	88
1.5	84.1	75.2	79.6	93.6	84.3	88.9
2	84.4	75.5	79.9	95.4	85.4	90.4

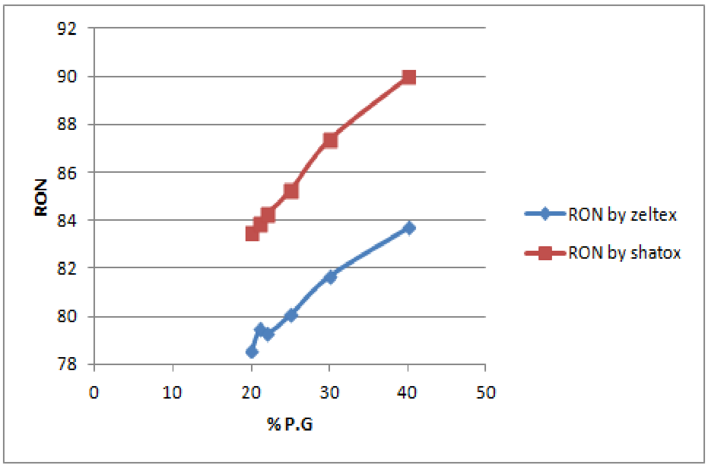

Fig. (2) Effect of pyrolysis gasoline ratio on naphtha RON s using Zeltex and shatox instruments.

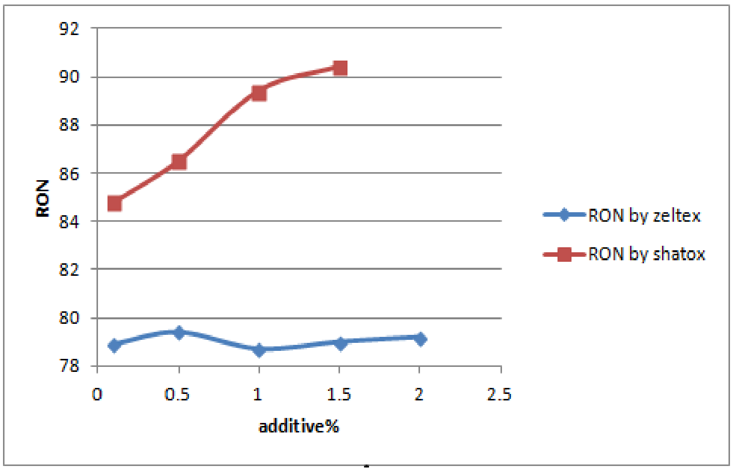

Fig. (3) Effect of EPT Octane Enhancer on the RON s of the blend (20%) P.G plus (80%) naphtha using zeltex and shatox instruments.

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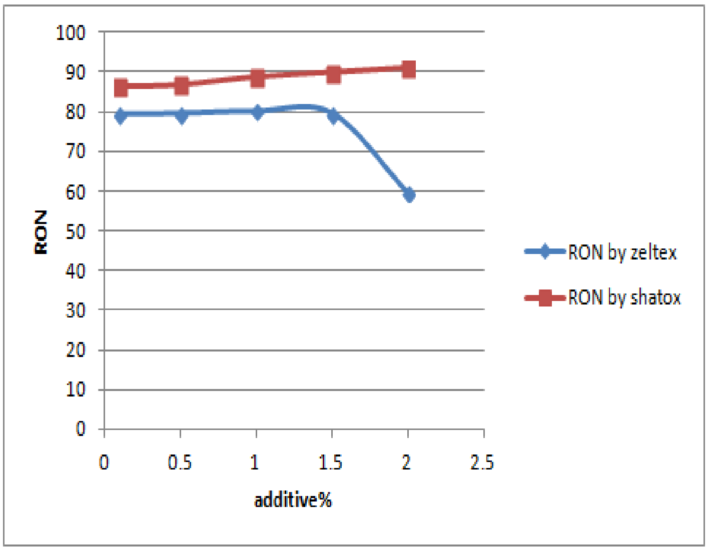

Fig. (4) Effect of EPT Octane Enhancer on the RON s of the blend (22%) P.G plus (78%) naphtha using Zeltex and shatox instruments.

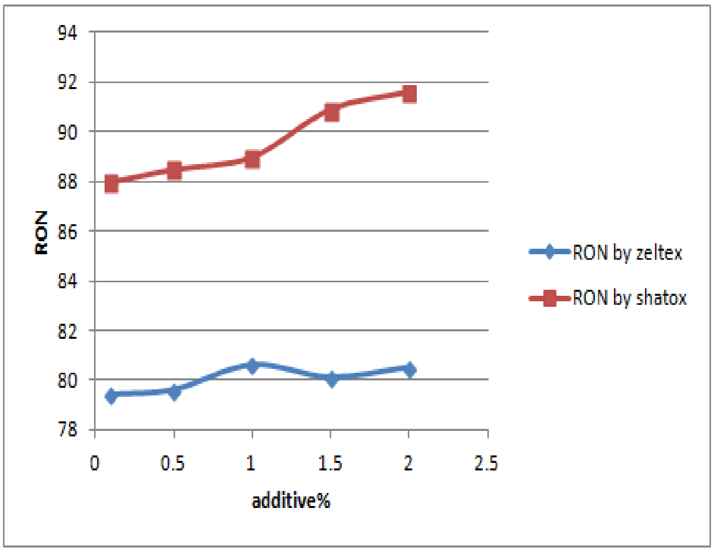

Fig. (5) Effect of EPT Octane Enhancer on the RON s of the blend (25%) P.G plus (75%) naphtha using Zeltex and shatox instruments.

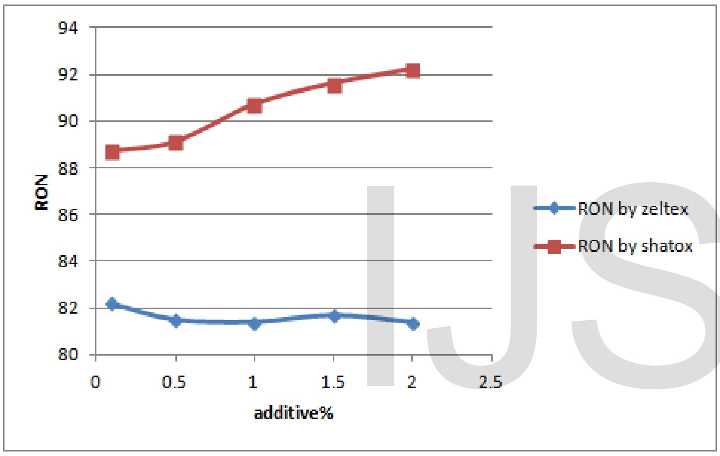

Fig. (6) Effect of EPI Octane Enhancer on the RON s of the blend (30%) P.G plus (70%) naphtha using Zeltex and shatox instruments.

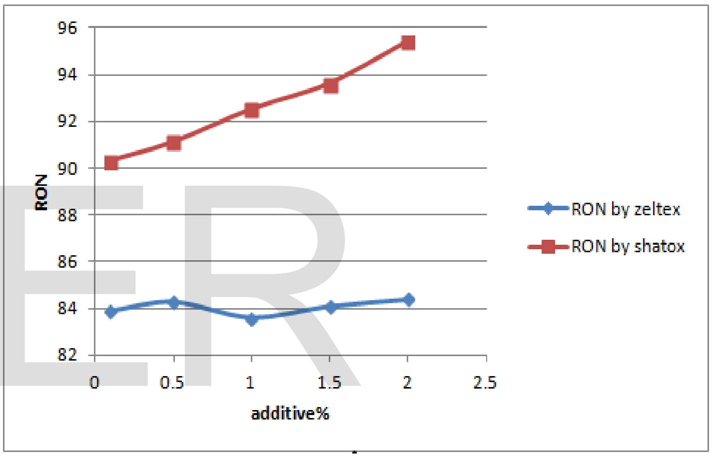

Fig. (7) Effect of EPT Octane Enhancer on the RON s of the blend (40%) P.G plus (60%) naphtha using Zeltex and shatox instrument.

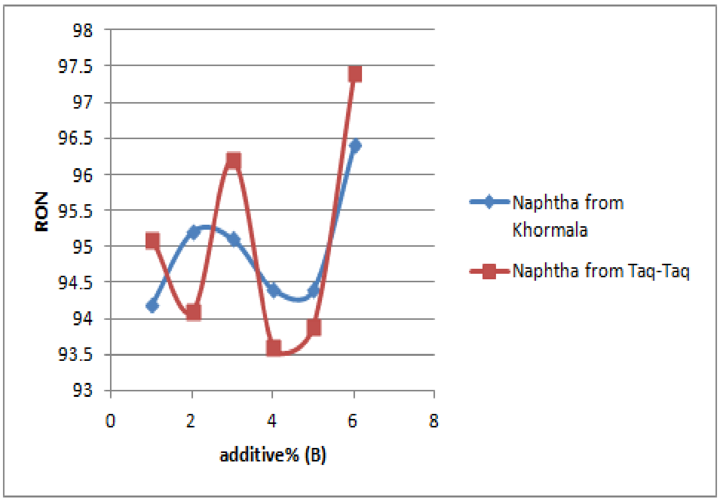

Fig. (8) Effect of additove (B) on the RON s of both naphtha samples using OKM - 2 instruments.

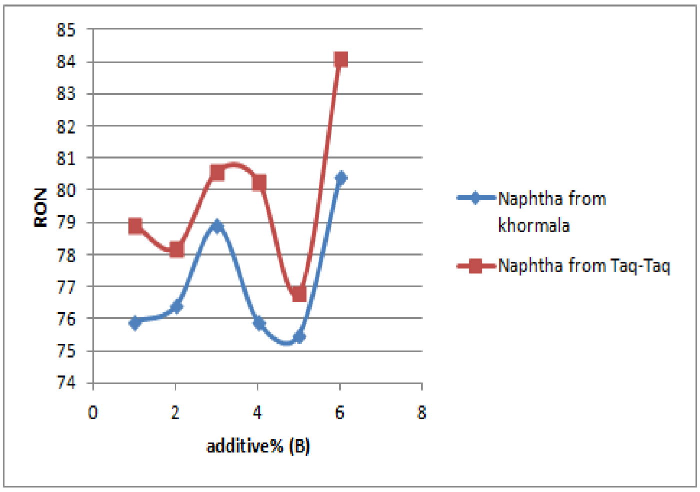

Fig. (9) Effect of additive (B) on the RON s of both naphtha samples using Zeltex 101 C instruments.

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Addition of additive (B):

Six blends from additive (B) components prepared with different motor octane number as shown below:

	Additive (B) Blends					
Blend No.	B1	B2	B3	B4	B5	B6
MON	300	240	220	400	310	175

Then these blends added to both naphtha samples with the using OKM – 2 instruments. The results are show in table (15). specified percentages, and octane number measured for all using OKM – 2 instruments. The results are show in table (15).

Table (15) effect of additive (B) on ONS of both naphtha samples using 0 KM – 2 instruments.

Additive (B)	ONS of both naphtha sample					
	Naphtha from Taq-Taq			Naphtha from khormala		
	RON	MON	AKI	RON	MON	AKI
B1 , 12.28 %V	94.2	71.3	82.7	95.1	83	89.1
B2 , 15 %V	95.2	68.1	81.6	94.1	82.1	88.1
B3 , 16.7 %V	95.1	72.6	83.8	96.2	84.7	90.4
B4 , 23 %V	94.4	67.5	80.9	93.6	77.5	85.5
B5 , 10.9 %V	94.4	68	81.2	93.9	78.6	86.2
B6 , 20.63 %V	96.4	85.5	90.9	97.4	86.6	92.0

While addition of additive (B) and measuring ONS using zeltex are shown in table (16).

Table (16) effect of additive (B) on ONS of naphtha samples using zeltex instrument.

Additive (B)	ONS of both naphtha sample					
	Naphtha from Taq-Taq			Naphtha from khormala		
	RON	MON	AKI	RON	MON	AKI
B1	75.9	70.9	73.4	78.9	71.7	75.3
B2	76.4	71.6	73.9	78.2	72.7	75.4
B3	78.9	72	75.5	80.6	72.7	76.7
B4	75.9	70.6	73.2	80.3	72.6	76.4
B5	75.5	70.5	73	76.8	71.1	73.9
B6	80.4	73.5	77	84.1	76.3	80.2

Zeltex 101C instrument measures octane number via near – infrared (NIR) transmission spectroscopy , the instrument contains a patented sold – state optical system comprising 14 near – infrared emitting diodes with narrow band pass filters, a silicon detector system, and fully integrated micro processor , this instrument operates in the short NIR, from 800 to 1100 nm wave , the instrument is factory calibrated to predict octane number from the absorption spectra of the fuels being tested , this prediction is accomplished through the use of a multivariate regression of the form : [18],[19]

Octane number = $K_{\circ} + K_1 (OD_1) + K_2 (OD_2)$ ……..…. + $K_{14} (OD_{14}) + K_{15} (T_a)$ where $K_{\circ}$ is a bias term, K_1 through K_{15} are slope coefficients, OD_1 through OD_{14} are the absorbencies measured at each of the 14 wave length , and T_a is the ambient temperature .

The instrument can store up to 10 calibration equations and is factory calibrated for RON, MON, and AKI of blended gasoline. The results obtained by zeltex 101C measurements in this research have no significant differences between measurements before and after additive addition this means that the existing calibration mode of the instrument is not suitable for these additives (A) and (B) and it needs factory calibration to predict octane numbers from the absorption spectra of the fuels being tested, because the empirical rules of octane number dependence on the structure of alkenes are amended [20]. ON decreases with the number of CH_2 groups and increases with the number of CH_3 groups, the number of adjacent CH_2 groups has the highest influence; ON decreases with the separation between branches; it increases with the more central position of branches and with their bulkiness, Ethyl group causes apparently contradictory effects: if it increases the number of CH_2 groups, ON decreases; if not, ON increases.

The use of structured features of alkanes i.e. the size of the molecule, the number of branches , the position of branches , the separation between them, the type of branches , and the type of the branched structure enables a more thorough understanding of the relation between the structure of alkane and their physicochemical properties (20).

The composition of each additive package used in this research is different from the other, so it is necessary to factory

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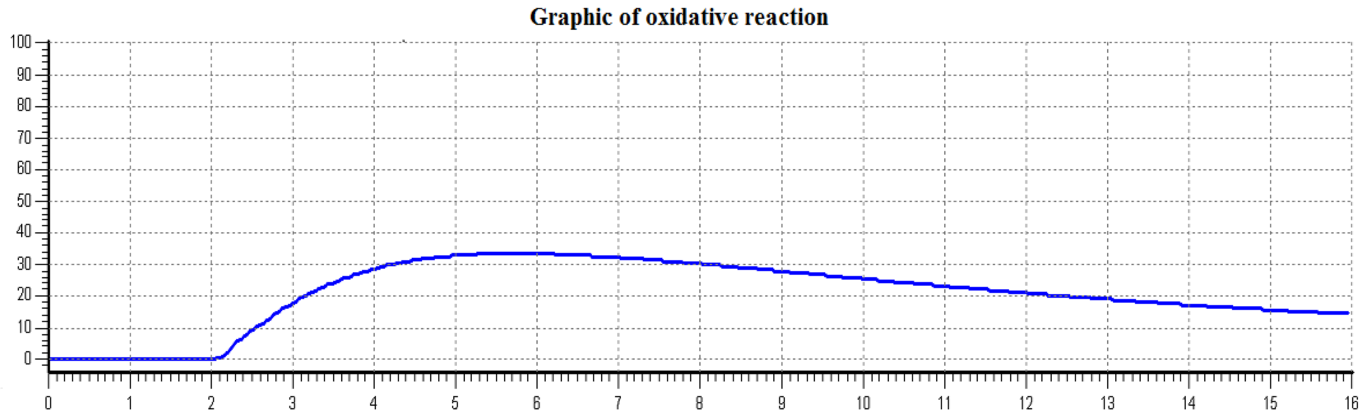
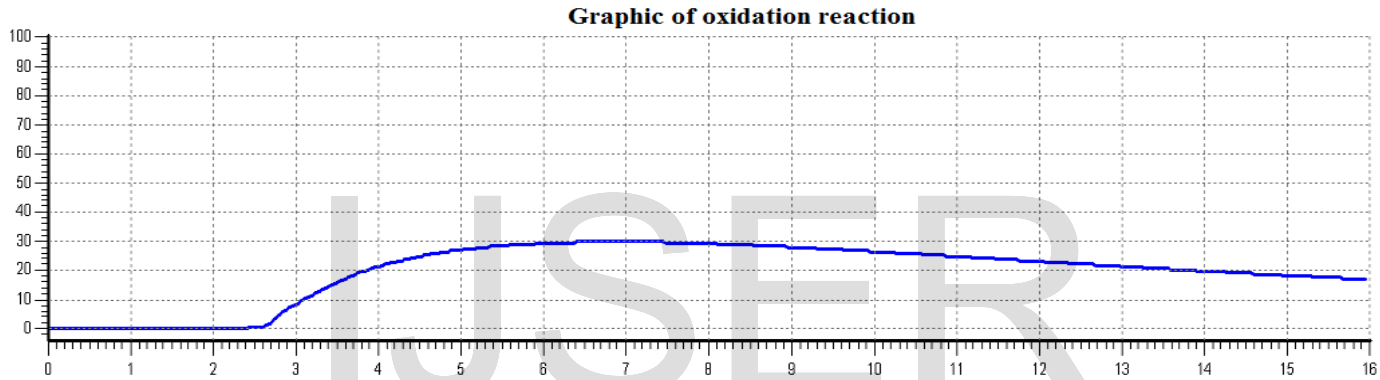
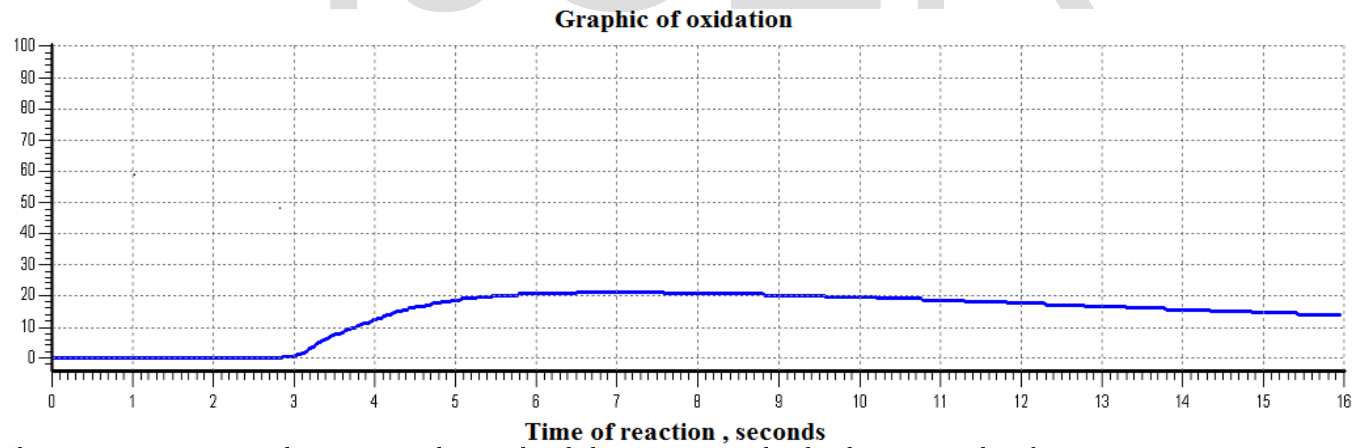
calibration of this zeltex 101C instrument to be suitable to predict octane number from the absorption spectra of the blends being tested.

While the principle of the operation of OMK – 2 instruments is based on the test of hydrocarbon fuel under high temperature, which causes the oxidation reaction (combustion), followed by the release of heat. As a result of the measurement of the temperature characteristic of the oxidation reaction we establish an unambiguous relationship with the parameters of the oxidation reaction with knock resistance of the tested gasoline. The low octane number is indicated also by higher reaction temperature and lower time of reaction period as show in the figures below.







Shatox instrument operates by measuring the sample's dielectric properties and comparing the results to stored parameters in its internal program of typical known chemical compounds widely used in fuel production Extremely sensitive to changes in these dielectric properties , the octane meter is able to detect subtle differences in the chemical makeup of the fuel sample and therefore become valuable tool for determining the octane , cetane as well as many other parameters for typical gasoline , diesel fuel and other petroleum products.

Since different fuel blends react differently, all shatox octane meters employ additional modes providing the ability to make corrections quickly and easily.

The disadvantage is that the octane meter is not compatible with Bio – fuels and ethanol fuel blends.

4 Conclusions:

From the results of this work it has been concluded that:

1- Fractionation of gas condensate showed that it contains some kerosene and gas oil fractions, which must be removed prior to blend with additives.

2- The instruments must be factory calibrated for RON, MON, and AKI of blended gasoline samples with additives.

3- The instrument OMK - 2 is based on the oxidation reactions following by the release of heat, so it gives better results.

4- The additive EPT alone can raise RON only 3-4 numbers up to 2.5% dosage and it is better to use it with higher octane number gasoline to reach the premium grade gasoline.

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