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PHYSICAL AND CHEMICAL PROPERTIES OF OILS FROM OILFIELDS OF IRAQ*Assad M. Ali Ibraheem, S. V. Boychenko*

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Ірак одна з найбагатших нафтогазоносних країн у світі. Його нафтопереробна та нафтохімічна промисловості протягом кількох десятиріч динамічно розвивались разом із промисловістю інших країн-членів ОПЕК. Нафта в м. Кіркук та Басра одна з найкращих в Іраку за вмістом парафінових, нафтиєвих вуглеводнів та загальної сірки. Як об'єкти дослідження обрано п'ять зразків нафти із різних регіонів країни: Бузирган, Румаїла, Нахран-Омар, Кіркук та Маджнун.

Ключові слова: нафта, нафтопереробка, фракційний склад, Ірак, фізико-хімічні якості, бензинова фракція, дизельна фракція, залишкова фракція.

Iraq is one of the richest oil-and-gas bearing countries in world. During some decades its oil-processing and petrochemical industries have been dynamically developed together with industry of other countries-members of OPEC. Oil in Kirkuk Crude and Basrah Crude is one of the best in Iraq in content of paraffin, naphthenic hydrocarbons and general sulphur. As investigation objects there were selected five examples of oils from different regions of country: Buzyrgan, Rumaila, Nahran-Omar, Kirkuk and Majnun.

Keywords: Oil, oil processing, fractional composition, Iraq, physical and chemical properties, gasoline fraction, diesel fraction, residual fraction.

It is common knowledge that [1], oil from various oilfields differs from each other by physical and chemical features, which determine direction of oil processing and have considerable influence upon quality of received oil products.

That's why it is acceptable to classify oil depending on its features [2].

In table 1 there are basic indices of physical and chemical features of investigated oil samples, which were received by us with the help of standard methods of oil and oil products examination. Determination of density was made under GOST 3900 «Oil and oil products. Methods of density determination»; sulphur content — under GOST 1437.

Table 1

Physical and chemical characteristic of Iraq oils

Indices	Factual data				
	Rumaila	Nahran-Omar	Buzyrgan	Kirkuk	Majnun
Density by 20 °C, kg/m ³	835	856	849	851	858
Sulphur content, % of mass	1,30	0,73	1,54	1,69	1,30
Water content, % of mass	Отс.	Отс.	Отс.	0,02	Отс.
Content of mechanical impurities, % of mass	Отс.	Отс.	Отс.	Отс.	Отс.
Concentration of chloride salts, mg/dm ³	14,06	23,01	17,52	21,16	19,22
Fractions output, % of mass: up to 200 °C up to 350 °C	27,85 50,02	34,35 59,87	29,40 43,77	28,63 46,59	25,32 44,27

«Dark oil products. Speeded method of sulphur determination»; water content — under GOST 2477 «Oil and oil products. Method of water content determination»; content of mechanical impurities — 6370 «Oil, oil products and additives. Method of mechanical impurities determination»; concentration of chloride salts under GOST 21534 «Oil. Methods of chloride salts determination»; output of fraction under GOST 11011 «Oil and oil products. Method of determination of fraction composition in apparatus APH-2» [3—5].

As a result of investigations it was established that in accordance with requirement of GOST 9965 «Oil for oil-processing enterprises. Technical conditions» [6] and technological classification samples of oils under indices of degree of preparation to processing (concentration of chloride

salts — 14,06—23,01 mg/dm³, water content — 0,02 %, mechanical impurities are absent) are referred to 1 group. According to indices «sulphur content — 0,73—1,69 %» and «density — 835— 858 kg/m³» presented samples are referred to 2 class and 1,2 type [7].

Oil consists of big quantity of hydrocarbons, which have different boiling temperatures [8—9]. It is impossible to divide oil completely into individual substances, but there is no need to do so neither for its investigation nor for industrial use.

In table 2 there is potential output of oil fractures of oilfields of Iraq in accordance with GOST 11011. Distillation of oil in apparatus APH-2 is necessary for installation of outputs of oil fractions with the aim of selection of variant of its processing (fuel, oil and fuel-oil).

Table 2

Results of determination of fraction composition in accordance with GOST 11011 (distillation in apparatus APH-2) of investigated examples of oil

Temperature limits for fraction °C	Output, % of mass.									
	Rumaila		Nahrn Omar		Buzyrgan		Kirkuk		Majnun	
	Separate fraction	Total	Separate fraction	Total	Separate fraction	Total	Separate fraction	Total	Separate fraction	Total
HK-50	2,12	2,12	3,68	3,68	1,78	1,78	3,15	3,15	2,38	2,38
50-60	1,63	3,75	1,00	4,68	0,66	2,43	1,13	4,28	1,05	3,43
60-70	1,69	5,44	1,32	6,00	1,44	3,87	1,55	5,84	0,78	4,21
70-80	1,83	7,26	1,94	7,94	1,30	5,18	1,47	7,31	0,63	4,84
80-90	1,84	9,10	2,54	10,48	0,98	6,16	1,82	9,13	1,41	6,25
90-100	2,01	11,11	2,46	12,94	0,57	6,73	1,33	10,45	0,67	6,93
100-110	1,78	12,89	1,32	14,26	2,38	9,11	1,31	11,77	0,83	7,76
110-120	1,22	14,11	5,43	19,69	2,44	11,55	1,29	13,06	0,66	8,42
120-130	1,47	15,58	3,23	22,92	0,61	12,15	1,22	14,28	3,26	11,67
130-140	2,39	17,97	2,95	25,87	0,61	12,76	2,84	17,12	0,64	12,31
140-150	3,09	21,06	1,28	27,15	2,73	15,49	4,92	22,04	3,86	16,17
150-160	2,85	23,91	2,89	30,04	0,91	16,41	2,85	24,89	2,08	18,25
160-170	1,69	25,60	1,80	31,84	3,56	19,97	1,27	26,15	1,69	19,94
170-180	2,24	27,85	2,30	34,12	3,36	23,32	2,48	28,63	5,38	25,32
180-190	0,00	27,85	0,00	34,12	2,54	25,87	1,04	29,68	1,40	26,72
190-200	0,66	28,51	0,21	34,33	3,53	29,40	0,12	29,79	2,38	29,11
200-210	0,32	28,83	0,54	34,86	0,24	29,64	0,13	29,92	0,04	29,14
210-220	1,44	30,27	1,13	35,99	0,35	29,98	0,43	30,35	0,00	29,14
220-230	0,61	30,88	1,25	37,25	0,29	30,28	0,41	30,76	0,09	29,24
230-240	2,62	33,50	1,04	38,29	0,21	30,48	0,33	31,08	0,13	29,37
240-250	1,91	35,41	1,38	39,67	0,49	30,97	1,05	32,14	0,12	29,50
250-260	1,75	37,16	1,39	41,06	0,87	31,84	1,07	33,20	1,00	30,49
260-270	1,52	38,68	1,44	42,50	0,90	32,74	1,16	34,36	0,98	31,47
270-280	1,47	40,14	2,07	44,58	2,19	34,93	1,62	35,98	1,26	32,74
280-290	1,93	42,07	2,62	47,20	0,86	35,79	1,43	37,41	0,92	33,65
290-300	1,65	43,73	2,15	49,35	1,32	37,11	1,57	38,98	1,59	35,24
300-310	0,54	44,26	2,00	51,34	1,05	38,16	1,46	40,45	2,63	37,87
310-320	1,98	46,24	1,93	53,27	0,61	38,77	1,05	41,50	0,85	38,72

The end of Table 2

Temperature limits for fraction °C	Output, % of mass.									
	Rumaila		Nahrn Omar		Buzyrgan		Kirkuk		Majnun	
	Separate fraction	Total	Separate fraction	Total	Separate fraction	Total	Separate fraction	Total	Separate fraction	Total
320–330	1,12	47,36	2,98	56,25	1,78	40,55	1,67	43,17	1,49	40,21
330–340	1,98	49,34	2,45	58,70	0,96	41,52	1,76	44,93	2,68	42,89
340–350	0,68	50,02	1,15	59,85	2,26	43,77	1,67	46,59	1,38	44,27
350–360	1,66	51,68	1,43	61,27	0,89	44,66	1,38	47,97	2,19	46,46
360–370	1,26	52,94	1,63	62,91	1,88	46,54	1,20	49,17	1,37	47,83
370–380	1,77	54,72	1,83	64,73	2,01	48,55	0,97	50,14	1,26	49,09
380–390	1,38	56,09	2,14	66,87	0,59	49,15	4,56	54,70	1,91	51,01
390–400	1,93	58,03	2,55	69,42	1,92	51,07	2,85	57,55	2,00	53,00
400–410	1,80	59,83	1,87	71,29	1,32	52,45	3,25	60,80	1,80	54,81
410–420	2,61	62,45	2,74	74,03	3,58	56,03	3,15	63,95	3,49	58,30

By analysis of investigation results (table 2) of oils with the help of method of distillation there was determined potential content of gasoline, diesel fractions and oil residual (табл. 3).

Table 3

Results of distillation of Iraq oils

Output of fractions % of mass	Name of oilfields				
	Rumaila	Nahrn-Omar	Buzyrgan	Kirkuk	Majnun
Gasoline fraction HK — 180°C	27,85	34,12	21,34	28,63	25,32
Diesel fraction HK — 360°C	23,89	27,15	23,32	19,34	32,98
Oil residual	10,77	12,76	11,37	15,98	11,83
Output of light fractions, which are boiled away to 360°C	51,68 %	61,27	44,66	47,97	58,30

Abovementioned fractions were received by the way of atmospheric distillation [10].

Oil residual is residuum of atmospheric distillation, which is boiled away by the temperature of more than 360° C. Graphic interpretation of received experimental (Table 2) data are presented on picture 2.

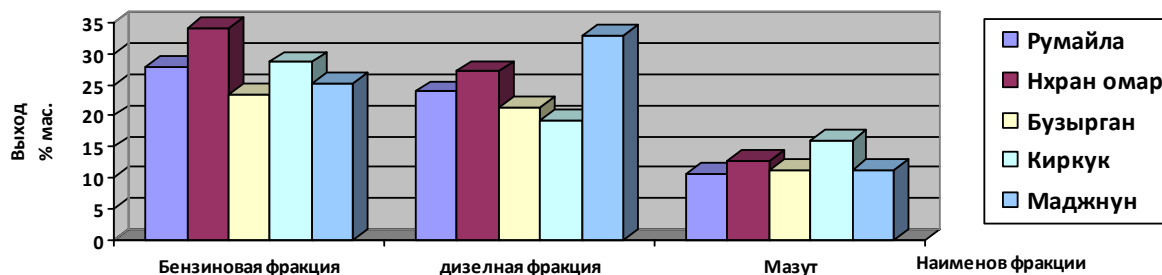


Diagram of output of straight-run fractions of oils from oilfields of Iraq

Summary

Preliminary estimate of potential possibilities of oil stock is made on the basis of complex of indices which are part of technological classification of oil. But for more precise determination of set technological processes, assortment and oil products quality, making material balance of equipment, workshops and refinery in whole it is necessary to conduct more careful investigations [11]. For these purposes there must be conducted investigations which are necessary for project development in determination of all quality indices of feedstock, its narrow fractions, and fuel and oil components of intermediate raw materials for technological processes and so on. In this work there are results of oil investigation under basic physical and chemical parameters, and also its distillation, determination of content of gasoline, diesel and residual fraction. It is not enough to have this data for preparation of technical and economic feasibility of future enterprise, but it is first important step in this direction. It is important to note that in spite of investigation of oil from different oilfields outputs of gasoline, diesel fractions, oil residue are on quite identical level. This points to the fact of interchangeability of oils from different oilfields, which considerably simplifies problem to designers and implies possibility of enterprise's work on any domestic raw material. Also taking into consideration quality of raw material and low level of country's technical development primary oil processing is capable of satisfaction of national economy yet for a long time. However, considering optimistic development script of this Eastern country it is necessary to recommend to send oil for secondary processing. The most preferable are processes of hydrofining and hydrogen cracking, because diesel and aviation fuel are most in-demand for national economy of this country.

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