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POSSIBILITIES TO INCREASE THE YIELD OF LIGHT PRODUCTS AT PRIMARY PROCESSING OF OIL AND PETROLEUM MIXTURES

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Abstract

The importance of oil and gas for the economic life of our planet is exceptional. Without them mankind would be difficult coped since oil provides about 40%, and natural gas is about 23% of primary energy resources (PER) of the world. Besides being an important source of energy, they are also the main raw material for the chemical and other industries. Conquest of resources of oil and natural gas is a major factor in world politics and has aroused many military conflicts, political and economic crises.

It determines the present work, which is to study possibilities for increasing of light petroleum products yield from oil and petroleum mixtures.

Key words: petroleum; oil light fractions; oil mixtures.

1. Introduction

The aim of the present paper is to consideration of the initial processing of mixed types of oil produced in Bulgaria and optimize the yields of light products were made eight samples in different percentages of Tulenovo and Dolni Dubnik`s petroleum.

Petroleum and petroleum derivates have an enormous role in the development of scientific and technological progress in all areas of human activity. It is a source of energy for industry, transport, agriculture, etc. Of the total quantity of products derived from oil, 85% is used as motor and other fuels. Today, however, it goes beyond its importance as a major energy source. It is raw material for many other petroleum and chemical products [1-2].

Importance of oil and gas to the world economy stimulated the rapid growth of their production in the world. In the last 50-60 years oil production grew at very high rates. Now it keeps about 3 billion tons per year [3]. It was established that global reserves amount to about 135 billion tons of oil and 174 trillion m^3 of natural gas. This means that in this century these natural hydrocarbons will play a key role as an energy source and raw material for processing [4].

The availability of oil stocks on average worldwide is 40 years. The greatest provision (over 100 years) are Iraq, Kuwait and others with smallest (4-5 years) - Bulgaria, the Netherlands, the United Kingdom [5]. Saving petroleum and its replacement by other sources of energy (nuclear energy, natural gas, coal) poses to oil refining industry global problem for most rational processing of oil in order to obtain the maximum amount of fuel and other oil products and raw materials for petrochemical synthesis.

2. Experimental

We used as a subject two kind of petroleum such as oil from Tulenovo and Dolni Dubnik`s petroleum, which are produced in Bulgaria. Petroleum processed into "Bulgarian Petroleum Refinery" – Sofia. Physical and chemical properties and composition of our oil show that it is of two types (Table 1 and 2).

In Table 1 is presented data for petroleum from Tulenovo. The experimental results show that it is heavy, with high density and viscosity, low paraffin, sulfur content and low freezing

temperature. This oil contains a lot of asphalt-resinous substances, no light gasoline fractions and content of light fractions to 350°C is low.

It should be noted that on the basis of their physicochemical properties Dolni Dubnik`s oil belongs to the group of light, high paraffinic types of oil with low sulfur content. Their content of the asphalt-resinous substances is low, and the freezing temperature – high, too. In Table 2 are given the distillation characteristics of this petroleum, which show that gasoline fractions boiling up to 200°C is higher than 25%, and the total content of the light fractions boiling up to 350°C is not more than 60%.

To achieve the objective of this work, namely the consideration of the initial processing of mixed types of oil produced in Bulgaria and optimize the yields of light products were made eight samples in different percentages of petroleum from Tulenovo and Dolni Dubnik`s oil. The latter were characterized by different physicochemical standard methods of analysis referred to in the standard technical requirements for petroleum.

3. Results and discussion

We characterized petroleum mixtures by investigation and determination of its physicochemical properties. It was determined also physicochemical properties of obtained gas oil fractions – a product of various petroleum blends. It was derivate dependencies of yield and density of proportion and composition of mixtures. Graphical illustration is shown in Figure 1 and 2.

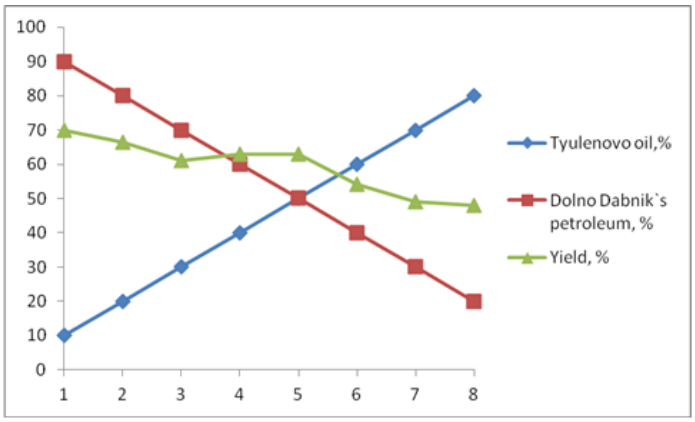

Fig. 1 Dependence on the oil fraction yield from percentage composition of the mixtures

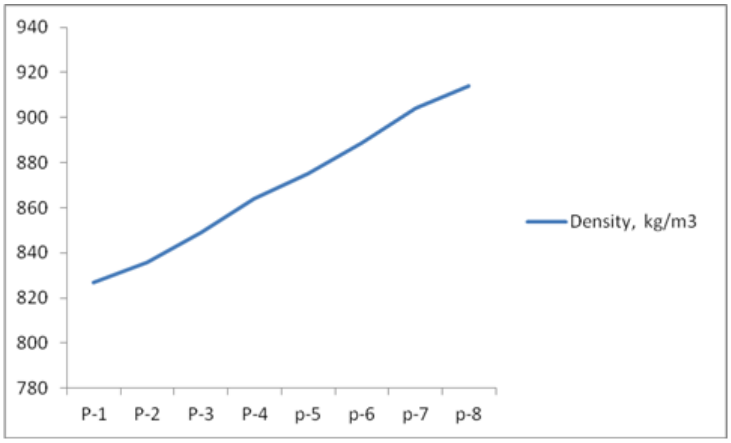

Fig. 2 Amendment of the density at 20°C of the test mixtures according to their percentage Tulenovo oil: Dolnodubnik`s oil

In order to establish the optimum material from mixed oil for primary processing as a criterion used to assess physicochemical parameters of obtained gas oil fraction in the primary processing of us studied blends. As a basis for comparison we were used physicochemical data of gas oil fractions obtained from primary processing of oil from Tulenovo and Dolni Dubnik`s petroleum. The experimental basic results and physicochemical data

obtained from experimentally established petroleum mixtures are reflected in the following tables. Based on the experimental research - creating the physicochemical characterization of eight oil mixtures (Fig. 1 and 2) which are received from Tulenovo`s petroleum and Dolni Dubnik`s oil is found that the most optimal are mixtures P-3 and P-4.

It should be noted that when the petroleum blends P-3 and P-4 were fractionated to 360°C were obtained best yields and also their density were in the order of 849.0 – 864.0 kg/m^3. In support of this assertion were the results of physicochemical analysis of obtained gas oil fractions from primary processing of mixtures of P-1 to P-8, compared with physicochemical parameters of gas oil fraction derived from pure Dolni Dubnik`s oil and oil from Tulenovo.

As shown in Tables from 3 to 12, the oil mixtures P-3 and P-4 were similar in value to the density and distillation characteristics, and moreover the sulfur content of the two petroleum blends was of the order of 0.08%.

Table 3 Physico-chemical properties of gas oil, obtained from Tyulenovo oil

№	Parameter	Test method	Value
1.	Density at 20°C, kg/m^3	BSS EN ISO 3675:2004	889.6
2.	Distillation characteristics	BSS EN ISO 3405:2011	
	10 % (v/v), °C		236
	75 % (v/v), °C		308
3.	Flash point, °C	BSS EN ISO 2719:2004	96
4.	Sulfur content, %	BSS ISO 8754:2006	0.14

Table 4 Physico-chemical properties of gas oil, obtained from Dolni Dabnik`s oil

№	Parameter	Test method	Value
1.	Density at 20°C, kg/m^3	BSS EN ISO 3675:2004	823.4
2.	Distillation characteristics	BSS EN ISO 3405:2011	
	10 % (v/v), °C		226
	75 % (v/v), °C		320
3.	Flash point, °C	BSS EN ISO 2719:2004	94
4.	Sulfur content, %	BSS ISO 8754:2006	0.08

Table 5 Physico-chemical properties of gas oil, obtained from petroleum mixture P-1

№	Parameter	Test method	value
1.	Density at 20°C, kg/m^3	BSS EN ISO 3675:2004	836.1
2.	Distillation characteristics	BSS EN ISO 3405:2011	
	10 % (v/v), °C		228
	75 % (v/v), °C		318
3.	Flash point, °C	BSS EN ISO 2719:2004	94
4.	Sulfur content, %	BSS ISO 8754:2006	0.08

Table 6 Physico-chemical properties of gas oil, obtained from petroleum mixture P-2

№	Parameter	Test method	Value
1.	Density at 20 °C, kg/m^3	BSS EN ISO 3675:2004	843.0
2.	Distillation characteristics	BSS EN ISO 3405:2011	
	10 % (v/v), °C		230
	75 % (v/v), °C		315
3.	Flash point, °C	BSS EN ISO 2719:2004	94
4.	Sulfur content, %	BSS ISO 8754:2006	0.08

Table 7 Physico-chemical properties of gas oil, obtained from petroleum mixture P-3

№	Parameter	Test method	Value
1.	Density at 20°C, kg/m^3	BSS EN ISO 3675:2004	846.4
2.	Distillation characteristics	BSS EN ISO 3405:2011	
	10 % (v/v), °C		230
	75 % (v/v), °C		310
3.	Flash point, °C	BSS EN ISO 2719:2004	94
4.	Sulfur content, %	BSS ISO 8754:2006	0.08

Table 8 Physico-chemical properties of gas oil, obtained from petroleum mixture P-4

№	Parameter	Test method	Value
1.	Density at 20°C, kg/m^3	BSS EN ISO 3675:2004	852.2
2.	Distillation characteristics	BSS EN ISO 3405:2011	
	10 % (v/v), °C		232
	75 % (v/v), °C		315
3.	Flash point, °C	BSS EN ISO 2719:2004	94
4.	Sulfur content, %	BSS ISO 8754:2006	0.08

Table 9 Physico-chemical properties of gas oil, obtained from petroleum mixture P-5

№	Parameter	Test method	Value
1.	Density at 20°C, kg/m^3	BSS EN ISO 3675:2004	855.4
2.	Distillation characteristics	BSS EN ISO 3405:2011	
	10 % (v/v), °C		234
	75 % (v/v), °C		308
3.	Flash point, °C	BSS EN ISO 2719:2004	95
4.	Sulfur content, %	BSS ISO 8754:2006	0.09

Table 10 Physico-chemical properties of gas oil, obtained from petroleum mixture P-6

№	Parameter	Test method	Value
1.	Density at 20°C, kg/m^3	BSS EN ISO 3675:2004	858.0
2.	Distillation characteristics	BSS EN ISO 3405:2011	
	10 % (v/v), °C		236
	75 % (v/v), °C		305
3.	Flash point, °C	BSS EN ISO 2719:2004	75
4.	Sulfur content, %	BSS ISO 8754:2006	0.09

Table 12 Physico-chemical properties of gas oil, obtained from petroleum mixture P-8

№	Parameter	Test method	Value
1.	Density at 20°C, kg/m^3	BSS EN ISO 3675:2004	863.2
2.	Distillation characteristics	BSS EN ISO 3405:2011	
	10 % (v/v), °C		236
	75 % (v/v), °C		304
3.	Flash point, °C	BSS EN ISO 2719:2004	79
4.	Sulfur content, %	BSS ISO 8754:2006	0.1

4. Conclusions

In conclusion it must be emphasized that the obtained gas oil fractions of mixed types of oil produced in Bulgaria confirmed to European norms and Bulgarian state standards and no further cleanup of unlikely sulfur components, which in turn further reduces the cost of the obtained products.

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