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GENERAL INFORMATION ABOUT BIONEFT PRODUCTS

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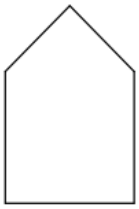
Abstract
The density of bio-oil is 770–920 kg/m^3, the heat of combustion is 43000–45500 kJ/kg. Bio-oil contains approximately 84–86% carbon, 10–14% hydrogen and 1–3% sulfur, oxygen and nitrogen. The first 4 representatives of hydrocarbons are in a gaseous state at a temperature of 0°C and a pressure of 0.1 MPa.Methane CH_4, ethane C_2H_6, propane C_3H_8, butane C_4H_{10} are included. the amount of hydrocarbons is limited, because they stick to the parts at high temperatures and form alloys in the composition of bio-oil products, it is found in a very small amount, mainly in the form of tar-asphalt substances (0.3 %).

Keywords: bio-oil, liquid, hydrocarbon, temperature, pentane, paraffin, benzene, cyclopentane, cyclohexane.

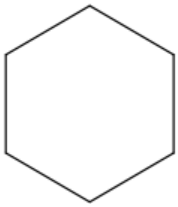
Bioneft is a dark oily liquid with a specific smell and has a brown color of various shades. The density of bio-oil is 770–920 kg/m^3, the heat of combustion is 43000–45500 kDj/kg [1].
Bio-oil contains approximately 84–86% carbon, 10–14% hydrogen and 1–3% sulfur, oxygen and nitrogen. The total amount of hydrocarbons by mass is 97–98%. Despite the similarity of the elements in the composition, the physical and chemical properties of oils obtained from different places are different. The reason for this is that carbon and hydrogen atoms can combine in different ways [2].
All hydrocarbons in bioneft are divided into 4 groups according to their chemical structure [3].
1. Saturated or paraffin hydrocarbons, general formula: C_nH_{2n+2}.
Saturated hydrocarbons in the composition of bio-oil are mainly in low-boiling (light) fractions. The first 4 representatives of these hydrocarbons are in the gaseous state at a temperature of 0°C and a pressure of 0.1 MPa.
These include: methane CH_4, ethane C_2H_6, propane C_3H_8, butane C_4H_{10}. Pentane, the fifth representative of saturated hydrocarbons, is in liquid form from C_5H_{12} to $C_{16}H_{34}$ representative and from $C_{17}H_{36}$ in solid state.
Paraffin hydrocarbons are divided into two groups depending on their chemical structure divided into:
-Normal-paraffin hydrocarbons;
-Isomer-paraffin hydrocarbons.

2. Naphthenic hydrocarbons, chemical formula: C_nH_{2n}.

These hydrocarbons have a cyclic structure. They differ from paraffinic hydrocarbons by having 2 hydrogen atoms less. Naphthenic hydrocarbons have the following structure:

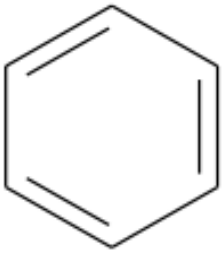


Cyclopentane

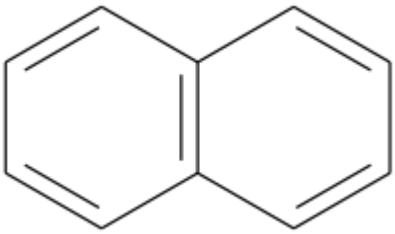


Cyclohexane

3. Aromatic hydrocarbons, general formula: C_nH_{2n-6}, C_nH_{2n-12}.
Aromatic hydrocarbons are found in oil in a small amount (5-20%) compared to paraffin and naphthenic hydrocarbons.



Benzene



Naphthalene

Their first representative is benzene, whose presence in gasoline increases the octane number. But the amount of these hydrocarbons is limited, because they stick to the parts at high temperatures and form alloys.

It is good that aromatic hydrocarbons are low in diesel fuel, because they are difficult to oxidize in diesel fuel and prolong the ignition time, resulting in inefficient engine operation. And in oils, aromatic hydrocarbons cause a lot of soot formation and also increase the viscosity of oils when the temperature drops. Therefore, aromatic hydrocarbons are rarely added to lubricants.

4. Unsaturated hydrocarbons, general formula: C_nH_{2n}, C_nH_{2n-2}.
During oil refining, many unsaturated hydrocarbons are formed. Unsaturated hydrocarbons are more reactive, for which they are more prone to addition reactions due to double bonds. They are easily oxidized to form resins, organic acids and other compounds. Unsaturated hydrocarbons deteriorate the properties of any petroleum products, so it is not advisable to have them in fuel or oil. Depending on the number of double bonds, unsaturated hydrocarbons are as follows: single double bond– olefins: $C_nH_{2n;}$ diolefins with two double bonds: C_nH_{2n-2}.

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In addition, oil products contain:
- sulfur compounds;
-oxygen compounds;
There are also nitrogenous compounds.
These compounds deteriorate the quality of motor fuels and oils.
Sulfuric compounds increase corrosion of parts:
Sulfur content should not exceed 0.1–0.2% in gasoline and 0.2–0.4% in diesel fuel [4].
Oxygenated compounds are often found in the upper fractions of petroleum products (starting with kerosene). Their amount does not exceed 10%. These compounds are mainly in the form of various acids. They increase the corrosion of details. It leads to the formation of tar-asphalt substances in bio-oil [5].

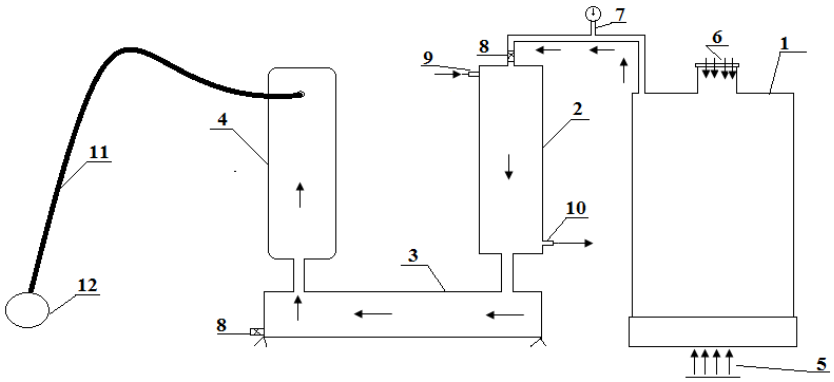

Figure 1. 1-Bioreator. 2-cooler (radiator). 3-tank for collecting bio-oil. 4-gas golder, 5-heating part (gas burner). 6-part where raw materials are placed (lid). 7-manometer. 8-krainik. 9-the part where cold water enters. 10-hot water outlet. 11-gas pipe. 12-gas burner.

Nitrogenous compounds are found in almost very small amounts in the composition of bio-oil products, mainly in the form of tar-asphalt substances (0.3%). These substances increase the formation of soot and mold in hot parts [6].

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