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ANALYSIS OF THE POSSIBILITIES OF USING PETROLEUM COKE IN VARIOUS INDUSTRIES

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The efficiency of the delayed coking process lies in the fact that along with the production of petroleum coke, a significant amount of distillate products is formed that is suitable for the production of high-quality motor fuels. It is possible to process oil sludge and other waste. The raw materials are heavy fractions of oil formed as a result of atmospheric and vacuum distillation of oil (fuel oil, semi-tar, tar), cracking-residues from thermal cracking of fuel oil and tar, heavy gas oils of catalytic cracking, residues of oil production (asphalt of propane deasphalting of tar, extracts of phenolic oil purification, etc.)

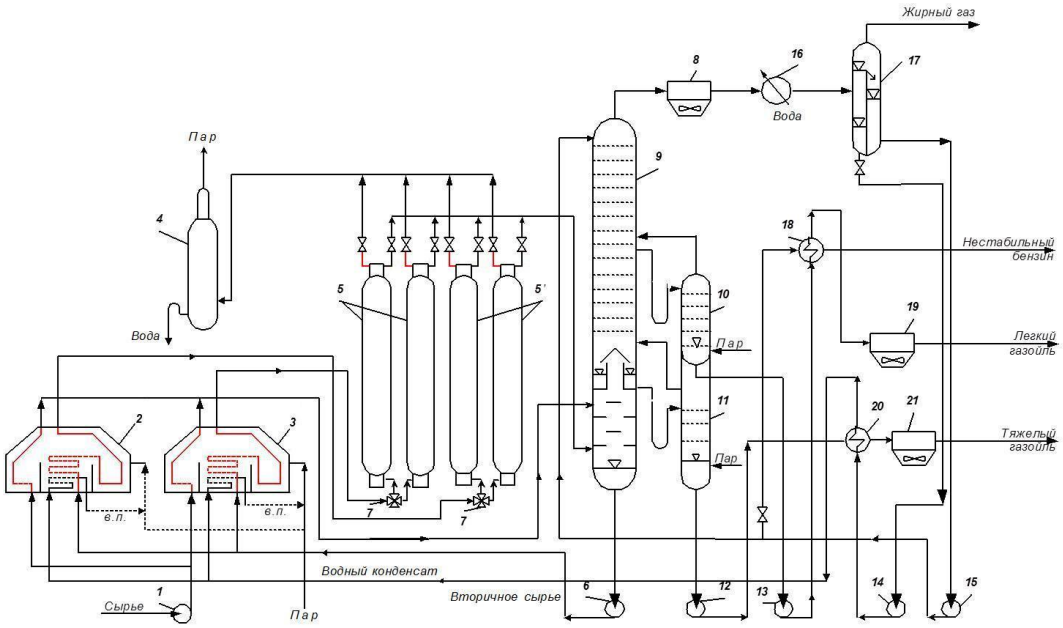

Fig. 1. – DCU (delayed coking unit) scheme

Technological devices and equipment:

1, 6, 12-15-pumps; 2, 3-tube furnaces; 4-receiver; 5, 5' - delayed coking chambers; 7-four-way cranes; 8, 19, 21-air cooling devices; 9 – rectification column; 10, 11-steam columns; 16-refrigerator; 17-water and gas separator; 18, 20-heat exchangers.

The industrial coking process is carried out on 3 types of installations: periodic coking in coke cubes, delayed coking in chambers, continuous coking in the fluidized bed of the carrier coke.

Delayed coking

Delayed (semi-continuous) coking is the most widespread in the world practice. The raw material, preheated in tubular furnaces to 350-380 °C, is continuously fed to the cascade plates of the distillation column (operating at atmospheric pressure), flowing down where it contacts the rising vapors supplied from the reaction apparatuses.

As a result of heat and mass transfer, some of the vapors condense, forming with the raw material the so-called secondary raw material, which is heated in tubular furnaces to 490-510 °C and enters the coke chambers-hollow vertical cylindrical apparatuses with a diameter of 3-7 m and a height of 22-30 m. The reaction mass is continuously fed into the chamber for 24-36 hours and coked due to the heat accumulated by it. After filling the chamber with 70-90% coke, it is removed, usually with a high-pressure water jet (up to 15 MPa).

The coke enters the crusher, where it is crushed into pieces of no more than 150 mm in size, after which it is fed by an elevator to the screen, where it is divided into fractions of 150-25,25-6 and 6-0. 5 mm. The chamber from which the coke is discharged is heated with hot water vapor and steam from the working coke chambers and filled again with the coked mass.

The volatile coking products, which are a vapor-liquid mixture, are continuously removed from the operating chambers and sequentially separated into gases in the distillation column, water separator, gas block and steam column.

Typical process parameters: temperature in the chambers 450-480 °C, pressure 0.2-0.6 MPa, duration up to 48 hours. The advantage of slow coking is the high yield of low-ash coke. From the same amount of raw materials, this method can produce 1.5-1.6 times more coke than with continuous coking.

As a result of delayed coking processes, lumpy petroleum coke with the following characteristics is obtained:

1) the amount of coke fines (particle less than 10 mm) = 30-50%
2) coke humidity = 5-7 %
3) volatile matter yield 8-15%

Lump coke is divided into fractions by size and subjected to calcination.

Quality of anodic (calcined) coke:

1) sulfur content up to 3%
2) nickel content 200 weight parts per million
3) vanadium content 200 parts by weight per million
4) ash 0,3%
5) grinding capacity less than 90%
6) the content of volatile fuels in-in 0,3%

Petroleum coke, which is a solid porous product from dark gray to black color, is obtained by coking petroleum raw materials. The main quality indicators are the content of S, ash, moisture (usually no more than 3% by weight), the yield of volatile substances, granulometric composition, mechanical strength.

Petroleum coke is divided: by the content of S into low-sulfur (up to 1%), sulfur (up to 2%), high-sulfur (more than 2%); by the content of ash into low-ash (up to 0.5%), medium-ash (0.5-0.8%), high-ash (more than 0.8%); by the granulometric composition into lumpy (fraction with a particle size of more than 25 mm), "nut" (6-25 mm), small (less than 6 mm).

Application of coke:

– aluminum industry, where coke serves as a reducing agent (anode mass) when smelting aluminum from aluminum ores (bauxite). The specific consumption of coke is 550-600 kg / t of aluminum.
– raw materials for the manufacture of electrodes used in steelmaking furnaces;
– for the production of carbides (calcium, silicon), which are used in the production of acetylene;
– production of grinding materials,
– in the manufacture of conductors, refractories, etc.

Before use, petroleum coke is usually subjected to refining (calcination) at refineries immediately after receipt or from the consumer. During calcination, volatiles and partially heteroatoms (e.g., S and V) are removed, and the electrical resistivity is reduced. In the food industry coke is used in the production of sugar to replace blast furnace coke. Low-quality sulfur coke is used as fuel.

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