

BITUMENS AND BITUMEN COMPOSITIONS BASED ON OIL- CONTAINING WASTES

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Annotation: This article analyzes methods for recycling oil sludge, indicating the advantages and disadvantages of these methods, and also proposes a method of electric combustion technology with environmentally friendly combustion of fuel briquettes.

Keywords: oil sludge , thermal drying , gravitational settling, filtering oil sludge , surfactants, biodegradation , electric fire method, thermal methods for processing oil sludge.

At the moment, there is a situation of reduction in global energy reserves, and therefore a modern and competent approach to the utilization of petroleum products can significantly increase the efficiency of using energy reserves. At the same time, a particularly acute problem is the organization of competent disposal of oil refining waste, with the help of which the industry can not only significantly improve the environmental situation in the region, but also significantly increase its economic potential.

Oil sludge disposal methods can be classified into: thermal - combustion in open barns, furnaces of various types, production of bituminous residues, combustion of oil sludge in the form of 23 water emulsions and utilization of the released heat and gases, dehydration or drying of oil sludge with the return of oil products to production, and waste water - into reverse circulation and subsequent burial of solid residues; physical - mixing and physical separation of oil sludge ; chemical - extraction with solvents, hardening with the use of additives; physicochemical - the use of specially selected reagents (solvents, demulsifiers , surfactants, etc.) that change the physicochemical properties, followed by processing on special equipment; biological - microbiological decomposition in the soil directly at storage sites, biothermal decomposition. Let us consider in more detail the methods of processing oil sludge , indicating the advantages and disadvantages of the above methods.

1) Thermal methods for processing oil sludge: burning in open barns; combustion in furnaces of various types and designs; heat drying; pyrolysis as a result of thermal processing of oil sludge, semi-coke, liquid pyrolysis product and synthesis gas are obtained, the percentage of substances is shown in Figure 1.

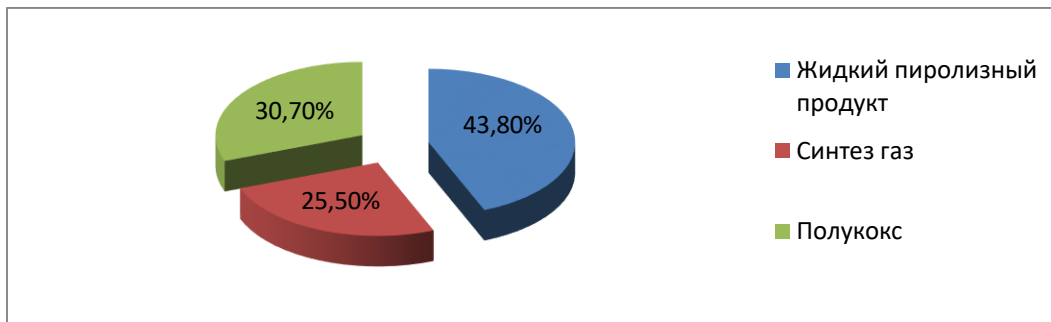


Figure 1 - Percentage of substances obtained by the thermal method of processing oil sludge.

The process of burning oil sludge is a type of processing that is expensive and requires a certain amount of time.

These methods do not require large capital expenditures, are used for many types of waste, have a high degree of decomposition, and produce valuable products.

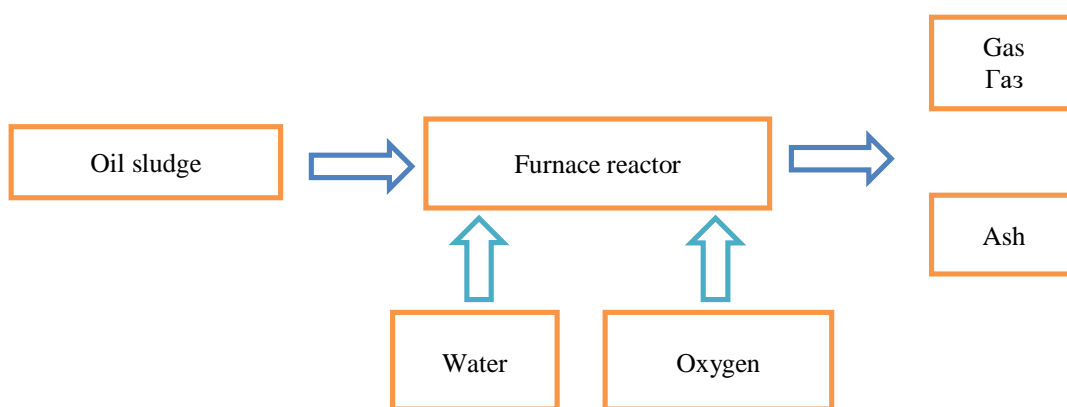


Figure 2 – Scheme of the oil sludge combustion process

The disadvantages of the thermal method include high costs for cleaning and neutralizing flue gases, incomplete combustion of petroleum products, and a high risk of air pollution by combustion products.

2) Physical methods for processing oil sludge: waste separation in a centrifugal field; gravitational settling.

Oil sludge settling is a method that is a very slow process that does not bring the desired effect, both technologically and environmentally.

To apply this method, it is necessary to use significant volumes of certain chemicals, as well as to look for large areas of land to place oil waste settling tanks, which is difficult for those enterprises that do not have large areas to use waste for these purposes.

Processing of oil sludge using the filtration method involves filtering using a special press. This method is the most common processing method. During this method, the liquid and the impurities it contains are separated. The disadvantages of this method are low throughput, problems with disposal of the material that is filtered, which leads to an environmental threat.

3) Chemical methods for processing oil sludge: hardening by dispersing with reagents; oxidation; neutralization. High efficiency of the oil-containing waste processing process. Disadvantages include the use of special equipment and reagents.

4) Physico-chemical methods for processing oil sludge: the use of specially selected surfactants

– demulsifies.

This method has a high cost of reagents, and also produces undisposed solid waste.

5) Biological methods for processing oil sludge : biodegradation by introducing (mixing) oil-containing waste into the topsoil; biodegradation using special strains of bacteria, nutrients and air supply.

The biological method requires minor capital costs, but it has a long waste processing process and the risk of soil contamination with harmful compounds.

Analysis of the above methods showed that each of these known technologies has its own advantages and disadvantages. Nevertheless, many useful products are already actually obtained from oil sludge , in particular commercial oil, fuel for boiler plants, and some construction materials. A common disadvantage of all known technologies for utilization and processing of oil sludge is their low productivity and high material, energy and financial costs for their implementation.

In addition, they do not allow complete and intensive processing and disposal of oil sludge, especially with the utmost environmental safety for the environment. It is these shortcomings that do not allow us to effectively solve the problem of complete and intensive disposal of various oil sludges

By choosing different processing methods, you can obtain products that are most in demand under current conditions.

Based on the research carried out, a comprehensive technology for processing oil-containing waste was developed to produce secondary products in the form of bitumen and bitumen compositions for various technological purposes. The functional diagram of the complex is shown in Fig. 2 .

Oil sludge processing according to this technology, it is carried out as follows : NSO enters a heated receiving hopper, where it is heated to a viscous-fluid state and large mechanical impurities are separated from them , after which NSO is sent through cassette filters to a homogenizer heated by water steam, Cake formed in the cassette filters, goes into the oven where it is burned.

Homogenized oil sludge is collected in a storage tank, from where it is gradually pumped by a pump into a tank heated by an oil heater . a cube equipped with a jacket and a bubbler spiral.

The heat flow for the oil heater and furnace is provided by flue gases, which are produced in a thermal unit (regulated flue gas generator) by burning fuel (fuel oil, black diesel fuel, waste diesel fraction, heating oil, etc.) when pumping air with a compressor,

In the still, the oil sludge is subjected to preliminary partial dehydration, and then, depending on the mode and the required output product, ICO is processed either at atmospheric pressure or at reduced pressure.

To process oil sludge at atmospheric pressure, they are first heated in a reactor to 107-155°C to separate the remaining water and azeotropes , and then to 360°C until condensate stops flowing into the storage tank.

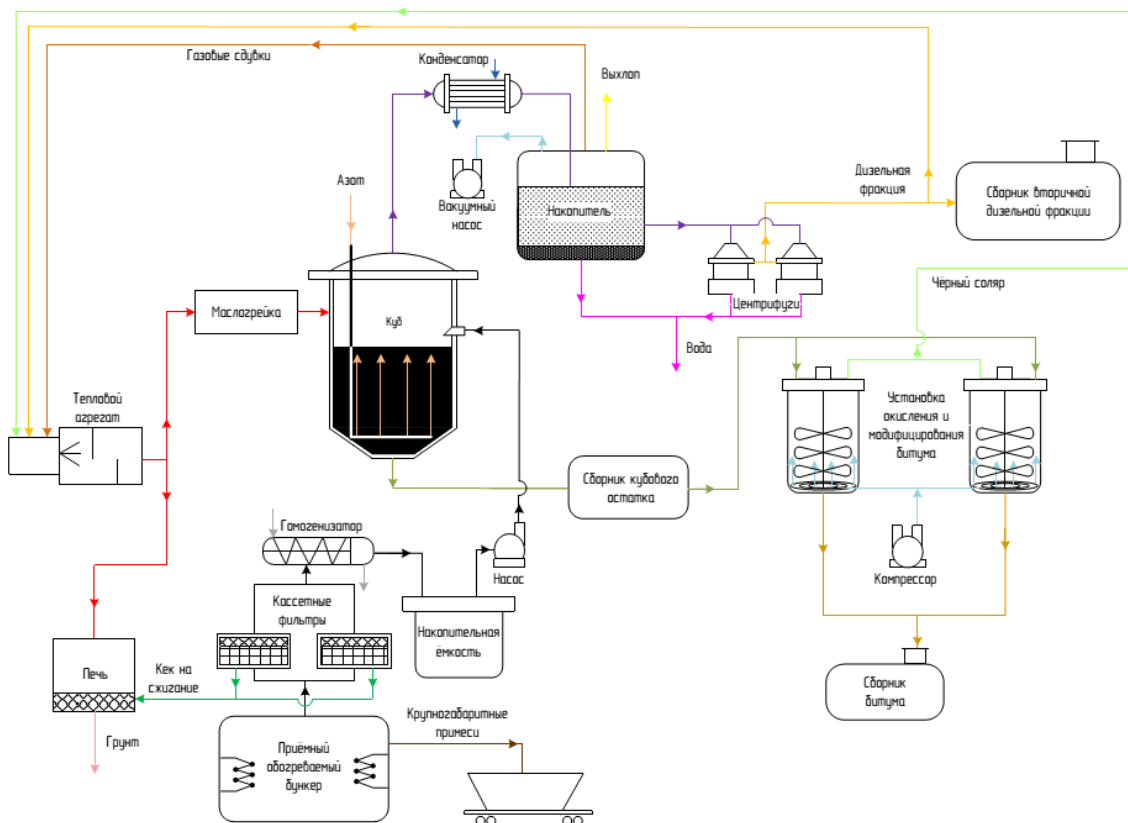


Fig.3. Functional diagram of the oil-containing waste processing complex

To process oil sludge at reduced pressure, air is pumped out of the reactor during the heating process through a condenser and storage tank with a vacuum pump to a residual pressure of 30-3 S mmHg , and nitrogen is supplied under low pressure through a bubbling spiral at the bottom of the reactor to create an inert atmosphere and backwater. exhaust condensate vapors. Heating is carried out until the flow of light oil products into the storage tank stops - to a temperature of 360-380°C,

The distillate from the still enters the condenser, where it is cooled with water. The condensate is then moved to a storage tank, where the gas purges and water are partially separated. From the storage tank, the distillate is fed to centrifuges, in which the diesel fraction and water are separated, after which the diesel fraction is sent to a collection tank, and the water is sent for neutralization.

After heat treatment of oil sludge at atmospheric or reduced pressure, the bottom residues enter the bottoms collection, from where they are sent to bitumen oxidation and modification units, where they are either oxidized and compounded, or modified with sulfur or polymers in accordance with the methods described in this dissertation, depending on the need for any brand of bitumen.

oil sludge processing complex makes it possible to effectively dispose of accumulated non-carbon dioxide, producing a wide **range of secondary bitumen for various purposes (both road and construction) using the methods described above.**

The developed complex technology provides the opportunity for the most complete processing of PSO and allows the resource potential contained in oil sludge to be returned to the technological process.

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