

PROMISING METHOD OF OIL WASTE DISPOSAL

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ABSTRACT

This article provides a brief overview of the negative impact of oil waste, both on the environment and on the economic component of oil-extracting and refining enterprises, formed during the extraction, transportation, storage of oil and oil products, and methods of their disposal are also considered. The urgency of the problem of oil waste utilization is considered. The most effective solution to the problem by briquetting is proposed.

Keywords: oil sludge, fuel briquettes, reservoir oil sludge, complex disposal, energy resources, alternative fuel, recycling, asphalt-resin-paraffin deposits.

INTRODUCTION

At the moment, there is a situation of reduction of world reserves of energy resources, in connection with which it is a modern and competent approach to the disposal of petroleum products that can significantly increase the efficiency of using energy reserves. At the same time, a particularly acute problem is the organization of competent disposal of waste from oil refining production, 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 [1].

The problem of the negative impact on the environment of the accumulated waste generated during the extraction, transportation, storage of oil and petroleum products has not yet been resolved. As a result of the migration of harmful substances, environmental pollution occurs.

It should be noted that all the processes of conversion of hydrocarbons are activated in hot climates - due to a decrease in viscosity and an increase in the reaction rate [2-5].

METHODOLOGY

Enterprises associated with oil and gas production and processing of oil and gas raw materials are forced to accumulate and store oil sludge on their territory due to the insufficient number of industrial waste landfills that receive them or due to the lack of installations for processing oil - containing waste, respectively, paying for their storage.

The accumulation of oil waste in production areas can lead to intensive pollution of soil, air and groundwater. Often, oil-containing waste is destroyed at industrial sites by incineration, which is a violation of environmental legislation..

Asphalt-resin-paraffin deposits (ARPD), which are a complex mixture of high-molecular organic compounds with inorganic inclusions, represent a big problem in terms of oil sludge disposal [2, 3, 6-9].

RESULTS

In turn, the issues of providing the population with fuel for economic needs, as well as the transition of industrial enterprises from gas to cheaper and alternative fuel, are actual.

Oil sludge is a complex physico-chemical mixture that consists of petroleum products, mechanical impurities (clay, metal oxides, sand) and water. The ratio of the elements that make up the oil sludge can be very different.

Oil sludge is formed during production processes such as oil refining, production and transportation. This type of waste represents a great danger to the environment and must be buried or recycled.

Oil sludge can be formed both as a result of natural controlled processes (for example, cleaning oil from impurities and water), and from all kinds of accidents (spills). In the latter case, with late detection or a large-scale accident, nature can be greatly damaged [8-13].

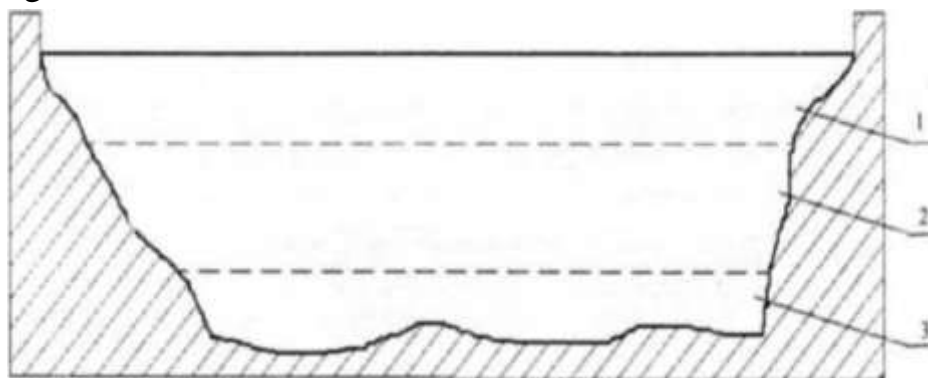


Figure 1. Level-by-level layers of the sludge accumulator. 1 - oil and fuel oil layer; 2 water-emulsion layer; 3 - bottom sediments

Currently, the production of the refinery is directed towards the development of waste-free environmental technologies, according to which the amount of oil waste is minimized, or they are reused and used profitably.

Table 1. Chemical composition of oil sludge

Component name	Quantity, mass %			
	Organic Ingredients	Moisture	Sulfur	Mineral part
Oil sludge	72	10,2	1,8	16

In addition to the formation of oil sludge, other types of waste are accumulated at petrochemical and oil production enterprises, such as: contaminated soils; drilling mud; acid tar; spent catalysts; adsorbents; ash; solid residue of oil; resinous substances; dust caught during the cleaning of emissions.

Table 2. Mineral composition of oil sludge

Content of components, %					
SiO ₂	CaO	Fe ₂ O ₃	Al ₂ O ₃	MgO	other
4,55	3,14	1,65	2,36	1,0	3,3

Table 3. Classification of oil sludge, in accordance with existing legal regulations

Structure, %	Oil sludge						
	oiled soil	Bottom sludge	Tank cleaning products	Oil-water emulsion	Trap oil	Drill cuttings	Barn top layer
Mechanical impurities	50-90	15-50	5-10	1,5-15	0,05-0,5	11-25	0,5-15
Oil, petroleum products	to 10	10-30	50-70	30-80	70-90	7-14	90-95
Asphaltenes	-	6,5	42	5-10	4-15	-	9,5
Resins	-	18	20	10-20	10-45	-	-
Paraffins	-	2,5	5,6	3-9	2-10	-	3
Water	to 20	to 60	25-40	to 70	to 15	75-90	1,5-5

To determine the scope of application of oil sludge, it is necessary to conduct a preliminary analysis of the qualitative composition of the feedstock.

Scheme 1 illustrates the stages of primary processing and analysis of oil sludge. (Fig. 2).

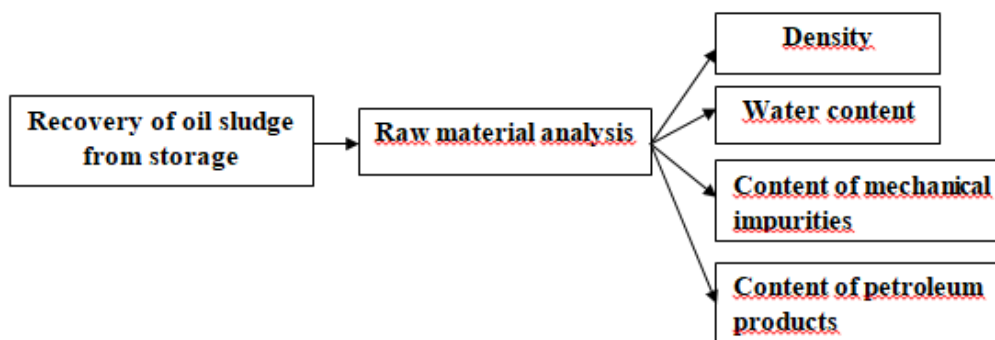


Figure 2. Scheme of technological stages of oil sludge processing and composition analysis

The reviewed studies in the field of oil-containing waste management revealed the need for a unified system of treatment in the field of oil sludge utilization and processing, despite the presence of many approaches and technologies. Oil-containing waste should be involved in recycling in order to minimize the technogenic impact on the environment, taking into account their characteristics, in order to maximize their involvement in resource turnover. Currently, the majority of technologies used for the disposal of oil-containing waste involve the processing of the upper layer of oil sludge, leaving the lower-bottom layer of historical accumulation intact.

DISCUSSION

To identify the suitability of oil sludge and select the required technology, it is necessary to conduct experimental studies in order to analyze its chemical composition and properties. That in the future will allow you to choose the optimal method of recycling in various industries. The most promising technologies for the processing of oil sludge is their use in the production of building materials. At the same time, it is necessary to take into account the ecological and economic justification of the choice and the prospects for the implementation of the technology.

In turn, the issues of providing the population with fuel for household needs and as a boiler fuel, as well as the transition of industrial enterprises from gas to cheaper and alternative fuel, are topical.

With all the variety of characteristics of various oil waste in the most general form, all oil sludge can be divided into three main groups in accordance with the

conditions of their formation - ground, bottom and reservoir type. Depending on the method of formation and, accordingly, the physic-chemical composition, oil sludge is divided into several groups or types:

1. Bottom, formed at the bottom of various reservoirs after an oil spill.
2. Formed when drilling wells with hydrocarbon-based drilling fluids.
3. Formed in the process of oil production, or rather, in the process of its purification. The fact is that the oil extracted from the well contains numerous salts, precipitated solid hydrocarbons, mechanical impurities (including particles of rocks).
4. Tank oil sludge is a waste that is generated during the storage and transportation of oil in a wide variety of tanks.
5. Soil, which is the product of the connection of the soil and the oil spilled on it (the reason for this can be either a technological process or an accident). This type of oil sludge (contaminated soil) refers to waste only after it is placed in waste storage facilities or in landfills for waste processing.

In the most simplified form, oil sludge is a multicomponent stable aggregate physic-chemical system, consisting mainly of oil products, water and mineral additives (sand, clay, metal oxides, etc.). The main reason for the formation of tank oil sludge is the physicochemical interaction of oil products in the volume of a specific oil intake device with moisture, air oxygen and mechanical impurities, as well as with the material of the walls of the reservoir. As a result of such processes, partial oxidation of the original petroleum products occurs with the formation of resin-like compounds and rusting of the tank walls. Along the way, the ingress of moisture and mechanical impurities into the volume of the oil product leads to the formation of water-oil emulsions and mineral dispersions. Since any sludge is formed as a result of interaction with a specific environment for its conditions and for a certain period of time, there are no sludges that are identical in composition and physic-chemical characteristics in nature. According to the results of many studies in tank-type oil sludge, the ratio of oil products, water and mechanical impurities (particles of sand, clay, rust, etc.) varies over a very wide range: hydrocarbons are 5-90%, water 1-52%, solid impurities 0, 8-65%. As a consequence, such a significant change in the composition of oil sludge, the range of changes in their physicochemical characteristics is also very wide. The density of oil sludge ranges from 830-1700 kg / m^3 , the solidification temperature from -3 to + 80 ° C. Flash point ranges from 35 to 120 °C [5].

Processing and disposal of oil sludge is an important environmental and economic challenge.

Technologies for the disposal of oil sludge, based on destructive methods, do not allow the full use of oil-containing waste in economic activities.

At the same time, the waste of the woodworking industry -wood sawdust, is not less than 40 % of the total volume, and the efficiency of their use does not exceed 48 %, at the same time, the waste of coal production is not less than 20-30% of the total volume, they are also formed during extraction and transportation, and their disposal is not fully carried out, which negatively affects the ecology of the environment.

Therefore, the complex disposal of oil sludge and sawdust by obtaining fuel briquettes is an urgent task, has scientific novelty and great practical significance, as it allows you to save energy resources and provide fuel to hard-to-reach areas.

CONCLUSION

We propose a comprehensive disposal of oil sludge with other production wastes for the manufacture of fuel briquettes based on mixing ARPD with waste from other industries, using both cheap and available raw materials and molding them using high-molecular compounds with inorganic inclusions. The main parameters of fuel briquettes are their calorific value, strength, ash content and duration of combustion.

Fuel briquettes from oil waste are one of the most effective solutions in matters of both environmental pollution, soil and underground sources, and in providing the population and industrial enterprises with cheaper and alternative fuel.

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