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Destruction of Sustainable Water Oil Emulsions Formed In Local Oil Sludge

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ABSTRACT: Intensive growth in oil production in Uzbekistan is accompanied by an increase in the formation of oil sludge in oil fields, oil refineries, etc. We studied the composition of local oil sludge obtained in the fields, the use of oil sludge, showed the particle size distribution of particles of sludge emulsion of local oils, studied surfactants in local oil sludge. using a composition of developed local demulsifiers, studied the process of dehydration, desalination and removal of solids from stable emulsions formed from local emulsions oil sludge.

KEYWORDS: Oil, oil sludge, demulsifier, ecology, processing, sustainable oil-water emulsion, surfactants, hydrophobic, hydrophilic, oil refinery.

I.INTRODUCTION

Intensive growth in oil production in Uzbekistan is accompanied by an increase in the formation of oil sludge at the oil treatment installation (OTI), oil refining industries, etc.
The composition of oil slime varies greatly among themselves and contains a significant amount of water, mechanical impurities and other components, which complicate the subsequent processes of their processing.
The presence of asphaltenes, resins, paraffin's and other natural surfactants in oil slime contributes to the formation of stable emulsions with a high content of particulate matter.
The turbulent movement of oil sludge in the means of their formation and transportation increases the stability of emulsions due to the formation of complicated complexes (associates, clusters, etc.). In addition, at the oil refining enterprises, a large amount of oil slime is formed during storage, processing of oil and oil products, washing of technological equipment, steaming of railway and tank trucks.

II. METHODOLOGY

The composition of oil slime is divided into the following groups: - soil, bottom and reservoir type.
The first are formed when oil products are irrigated onto the ground with a reservoir metal, water, oxygen, and mechanical impurities. In addition, during storage, the oil is stratified and thick oil sludge sinks at the bottom of the reservoir. In practice, oil products are pumped into reservoirs, where gravimetric forces at a temperature of (60-70) 0C separate the mixture.
More often, oil sludge is called oil mud, consisting of residues of oil products, water, etc. Therefore, oil mud is taken out for utilization and an average of 0.5-1.0 kg is formed per 1 ton of processed oil. They are collected in special storage tank - sludge reservoirs (slime collectors).
The analysis shows how long the oil sludge is stored, the more its stability increases due to the " age hardening " of the formed emulsion.
Oil sludge is quite heavily flooded (water content 30-75%), a thick viscous pasty mass. It contains an average of 30-70% of petroleum products and 10-15% of mechanical impurities in the form of dispersed particles of clay, sand, etc.
We have studied the composition of local oil slime obtained from oil and oil fields. The results obtained are presented in table 1.

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Table 1.
The main composition of oil-sludge in local production

Type of components	Content, %		
	Jarkurgan oil	Shurchi	Jarkak
Water	31-45	34-49	30-41
Solid phase	34-52	30-46	28-45
Hydrocarbon phase	29-54	33-50	32-48

From table 1 it is seen that with a high content of water, solid and hydrocarbon phases in the local oil sludge, stable emulsions are formed, the destruction of which requires the use of highly active demulsifiers or their compositions.
Today, oil sludge processing is aimed at the use of cost-effective and environmentally friendly technologies, including waste-free solutions to cleaning and disposal issues. Therefore, the use of oil sludge as a secondary raw material seems to be one of the main directions in their processing. Of course, today there is no universal technology for processing stable oil sludge emulsions. This is dictated by the suitability of oil sludge for use as secondary raw materials, taking into account their composition, properties and environmental hazards.

III. EXPERIMENTAL RESULTS

Works [1-3] appeared in the literature on the separate processing of oil sludge, depending on the method of their formation. Therefore, the choice of the processing method depends on the consistency of the oil slime and the composition of the organic part, mechanical impurities, water, etc.

In the table 2 shows the overburden of oil sludge obtaining from local OTI

Table 2
Composition and fields of application of oil waste

Type and name of oil waste	Composition of oil-sludge, % of mass			Objects of application
	Organic substances	Mineral substances	Water	
oil-sludge ORF Oil refining factory	6-12	65-70	20-25	road
sludge of oil production	15-35	52-85	10-15	construction
condensed oil-sludgee	20-29	50-70	15-30	architectural
oil with oil-sludge ORF	15-30	60-80	15-25	material
liquid wastes ORF	65-85	10-15	15-29	fuel production
waste products of petroleum oil	80-90	15-20	10-17	grease production
acid sludge	30-45	55-70	20-35	bitumen production

As can be seen table.2 oil sludge with a high content of organic part is used in fuel production, and with mineral part - in road construction, material and bitumen production. The latter are used in compositions of oil and cement, asphalt and gas concrete to increase mechanical strength, frost resistance, and water resistance, reduce water absorption, swelling, caking, etc.
An analysis of the particle size distribution of dispersed particles of a stable oil sludge emulsion shows the importance of their size in sedimentation and destruction.
In the table. 3 shows the particle size distribution of particles of sludge emulsion of local oils.

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Table 3.

Granulometric composition of dispersed particles of local oil-sludge

Granulometric composition, мм	Content of mechanical parts, %		
	Jarkurgan-oil	Shurchi	Jarkak
to 0,14	30-35	20-25	19-27
0,14-1,25	70-80	60-75	57-72
1,25-5	15-20	10-15	11-17

From the table. 3 it can be seen that the highest particle content in local oil-sludge varies within (57-80%) among sizes from 0.14 to 1.25 mm. And vice versa, the smallest in the range of 1.25-5.0 mm from 10 to 20% of the mass of local oil. The formation of stable emulsions in oil-sludge requires natural surfactants such as asphaltenes, resins, paraffin and naphthenic hydrocarbons [4-6].
These substances form armor shells for water particles by blocking with hydrophobic compounds and complexes.
We have studied surfactants in local oil-sludge, which make up the main organic part of this waste.
In the table. 4 shows the surfactant content in local oil-sludge, forming stable oil-water emulsions.

Table 4
Organic composition of local oil-sludge

NameofOTI	Asphaltines, %	Tar, %	Wax hydrocarbon, %	Naphthenic hydrocarbon, %	Aromatic hydrocarbon, %
Jarkurgan oil	8,1-9,3	31-34,5	12-21	10-21	25-30
Shurchi	6,5-7,4	26-28	8-15	8-17	21-23
Jarkak	6,2-7,7	24-27	6-10	7-9	18-24

From the table. Figure 4 shows that the composition of local oil sludge contains a large number of natural surfactants that form stable water-oil emulsions. For their destruction, it is necessary to choose an effective surfactant i.e. demulsifier or its composition consisting of hydrophobic and hydrophilic compounds.
It should be noted that the resins and asphaltenes that are part of the oil sludge, heavy aromatic and paraffin hydrocarbons are rapidly oxidized in air and harden, forming a good waterproofing layer and provide bond strength of the particles of mineral material.
As you can see, the scope of oil sludge is quite large, depending on their composition and properties, various processing technologies are used. More difficult is the use of oil sludge in fuel production, where emulsions are difficult to transport and process. The complex multicomponent composition of oil sludge often requires the use of a composition of demulsifiers with high surface-active properties.
Using the composition of the developed local demulsifiers, we studied the process of dehydration, desalting and removal of mechanical impurities from stable emulsions formed from local oil sludges. The obtained results are presented in table 5, where the amount of the introduced composition of demulsifiers was 100 g / t, and the temperature was 80-85 0C.

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Table 5
Fracture rates of stable oil-water emulsions formed in local oil-sludge

Name of oil sludge	Residue of the water, %	Residue of mineral salts, мg/dm^3	Mechanical impurities, %	Destruction time, hour
Jarkurgan oil	0,55	305,4	7,1	6,5
Shurchi	0,40	270,9	6,7	5,7
Jarkak	0,43	251,8	5,4	5,1

From table 5 it is seen that in terms of their performance, the destructed emulsions formed in local oil sludge may well be processed using the traditional technology of oil rectification. Moreover, for destruction, we consider it appropriate to use a composition of demulsifiers with high hydrophilic and hydrophobic properties.
Residues of water, mineral salts and solids in local oils i.e. oil sludge can be refined in a traditional ELOU refinery, which is very important for increasing the yield of obtained oil products and their profitability [7-8].

IV.CONCLUSION AND FUTURE WORK

Thus, the experimentation of local oil sludge forming stable oil-water emulsions allow scientifically grounded to select the technologies for their processing and application, to choose an effective composition of demulsifiers and the conditions for its application, as well as the possibility of mixing them together before industrial processing.

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