ISNN 3030-3907

2026
MAY
ISSUE - 5
VOLUME - 2

DEVELOPMENT OF SCIENCE

scientific journal



Development of science

Ilmiy jurnal

MAY 2026
Issue - 5, VOLUME - 2

ISSN 3030 -3907

Ilmiy jurnal OAK rayosatining 2024 yil 27 sentabrdagi 361-son qaroriga asosan 02.00.00 kimyo fanlari hamda 2025 yil 12 fevral 367- son qaroriga asosan 05.00.00 texnika fanlari bo‘yicha falsafa doktori (PhD) va fan doktori (DSc) ilmiy darajasiga talabgorlarning dissertatsiya ishlari yuzasidan dissertatsiyalari asosiy ilmiy natijalarini chop etish tavsiya etilgan milliy ilmiy nashrlar ro‘yxatiga kiritilgan.

BOSH MUHARRIR:
Temirov Alisher Hoshim o‘g‘li – texnika fanlari falsafa doktori (PhD),Dotsent.
TAHRIRIYAT KENGASH RAISI:
Fozilov Sadriddin Fayzullayevich – texnika fanlari doktori, professor
TAHRIRIYAT KENGASH A’ZOLARI

TEXNIKA FANLARI/ TECHNICAL SCIENCES/ ТЕХНИЧЕСКИЕ НАУКИ

Bozorov G‘ayrat Rashidovich
Buxoro Davlat Texnika Universiteti, professor
Abdurahmonov Olim Rustamovich
Buxoro Davlat Texnika Universiteti, professor
Adizov Bobur Zamirovich
O‘zbekiston Respublikasi Fanlar akademiyasi Umumiy va noorganik kimyo instituti, professor
Hayitov Ruslan Rustamjonovich
Buxoro Davlat Texnika Universiteti, professor
Jumayev Qayum Karimovich
Buxoro Davlat Texnika Universiteti, professor.
Berdiyev Dorob Murodovich
Islom Karimov nomidagi Toshkent Davlat Texnika Universiteti, professor
Maxmudov Rafiq Amonovich
Buxoro Davlat Texnika Universiteti, professor.
Tilloyev Lochin Ismatilloyevich
Buxoro Davlat Texnika Universiteti, dotsent.
Raxmonov Qahramon Sanakulovich
Buxoro Davlat Texnika Universiteti, dotsent.
Barakayev Nusratullo Rajabovich
Islom Karimov nomidagi Toshkent Davlat Texnika Universiteti, professor.
Jo‘rayev Xayrullo Fayziyevich
Buxoro Davlat Texnika Universiteti, professor.
Panoyev Erali Rajabboyevich
Buxoro Davlat Texnika Universiteti, dotsent.
Ataullayev Sherzod Nabiullyevich
Buxoro Davlat Texnika Universiteti, dotsent.
Murodov Malik Negmurodovich
Buxoro Davlat Texnika Universiteti, dotsent.
Axmedova Ozoda Bahronovna
Islom Karimov nomidagi Toshkent Davlat Texnika Universiteti.
Safarov Bahri Jumayevich
Buxoro Davlat Texnika Universiteti, dotsent.
Xaydarov Axtam Amonovich
Buxoro Davlat Texnika Universiteti, dotsent.
Safarov Jasur Alijon o‘g‘li
Buxoro Davlat Texnika Universiteti, dotsent.

KIMYO FANLARI/ CHEMICAL SCIENCES/ ХИМИЧЕСКИЕ НАУКИ

Axmedov Voxid Nizomovich
Buxoro Davlat Texnika Universiteti, professor
Umarov Baqo Bafoyevich
Buxoro Davlat Universiteti, professor
Kodirov Abduaxad Abduraximovich
Qarshi davlat Universiteti, professor
Qurbonov Mingniqul Jumagulovich
Qarshi davlat Universiteti, dotsent
Turemuratov Sharibay Naurizbaevich
O‘zbekiston Respublikasi Fanlar akademiyasi Qoraqalpog‘iston bo‘limi Bosh ilmiy kotibi, professor
Tursunov Kaxor Shonazarovich
Qarshi davlat Universiteti, professor
Do‘stov Hamro
Buxoro Davlat Texnika Universiteti, professor
Panoyev Nodir Shavkatovich
Buxoro Davlat Texnika Universiteti, dotsent.
Olimov Bobur Bahodir o‘g‘li
Buxoro Davlat Texnika Universiteti, dotsent.
Kasimov Sherzod Abduazimovich
Termiz Davlat Universiteti, professor.
Aliqulov Rustam Valiyevich
Termiz Davlat Universiteti, professor
Tropov Xamza Tursunovich
Samarqand Davlat Universiteti, professor

IQTISODIYOT FANLARI/ ECONOMICS/ ЭКОНОМИЧЕСКИЕ НАУКИ

Nizamov Aslitdin Badreddinovich
Buxoro Davlat Texnika Universiteti, professor.
Boboyev Akmal Choriyevich
Buxoro Davlat Texnika Universiteti, professor.
Ergashxojayeva Shaxnoza Djasurovna
Toshkent davlat iqtisodiyot universiteti, professor
Saidaxmedova Nodira Ilxomovna
Toshkent davlat iqtisodiyot universiteti, professor
Muxsinov Bekzod Toxirovich
Buxoro Davlat Texnika Universiteti, dotsent.
Shakarov Qulmat Ashirovich
Renessans ta'lim universiteti,dotsent.
Jumaeva Zulfiya Qayumovna
Buxoro Davlat Texnika Universiteti, dotsent.
Norova Salomat Yusupovna
Buxoro Davlat Texnika Universiteti, dotsent.
Avezova Shaxnoza Maxmudjonovna
Buxoro Davlat Texnika Universiteti, dotsent.
Jalilov Jamshid G‘anijonovich
Toshkent davlat iqtisodiyot universiteti, dotsent
Xasanova Gulruh Djumanazarovna
Buxoro Davlat Texnika Universiteti, dotsent.

PEDAGOGIKA FANLARI/ PEDAGOGICAL SCIENCES / ПЕДАГОГИЧЕСКИЕ НАУКИ

Siddiqova Sadoqat G‘afforovna
Buxoro Davlat Texnika Universiteti, dotsent.
Zoyirov Erkin Xalilovich
Buxoro Davlat Texnika Universiteti, DSc, professor
Gaffarov Feruz Hasanovich
Puchon Universiteti, *professor*
Ruziyev Davron Yuldashevich
Buxoro Davlat Universiteti, professor
Muradova Firuza Rashidovna
Buxoro Davlat Texnika Universiteti, professor.
Yunusova Gulandon Samiyevna
Buxoro Davlat Texnika Universiteti, professor.
To‘xtayeva Zebo Sharifovna
Buxoro Davlat Texnika Universiteti, professor.
Navro‘zova Gulchixra Nigmatovna
Buxoro Davlat Texnika Universiteti, dotsent.
Uzoqova Laylo Polvonovna
Buxoro muhandislik – texnologiya instituti, dotsent.
To‘raqulova Marjona Qiyom qizi
Buxoro Davlat Texnika Universiteti, dotsent.
Muradova Zarina Rashidovna
Buxoro Davlat Texnika Universiteti, dotsent.
Murodov Sanjar Aslonovich
Buxoro Davlat Texnika Universiteti, dotsent.
Shodiyev Jahongir Jo‘raqulovich
Buxoro Davlat Texnika Universiteti, dotsent
Gaffarov Laziz Hasanovich
Buxoro muhandislik – texnologiya instituti, dotsent.

Tahririyat a’zolarning to‘liq ro‘yxati jurnalning www.devos.uz saytida keltirilgan.

Tahririyat hay’ati a’zolarining tarkibini o‘zgartirish hamda qo‘shimcha kiritish yoki tahririyat a’zoligidan chiqarish bosh muharrir tomonidan amalga oshiriladi.

ISSN 3030-3907

Development of science ilmiy jurnali 2024 yil 15 aprel kuni №256445 sonli guvohnoma bilan Davlat ro‘yxatidan o‘tgan.

To‘plam elektron ko‘rinishda (pdf formatida) mualliflarga taqdim etiladi. To‘plamga kiritiladigan maqolalarning mazmuni, ulardagi statistik ma’lumotlar va me’yoriy hujjatlarning to‘g‘riligiga hamda har qanday fikr - mulohazalarga mualliflarning o‘zlari mas’ul hisoblanadilar. Talablarga javob bermaydigan maqolalar to‘plamga kiritilmaydi. Tashkiliy qo‘mita maqola matnini qisqartirish, qisman tuzatish kiritish, seksiyalarga joylashtirish huquqiga ega.

ISSN 3030-3907

UDC 665.6

IMPLEMENTATION OF THE PROCESS OF EXTRACTING THE MAIN ORGANIC COMPONENT FROM THE COMPOSITION OF THE OIL SLUDGE

Jo‘raqulov Muslimbek
Olmaliq State Technical University, Tashkent, Uzbekistan
Khurmamatov Abdugaffor Mirzabdullaevich
Olmaliq State Technical University, Tashkent, Uzbekistan
Pulatov Golibjon Muradivich
Olmaliq State Technical University, Tashkent, Uzbekistan

Annotation. This article considers mechanical impurities, water content and organic components in oil sludge, as well as methods of their analysis. Special attention is paid to the study of the amount of organic acids. For this purpose, laboratory studies were carried out to determine the physicochemical characteristics of the feedstock. Samples of oil sludge obtained from Bukhara oil refinery were used as material for extraction of organic fraction. Analysis of oil sludge composition showed that they contain a significant amount of petroleum products, mainly consisting of heavy oil fractions. Based on the studies of group composition and physicochemical properties it was found that oil sludge from Bukhara oil refinery is a promising raw material for the isolation of the organic component.

Key words: oil products, oil sludge, mechanical impurities, colloidal system, dyna and starka, soxhlet.

Annotatsiya. Ushbu maqolada neft loyidagi mexanik aralashmalar, suv miqdori va organik komponentlar, shuningdek ularni tahlil qilish usullari ko'rib chiqiladi. Organik kislotalar miqdorini o'rganishga alohida e'tibor beriladi. Buning uchun xom ashyoning fizik-kimyoviy xususiyatlarini aniqlash bo'yicha laboratoriya tadqiqotlari o'tkazildi. Organik fraksiyani ajratib olish uchun Buxoro neftni qayta ishlash zavodidan olingan neft loyining namunalari ishlatilgan. Neft loylari tarkibini tahlil qilish shuni ko'rsatdiki, ular tarkibida asosan og'ir neft fraktsiyalaridan iborat bo'lgan neft mahsulotlarining katta miqdori mavjud. Guruh tarkibi va fizik-kimyoviy xossalarini o‘rganish asosida Buxoro neftni qayta ishlash zavodidagi neft loylari organik komponentni ajratib olish uchun istiqbolli xom ashyo ekanligi aniqlandi.

Kalit so'zlar: neft mahsulotlari, neft loylari, mexanik aralashmalar, kolloid tizim, dyna va starka, soxlet.

Аннотация. В данной статье рассматриваются механические примеси, содержание воды и органических компонентов в нефтешламах, а также методы их анализа. Особое внимание уделено изучению количества

органических кислот. С этой целью были проведены лабораторные исследования для определения физико-химических характеристик исходного сырья. В качестве материала для выделения органической фракции были использованы образцы нефтешлама, полученного с Бухарского нефтеперерабатывающего завода. Анализ состава нефтешламов показал, что они содержат значительное количество нефтепродуктов, в основном состоящих из тяжелых нефтяных фракций. На основании исследований группового состава и физико-химических свойств было установлено, что нефтешлам Бухарского нефтеперерабатывающего завода является перспективным сырьем для выделения органического компонента.
Ключевые слова: нефтепродукты, нефтешламы, механические примеси, коллоидная система, dyna и starka, сокслет.

1. INTRODUCTION.

The problem of utilization of residual products of the oil industry, including oil sludge, is of global importance. Processing of such wastes contributes not only to improving the environmental situation, but also to increasing their economic value. Accurate determination of water and mechanical impurities content plays an important role in the process of separation of organic components from oil sludge. In the conditions of oil reserves reduction the search for alternative sources of hydrocarbon raw materials becomes especially important. In many foreign countries this direction is being actively developed. However, the utilization of various types of organic waste still remains a serious problem. This emphasizes the importance of developing technologies that provide efficient and economically feasible processing of such wastes [1].

Modern oil refineries are significant sources of environmental pollution accompanied by the formation of large volumes of oil sludge [2].

Oil sludge is formed as a result of crude oil settling in tanks, desalting and dehydration of oil at production enterprises, treatment of industrial sewage wastewater, as well as due to the presence of mechanical impurities in natural water entering the enterprises (up to 100 mg/l during floods) [3]. Insufficient efficiency of wastewater treatment and recycling water supply systems at oil refineries leads to the discharge of significant volumes of oil products into sludge reservoirs, although these contaminants should be detained by oil traps [4].

ISSN 3030-3907

Tab. 1

Sources of oil product pollution [5]

Types of contamination	Composition	Sources
Straits	Mixture of petroleum product and soil with water content up to 20%, content of mechanical impurities from 80%.	Extraction and preparation
Spills	Mixture of soil and petroleum product with water content up to 20%. Content of mechanical impurities from 80%.	Transportation
By land		
Pipeline transportation		
By sea transport	Water-in-oil emulsion with water content up to 95%, in case of soil contamination up to 30%, coast up to 80%, oil product up to 20%	
Tank cleaning	Heavy high-viscosity petroleum products with high concentration of heavy metals, sulfur-containing compounds, density >1,	Recycling
Wastewater treatment facilities, (settling ponds and oil sludge reservoirs)	Mixture of soil and petroleum product with water content up to 20%, content of mechanical impurities from 80%.	
Non-recyclable residue (tar, bitumen)	Petroleum product with content of mechanical impurities (rust, metal chips) up to 5 %, emulsified water up to 10 %	

Analysis of research data [6] shows that during processing at oil refineries each thousand tons of oil is formed from 1 to 5 tons of oil sludge. Since the existing technologies of oil waste utilization remain insufficiently effective, the enterprises are forced to accumulate sludge and increase the volume of sludge reservoirs.

Although the qualitative characteristics of oil sludge vary depending on the enterprise, its component composition is usually within the following limits: organic matter is from 10% to 25% of the mass, mechanical impurities - from 5% to 30%, and water content - from 50% to 70% of the mass [7].

The conducted patent and information analysis of foreign sources devoted to methods of neutralization and processing of oily waste allowed to generalize the studied material and present it in Table 2 [8;9,10, 11,12,13].

In addition to the methods of oil sludge utilization indicated in Table 2, there are other methods that are not widely used in the world practice at the

ISSN 3030-3907

moment. They include waste disposal, solidification, distillation with water steam, use of sludge as fertilizer and several other methods [14].

Tab. 2

Comparative characteristics of the main methods of utilization and processing of oily wastes [15].

Variety of method	**Apparatus design**	**Conditions and materials required**	**Limitations of use**
Combustion in furnaces of various types and designs	Furnaces: fluidized bed, fluidized bed; shaft, drum, tube furnaces. Rotary nozzles.	t=800-1200 ºC. Excess oxygen. Water for flue gas cooling.	Low economic efficiency. Environmental insecurity. Increased requirements to equipment operation.
Drying in dryers of various designs	Dryers: belt and shaft dryers with stationary bed of material; drum dryers with semi-weighted bed of material. Blowers.	t=80-100 ºC	High heat consumption
Pyrolysis	Furnaces, plasma reactors, plasma burners.	t=1200 °C	High material and energy costs.
Thermal desorption	Heater, particulate separators, gas separators	t = 480 - 595 “C. Nitrogen ≪cushion≫ to avoid combustion at the thermal stage. Stages: sludge dewatering, hydrocarbon-water stripping, cooling, condensation and stratification	Some metals are vaporized together with hydrocarbons. High capital expenditures and high energy intensity, Increased requirements to fulfill the norms of technological regime.

Oil sludge in its simplest form is a multi-component, stable aggregative physical and chemical systems, dominated by oil products, water and mineral additives (sand, clay, metal oxides, etc.). The main cause of oil sludge formation in tanks is physical and chemical interaction of oil products with moisture, air

ISSN 3030-3907

oxygen, mechanical impurities, as well as with the material of tank walls. In the process of these interactions partial oxidation of oil products with formation of tar-like substances and rusting of tank walls occurs. Simultaneously, the penetration of moisture and mechanical contaminants into the oil product leads to the formation of water-oil emulsions and mineral dispersions. Since each sludge is formed as a result of specific environment and within certain time frames, identical sludges in terms of composition and physical and chemical characteristics do not exist in nature. According to numerous studies, in tank-type oil sludge the ratio of oil products, water and mechanical impurities (sand, clay, rust, etc.) varies widely: hydrocarbons make up from 5% to 90%, water - from 1% to 52%, solid impurities - from 0.8% to 65%. Due to such significant variations in composition, the physical and chemical characteristics of oil sludge also have a wide range. The density of slurries ranges from 830 to 1700 kg/m³, pour point ranges from -30°C to +80°C, and flash point ranges from 35°C to 120°C [16].

2. METHODS AND MATERIALS.

To obtain the organic part, the key aspect is the composition of the feedstock. In this regard, laboratory experiments were conducted to determine the physicochemical properties of the feedstock. As a raw material for the extraction of the organic part were chosen samples of oil sludge brought from the Bukhara oil refinery.

Determination of water content. A series of experiments were conducted to determine the amount of water by the method of Dean and Stark. The experiment lasted for 45 minutes. The condensed solvent and water were continuously separated from each other in the trap until the increase in water volume ceased, with the water remaining in the graduated compartment of the trap and the solvent returned to the distillation vessel. The sample was thoroughly mixed by shaking in the vial for 5 min. High viscosity products were preheated to 40-500 C. From the stirred sample, a 100g sample was taken into a clean dry sample. The pre-weighed glass flask was then poured 100ml of solvent into the flask and the contents were stirred. Several glass capillaries or several pieces of pumice or porcelain were thrown into the flask for uniform boiling. The flask was attached to the outlet tube of the receiver-trap by means of a slurry, and the refrigerator was attached to the upper part of the receiver-trap on the slurry, the receiver-trap and the refrigerator should be clean and dry. To avoid condensation of water vapor and air, the upper end of the refrigerator should be covered with absorbent cotton. The contents of the flask were heated with an electric stove. The distillation was carried out in such a way that 2-4 drops per second fell from the tube of the refrigerator into the receiver - trap. Heating was stopped when the volume of water

ISSN 3030-3907

in the receiver-trap stopped increasing and the upper layer of solvent became completely transparent. After the test product had cooled to room temperature, the device was disassembled. If the amount of water in the receiver - trap is not more than 0.3 ml and the solvent is cloudy, then the receiver is placed for 20-30 minutes in hot water to clarify and again cooled to room temperature. After cooling, the volume of water in the receiver-trap was determined with an accuracy of one upper division [17].

Mass fraction of water V_{weight}, %, was calculated according to the formula [18]:

$$V\text{weight} = \left[\frac{100 \cdot V}{G}\right] = \frac{100 \cdot 0{,}1}{100} = 0{,}1\% \quad ,(1)$$

where V is the volume of water collected in the receiver - trap, ml; G is a sample of oil sludge taken for testing, g.

In the receiver - trap amount of water 0.1 ml and less is considered traces. Discrepancies between two parallel determinations of water content shall not exceed one upper division of the water occupied part of the receiver - trap.

Determination of the content of mechanical impurities. Mechanical impurities in the composition of oil sludge negatively affects the quality of the obtained product. We have conducted a series of experiments to determine the content of mechanical impurities in the oil sludge after dilution with oil fractions under stirring for 30÷60 minutes [19].

Mass fraction of mechanical impurities, %, was calculated according to the formula:

$$M = \left[\frac{m_1 - m_2}{m_3}\right] \cdot 100, \quad (2)$$

where m1 - mass of a cup with filter after filtering, g; m2 - mass of a cup with clean filter, g; m3 - mass of oil sample.

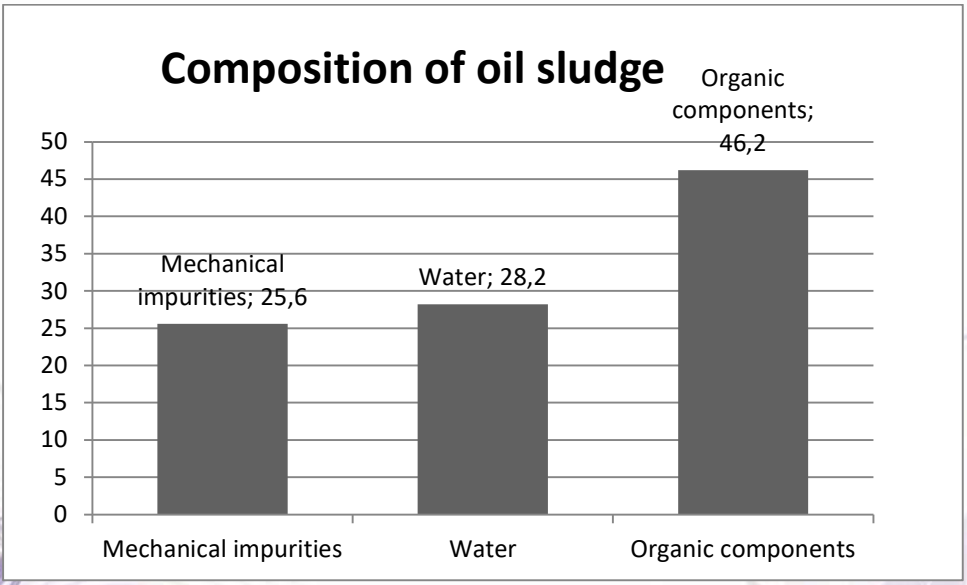
The content of mechanical impurities was calculated as the arithmetic mean of the results of two parallel determinations. If mechanical impurities contained no more than 0.05%, then this case is considered as the absence of mechanical impurities. First of all, the initial content of mechanical impurities in the composition of oil sludge was determined. The paper filter was dried, to constant weight at 105°C. The oil sludge suspension was preheated on a water bath to 40°C, because the analyzed oil sludge was highly viscous. Then a 2 g oil sludge suspension was diluted with 25 g gasoline. The hot solution of the suspension was filtered through a dried paper filter placed in a glass funnel. After filtering, the filter was transferred to a beaker and dried in the thermostat for 1 hour. After drying the beaker was cooled in the desiccator for 30 minutes [20].

ISSN 3030-3907

The content of the mass fraction of mechanical impurities in the oil sludge was determined by extraction of the sludge in a Soxhlet apparatus. The Soxhlet extractor was equipped with a round bottom flask containing the extracting solvent and was provided with a reflux condenser. In the center of the apparatus was a reservoir in which was placed a sleeve made of paper and filled with the solid sample from which the extraction was made. The solvent was heated to boiling point, vaporized and, passing through the side outlet, got into the return refrigerator, where it condensed and flowed into the sleeve. While the sleeve was filled with solvent, extraction of the target substance into this solvent took place. As soon as the liquid level in the sleeve reached the upper level of the siphon, the sleeve was emptied: the solution of the substance was poured into the original flask and the cycle was repeated again. Thus, the device allows for multiple extraction by reusing a relatively small volume of solvent, while the extracted substance accumulates in the main flask. The extraction efficiency is additionally increased due to the fact that the sleeve is located directly above the flask and is heated by vapors of boiling solvent [GOSTu 6370-83].

RESULTS AND DISCUSSION.

The analysis results showed that the mass content of mechanical impurities, water and organic components in the sample is 25.6%, 38.2% and 36.2%, respectively. The presence of salts in the composition of oil sludge causes serious complications during processing, as salts lead to clogging of equipment, especially in hot devices. When water evaporates, dissolved salts are released and some of them crystallize, sticking to surfaces and forming a strong crust on them. The results of the components of the investigated oil sludges are presented in the figure.



Oil sludge is a complex multi-component system containing a large amount of water (28.2%), mechanical impurities (25.6%) and organic part (46.2), which

ISSN 3030-3907

indicates the need for pre-treatment of the organic component before its extraction.

Thus, for the rational use of oil sludge it is necessary to develop technologies that will effectively separate water, mechanical impurities and organic phase, while minimizing hydrocarbon losses and harmful impact on the environment.

Determining the amount of mechanical impurities and water in oil sludge is very important to create opportunities for effective utilization of the organic part of the sludge. Because this process not only ensures clean and high quality sludge processing, but also helps to optimize its energy and resource requirements. Thus, accurate determination of the amount of mechanical impurities and water is necessary to maximize the potential of the oil sludge.

CONCLUSION.

The analysis of oil sludge showed that there are a lot of organic particles in its composition.According to the results of the experiments, it was found that oil sludge contains 28.2% of water and 25.6% of mechanical impurities. It was also found that the sludge contains 46.2% of organic part. In the conditions of reduction of oil products reserves the process of processing of the purified organic part of oil sludge, including separation of water and mechanical impurities, addition to oil and obtaining the necessary products, acquires special relevance. This approach allows not only to increase the efficiency of oil refining, but also to optimize the use of resources and minimize their losses. In addition, processing of the organic part of oil sludge to obtain new oil products plays a significant role in preserving existing reserves and ensuring energy security. Taking into account the limited resources and environmental challenges, this process becomes one of the key areas for sustainable development of the oil industry in the future.

REFERENCE LIST

1. Двоскин Г.И., Гришин А.А., Молчанова И.В. и другие Энергия из отходов // Экология и промышленность России. - 2000. - № 10. – С.15.
2. Пауков А.Н. Разработка технологии переработки нефтяных шламов, промышленных и бытовых отходов. дисс.канд.техн.наук. тюмень. 2010. 147 с.
3. Справочник современных природоохранных процессов/ Нефть, газ и нефтехимия за рубежом, 1994, N10, С. 28.
4. Физико-химические основы технологии строительных материалов: Учебно-методическое пособие / Я.Н. Ковалев. - М.: НИЦ Инфра-М; Мн.: Нов. знание, 2012. - 285 с.
5. Шпербер Д.Р. Разработка ресурсосберегающих технологий переработки нефтешлама. Краснодар, 2014. С. 23-25.

ISSN 3030-3907

6. Расветалов В.А., Брондз Б.И., Тяжкороб Л.А. Физико-химические свойства нефтешламов, активных илов и их смесей // В сборнике научных трудов: Разработки в области защиты окружающей среды. – М.: ЦЫИИТЭ – нефтехим, 1985, с.83-977.
7. Бибиков Г.Г., Бердин Ю.С., Немченко А.Г. Переработка и обезвреживание нефтешламов НПЗ и НХК // В сборнике научных трудов: Современное состояние и методы защиты окружающей среды на нефтеперерабатывающих и сланцеперерабатывающих производствах.- М.:ЦНИИТЭ нефтехим, 1984, с. 52.
8. Бердин Ю. С, Красненко А.Ф. Модернизация центрифуг для разделения нефтяных шламов/ ХТТМ, 1993, N4, с. 16.
9. Минтон Р.К. и др. Система очистки загрязненного нефтью шлама /Нефть, газ и нефтехимия за рубежом, 1992, N4, с.43-47.
10. Аграноник Р.Я. Сгущение и обезвоживание осадков сточных вод на центрифугах. /Технология обработки осадков городских СВ. М, 1985, с.88-97.
11. Тамбурано Ф. Удаление тяжёлых нефтяных остатков/ Нефтегазовые технологии, 1995, № 6, с.47-53.
12. Новые технологии в решении проблем экологической безопасности на НПЗ США/ Экспресс информация, ЦНИИТЭнефтехим, М., 1994, с.34-45.
13. Очистка отходов методом центрифугирования/ Экспресс информация, ЦНИИТЭ нефтехим, М., 1995, с.31-33.
14. Левицкий О.Ю. Опытно-промышленная установка сжигания нефтешлама./ Нефтепереработка и нефтехимия, 1987, 7, с. 11-12.
15. Розенталь Д.А., Корнилова Л.А. Химический состав гудронов смолистых нефтей // Нефтехимия. 1984. Т. 24. N 3. С. 319-325.
16. Нурабаев Б.К. Исследование состава нефтешламов // Вестник КазНТУ им. К.И. Сатпаева. 2010. N 4 (80). С. 229-230.
17. . Imran Hafeez Performance Prediction of Hot Mix Asphalt from Asphalt Binders / Imran Hafeez, Mumtaz Ahmed Kamal, Muhammad Reza Ahadi, Qamar Shahzad, Nadia Bashir// Pak. J. Engg. & Appl. Sci. Vol. 11, July., 2012 - P. 104-113
18. . Хурмаматов А.М., Юсупова Н.К., Хаметов З.М. Битум ишлаб чиқариш жараёнлари гидродинамикасини ўрганиш натижалари// Научно-технический журнал ФерПИ-Фергана, 2021. №1. Том 24.спец.вып. –С. 184-188.
19. . Xurmamatov A.M., Yusupova N. K., Boymirzaev T. T. Intensification of the Bitumen Production Process // IJIAET. International Journal of Innovative

ISSN 3030-3907

Analyses and Emerging Technology. Indonesia. e-ISSN: 2792-4025 | http://openaccessjournals.eu Volume: 1 Issue: 5. –P. 65-69.

20. . Edwards, Y. Effects of commercial waxes on asphalt concrete mixtures performance at low and medium temperatures / Y. Edwards, Y. Tasdemir, U. Isacsson // Cold Regions Sciense and Technology Volume 45, 2006. - P. 31-41.

ISSN 3030-3907