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RESEARCH METHODS OF WATER PURIFICATION FROM POLLUTION WITH PETROLEUM AND PETROLEUM PRODUCTS

[1]Abdumalik Rizaev

ABSTRACT-- *The article deals with the currently existing methods of water purification from petroleum and petroleum products, as well as analysis of the most popular ways to clean up the application of new technologies. The article briefly describes the technology of each method, as well as its main strengths and weaknesses, in particular, the use and quality of water treatment.*

Key word--*Water, flora and fauna, method of liquidation, petroleum and petroleum products, oil-contaminated, oil* ***spills****.*

I. INTRODUCTION

Currently, there is an acute problem of environmental pollution with oil products. This is primarily due to the development of the petroleum industry. The processes of extraction, transportation, processing and disposal are often accompanied by emissions of harmful substances into the atmosphere and oil spills. Thus, petroleum products enter the environment and cause significant environmental damage. All components of the ecosystem are affected: soil, water, atmosphere, flora and fauna. Human life safety is at risk.

The variety of existing methods and the active search for a new technology that allows you to effectively deal with oil pollution and at the same time having low cost, proves the urgency of the existing problem.

II. METHOD OF RESEARCH

At the moment, there are various methods and substances that can deal with oil pollution. All of them have their advantages and disadvantages.

When choosing a method of liquidation of an oil spill that has entered the environment, one must proceed from the following principles:

- carrying out work as soon as possible;
- an oil spill response operation should not cause more environmental damage than the emergency spill itself.

Consider the most popular of them.

Thermal method. It is mainly used for oil spills in the aquatic environment, but compared to other methods it is used much less frequently. For its application, it is necessary that the oil layer is more than 3 mm, otherwise it

[1] *Tashkent Institute of Railway Engineers, Tashkent, Uzbekistan.*

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will not burn due to the cooling effect of water. Another problem with the implementation of this method is that the combustible fractions evaporate quickly enough, which also prevents combustion.

The mechanical method. This method is most effective in the first hours after the spill. The reason for this is the sufficient thickness of the oil layer. Over time, the layer becomes thinner and the area of contamination is larger. In addition, the use of this method is complicated when cleaning the water areas of shipyards and ports. The fact is that such water areas are contaminated with various debris: boards, wood chips and other objects, which prevents the purification of water from oil products [1].

Throughout the world, various modifications of oil collectors are used to eliminate oil spills in the aquatic environment. This technology does not solve the problem completely, since after collection about 30% of petroleum products remain on the water surface. Another negative side of this method is that when collecting petroleum using suction devices, petroleum collectors absorb a significant amount of water, about 40-80%. The collected water contains petroleum products in various states: from floating to emulsified. An additional purification of these waters is required before returning them back to the reservoir, which carries additional costs. Thus, the cost of cleaning a unit of oil-contaminated area increases approximately 2 times. Thus, the use of this technology with an petroleum film thickness of 1-3 mm is not rational [2].

Chemical method. This method allows to achieve water purification from petroleum products up to 95%. This indicator is achieved by adding various reagents to the water that react with oil. Such substances remove oil in the form of sediment. The disadvantage of this method is the possibility of accumulation of petroleum products at the bottom of the reservoir, which leads to secondary pollution of the aquatic environment. Another variation of this method is the use of adsorbents. With the help of them, water purification up to 98% is achieved. The disadvantage of this method is the impossibility of its application for the purification of water bodies of water over the course, for example in rivers. The fact is that to use this method, the volume of water must be limited. Thus, the source of contamination must be localized.

Figure 1: An example of water pollution by petroleum and petroleum products during pumping is shown**.**

Microbiological method. This method is based on the use of petroleum-oxidizing bacteria. With their help, microbiological decomposition of petroleum occurs [3]. Based on the data of microorganisms, a dry powder is made according to a certain technology. In addition to the bacteria themselves, its composition includes biogenic salts necessary for feeding and activating bacteria. The moisture content in this preparation is about 10%. The application of this method is difficult. The reason for this is the slow progress of the process. In addition, the concentration of petroleum products should be sufficiently small.

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Among the advantages of this method, it is necessary to highlight greater efficiency at low concentrations and environmental safety. In addition, this method is economically feasible.

The controlled intensification of hydrocarbon biodegradation through the targeted use of selective oil-oxidizing bacteria is a promising area for the purification of industrial wastewater from impurities of oil products. Based on this, for the use of such biologics containing active microorganisms, it is necessary to develop an effective technology for the use of these drugs[2]. The best result will be achieved only if the technology is strictly implemented during the cleaning process. With the optimal ratio of a consortium of microorganisms and the concentration of biostimulating substances, it is possible to accelerate the biological oxidation of oil pollution by tens and hundreds of times and reduce the residual oil content to the final oxidation products - CO2 and H2O.

Dams. For the localization of oil pollution in soil and water, various types of dams are used. In addition to dams, earthen barns, dams, and also trenches for oil drainage can be used. The use of this or that construction depends on various factors: location on the ground, season, size of pollution and other factors.

Physicochemical (method using sorbents). Currently, this method is recognized as the most effective and safe. The choice of one or another sorbent depends on a number of factors, including the scale of pollution, the stage of purification, the required quality of purification, as well as the state of polluting petroleum products. In this direction, there is an active search for ways to improve the quality of existing substances and the development of new ones. The most promising are natural sorbents and sorbents from plant residues.

In addition to the above traditional methods, new methods and technologies are currently being developed that can effectively deal with oil pollution. Let us dwell on some of them.

The biosorption method allows for deep wastewater treatment from petroleum products contained in them. The principle of this method is the combined use of sorbents and microorganisms. It is based on the adsorption of contaminants from water by activated carbon, biomodification of resistant contaminants in the microporous structure of the sorbent into a biodegradable form, followed by their oxidation by biofilm on the surface of the sorbent.

This method is the most effective for water purification from bioresistant and biodegradable pollutants, such as: petroleum products, nitrogen compounds, organophosphorus and organochlorine compounds and others. This kind of result cannot be achieved using separate use of microbiological and sorption methods[4].

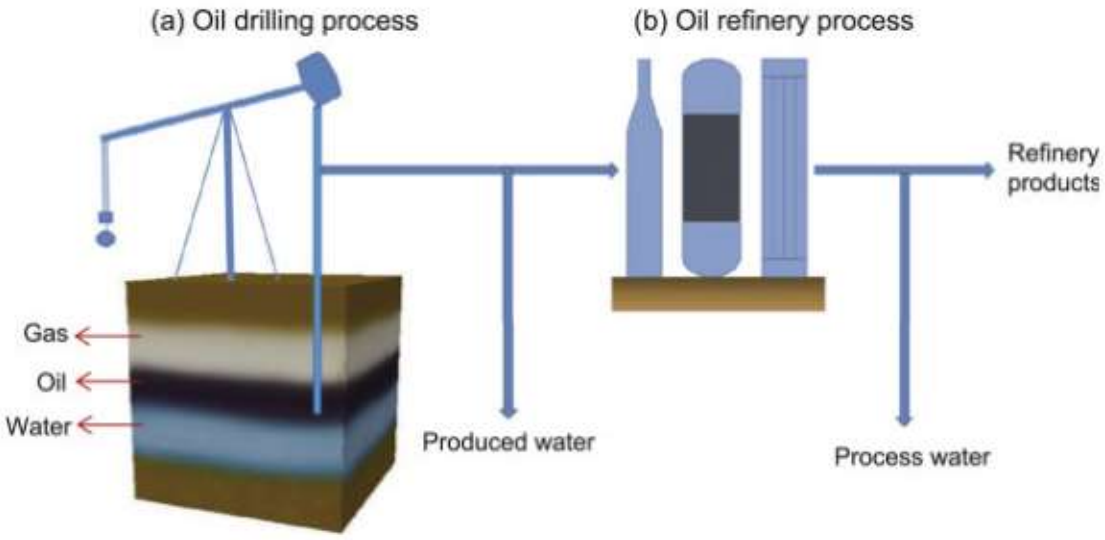

Figure 2: Shows the process of Petroleum getting into the environment.

With the help of magnets. This method is promising for the treatment of wastewater containing petroleum products. Its principle can be used to create local treatment facilities at oil depots, oil refineries, and oil fields. In addition, this technology is applicable to eliminate pollution of water bodies with petroleum products as a result of industrial accidents [6].

The technology of water purification from emulsified and dissolved petroleum products consists in filtering water through several layers of basalt fiber, alternating with layers of a powdered adsorbent - highly active aluminum oxide, characterized in that the water is preliminarily passed through a device with pairwise mounted permanent magnets, providing sequential action of unlike poles on water.

Ozonation of water. This method is one of the new developments in the field of water purification from petroleum pollution. Purification of pre-filtered water takes place in two stages. As a result, the content of dissolved hydrocarbons and suspended solids is significantly reduced in it.

In special tanks, a mixture of ozone and air comes into contact with water. Part of the ozone that has not reacted is eliminated and decomposed. This method of treating wastewater contaminated with petroleum products allows not only to get rid of hydrocarbons, but also to improve their organoleptic properties [7].

The essence of the method is that phenols and derivatives derived from them, contained in petroleum products, are easily oxidized and neutralized by ozone. During oxidation, phenols break down into carbon dioxide and water. Industrial wastewater contains various pollutants, most of which can be eliminated with ozone. As a result of foreign studies, it was found that ozone treatment provides water purification by 80 percent or more, and the best effect is achieved with combined treatment.

Cleaning by flotation-cavitation method. Wastewater treatment using this method from organic pollutants is quite widespread in various industrial sectors. The reason for this is a fairly simple cleaning technology and the availability of reagents used. But this method has a significant drawback - low quality cleaning.

To improve the quality of wastewater treatment, the use of adsorption methods is possible. The disadvantage of using this method is the increase in the cost of the process. To achieve deep water purification from oil products contained in them, cavitation phenomena occurring during the operation of high pressure pumps of pressure

flotation units are used. When these phenomena occur, the organic substances contained in the waters are destroyed [8]. Thus, the application of this method of purification of oily wastewater of industrial enterprises is appropriate. Purification using magnetic nanoparticles. Currently, abroad, a method based on the use of magnetic nanoparticles has received widespread use in the purification of liquid media from various pollutants. The technology is based on the principle of magnetization of petroleum products by adding magnetic fluid to wastewater and the subsequent separation of magnetized petroleum products by special magnetic separators. In the process of wastewater treatment from oil products by the proposed method, the force interaction of a magnetic fluid and an inhomogeneous magnetic field is used. Magnetic fluid is added to contaminated water, after intensive mixing of the mixture, droplets of magnetic fluid dissolve in contaminants, which become weakly magnetic. The resulting emulsion is passed through an inhomogeneous magnetic field and magnetic droplets are removed, thus reducing the oil content in water. Nanotechnology will allow in the future to solve the key problems of civilization: energy, environmental and food security.

III. CONCLUSION

Each of the methods considered has its own advantages and disadvantages. The choice of this or that method depends on a number of factors, such as the scale of pollution, its specificity and economic feasibility. The right choice of one or another cleaning method will reduce environmental damage to the environment, which in turn will affect human health.

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