

Development Of The Method Of Deep Ecological Effective Chemical Treatment Of Industrial Wastewater Generated In The Oil Industry

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The oil industry operates mainly in the areas of oil production and refining. Thus, the extraction, accumulation and initial purification of oil from gas, water, mechanical impurities at various depths, its final preparation and transportation as a commodity raw material, and the production of transportation operations for sale belong to the oil production industry. In the oil refining industry, desalination, dehydration, atmospheric-vacuum distillation, preparation of distillates (fractions) as commodities, storage, supply and sale are carried out.

During the technological processes of oil production and refining, industrial wastewater is obtained, which differs greatly in composition.

During our research, it was determined that the composition of industrial wastewater formed during the preparation of oil as a raw material in oil production is mainly oil with various emulsions (hydrophobic and hydrophilic properties), mainly sulfates, chlorides, the environment is mostly neutral (pH ~ 6.85 - 7.25). Such industrial wastewater mainly belongs to the oil extracted from the oil fields of Neft dashlari, Surakhany and Fikret Amirov oil and gas fields. As the wastewater obtained during the refining of heavy Balakhany oil is very different from the water contained in other oils, research work is underway to treat that water.

That is why during the process of preparation of oils from different fields, which are mainly different in composition, as raw materials, industrial wastes are obtained, which differ in composition.

Separate research is being conducted on the development of new methods in several areas for the deep ecological effective treatment of water samples taken from the treatment of various oils of Azerbaijan, as well as industrial wastewater from refining.

Formed in the production and refining of the oil industry, the resulting industrial effluents contain liquid and gaseous mixtures, as well as oil emulsions, which cause environmental pollution of the atmosphere, lithosphere and especially the hydrosphere in all existing treatment processes.

Therefore, for many years, scientific research on the deeper ecological effective treatment of industrial waste generated at both production facilities of the oil industry has been considered as one of the key issues of the time. Thus, industrial wastewater that is not fully treated, i.e. does not have the advantage of sanitary norms that require higher values than ecological standards, causes long-term environmental problems in the biosphere by these industries.

Due to the low demand for the rate of industrial wastewater (IWW) treatment in the oil industry, we have developed a new chemical method for the deep cleaning of IWW using special reagents, which has the greatest economic and environmental value in the preparation of oil as a raw material.

Using a new ecologically efficient chemical method developed, a deep ecologically efficient treatment of water from oil tanks for storage of crude oil, as well as IWW containing petroleum emulsion was achieved.

As can be seen from the results of previous and ongoing scientific research on the treatment of IWW in the oil industry [1-4], so far no treatment has been carried out by chemical methods that do not affect the quality of crude oil and fully meet environmental safety requirements.

As in the developed oil-producing countries of the world, in Azerbaijan the primary production of oil as a raw material is carried out by mechanical cleaning of water at long intervals, in some cases by heating to some extent, especially by mechanical deposition in tanks. In this case, it is not possible to thoroughly clean the IWW formed, which contains a stable oil emulsion (hydrophilic, hydrophobic

type emulsions). These waters have not been fully purified to 100% in several stages of mechanical, physical-chemical, chemical and biological treatment processes.

Therefore, the mechanical impurities in the oils prepared as a commodity should be 0.05 mg/l, and the maximum amount of water is 10 mg/l, as well as other parameters.

During the cleaning of IWW formed in the oil production industry by the new ecologically effective chemical method developed by us, the amount of oil was ~ 0%, the suspended particulate substances were ~ 0%, and the color was completely transparent. With the new method developed, the IWW was cleaned at a temperature in the range of 5°C to 20°C.

According to the developed method for the purification of oil from IWW samples taken from oil extracting facilities (except for the Balakhany oil extracting facilities), a mixture of hydrocarbon solvents from a solution of coagulant $\text{Me}_x(\text{SO}_4)_y$ - (conditionally labeled K-1) and a fraction of 40-70 °C petroleum ether from a gasoline distillate (conventionally labeled K-2) was used.

A special optimal regime for the use of the conditionally indicated K-1 and K-2 reagents has been developed, and at the same time, scientific researches carried out several times with several comparative reagents.

The following ecologically and economically significant results have been obtained:

The K-1 coagulant is then added to the treated water. Organic layer - the remaining K-2 component in the oil layer does not adversely affect the quality of the oil, as it consists of petroleum hydrocarbon mixtures.

Experiments have also been carried out on the re-use of this mixture, which contains oil and K-2 solvent component, obtained during the cleaning of IWW in oil production by a new environmentally effective chemical method developed by us.

Experimental work was carried out on the reuse of the oil and K-2 mixture obtained during the cleaning of IWW in oil production and refining industries for

the purification of oil in tanks from water, mechanical impurities (during mechanical cleaning by sedimentation) and high results were obtained.

Thus, it can be considered cost-effective to ensure that the K-2 component used in the refining process is used in conjunction with the refined oil for a long time.

According to the results of our study on the ecologically effective cleaning of IWW formed in the oil industry, the application of the new method in industry can be considered scientifically based. Thus, the use of the above mentioned method can be guaranteed for deep ecological and economic significant purification of IWW from water containing oil emulsion, formed in the process of preparation of oil as a raw material (i.e. purification from water, mechanical impurities) in oil extracting facilities of Azerbaijan (except Balakhany oil extracting facilities).

Based on the research conducted by us, the optimal technological mode of the new method has been determined.

The results of the conducted research and the main parameters of the optimal technological regime are shown in Table 1. Table 1 shows the amount of oil in mg/l before and remaining after IWW treatment.

Research work is also ongoing on deep ecologically effective cleaning of IWW samples from the Balakhany oil refinery and a tank for storing heavy Balakhany oil (from the tank at the Boyuk-Shor tank farm at the Heydar Aliyev Oil Refinery).

At the same time, the results of our research on the processing of IWW, which is formed in the oil refining industry and has a very complex composition and characteristics, are higher than IWW obtained in the oil industry.

Analysis of the composition of IWW samples, formed in the oil industry, purified by a new environmentally efficient method, was carried out by well-known chemical methods. At the same time, the amount of organic compounds (petroleum hydrocarbons) remaining in the treated water and well soluble in water was determined by special devices and the spectrum was registered. As can be seen

from the spectrum shown in Figure 1, the purified IWW does not contain up to 100% (0.01-0.02 mg/l) of petroleum hydrocarbons compared to the standards taken for analysis. Thus, after treatment of oil-containing IWW by the new chemical method, despite the large amount salts, mechanical mixtures, etc., the transparency of the water and the purification of crude oil 2-5 times lower up to 100 percent (from sanitary norm), i.e. cleaning to concentration of 0.01-0.02 mg/l was achieved.

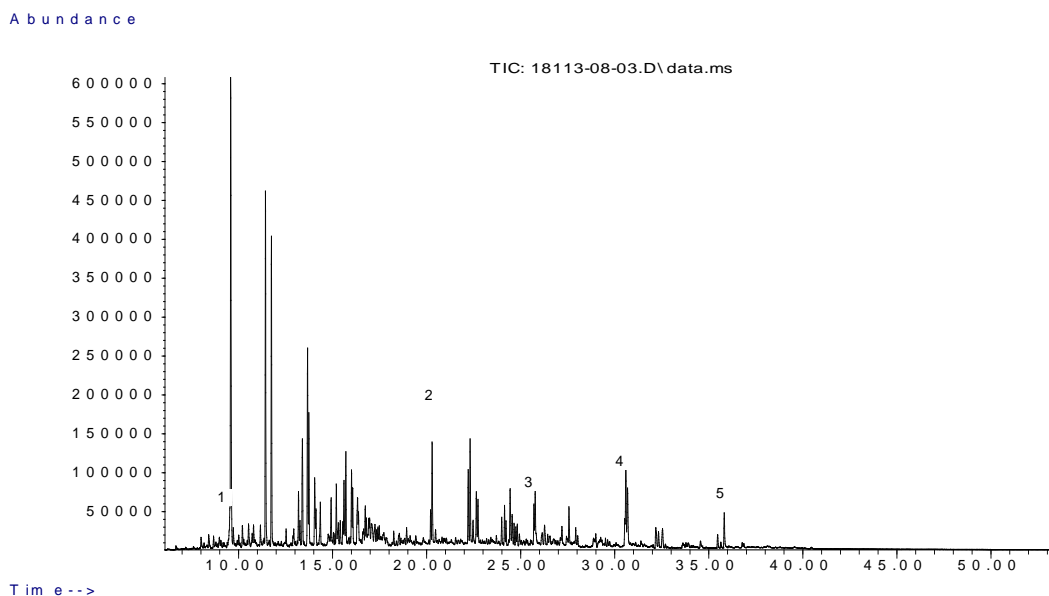
Table 1

Results of the research-method developed for deep ecological effective chemical treatment of IWW samples containing oil formed in the oil production industry

IWW samples										
the name of the source	composition before cleaning				reagents used in the cleaning			composition after cleaning		
	the oil content, mg /l		pH	color	sample amount	5% K-1	K-2, ml	Oil, mg	pH	color
1.Neft daşları	500 - 1000		7.2	with dark turbidity	1 liter	3-5	2-3	0,02	7	Transparent
2.Suraxanı	500 - 1000		2.Suraxanı	2.Suraxanı	1 liter	3-5	2-3	0,01	7	Transparent
F.Amirov			2.Suraxanı	2.Suraxanı	1 liter	3-5	2-3	0,01	7	Transparent

Figure 1. Oil production IWW spectrum

Sample T-X



Peaks of the internal standard:

1. Naftanlin -d8
2. Phenanthrene -d10
3. Pyrene -d10
4. Chrysanthemum -d12
5. Perilen -d12

Depending on the composition of industrial waste waters, generated in the oil and gas processing industry, we have studied the researches on their purification conducted for the last ten years. Based on the research, it was determined that according to the results of research, the mechanical, adsorption, absorption, physicochemical, chemical, thermal, biological and other methods are used for the treatment and neutralization of oil, oil product waste mixture (OPWM), other harmful substances in the IWW formed in the industry.,

As noted elsewhere [1-4], each method developed and used in the oil industry to treat IWW has many shortcomings. Thus, depending on the composition of the IWW formed in the oil industry, the degree of emulsion, the rate of purification, the degree of ecologically effective purification, the ecological safety class of reagents used, the impact on the quality of oil - OPWM and, and finally, in general,

their environmental impact to the biosphere, economic and environmental importance, IWW treatment methods are evaluated.

From this point of view, the new method developed by us is justified to carry out economically and ecologically significant cleaning of IWW formed in the oil production industry containing oil emulsion.

Depending on its composition and characteristics, the same method of purification of IWW formed during the preparation of crude oil, especially Balakhany oil as a raw material, does not have the same efficiency.

According to the results of scientific research, the above method of treatment of up to 100% (i.e. below sanitary norms) of industrial wastewater formed during the production of all types of Azerbaijani oils (except Balakhany heavy and light oils) can be considered scientifically based.

That is why selective components and long-term research to determine the optimal regime are required.

References

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