

## TREATMENT OF RECYCLED WATER OF OIL REFINERIES

Svetlana Israilova

Master's student Ferghana Polytechnic Institute

Khamdamova Shohida Sherzodovna

Doctor of Technical Sciences, Associate Professor of the

Department of "Chemical Technology" of the Ferghana Polytechnic Institute,  
hamdamova79@mail.ru

### ANNOTATION:

**This article provides a brief overview and characteristics of recycled and waste water of oil refineries, methods of their purification and disinfection. Chemical and biochemical processes involving sulfur and its compounds occurring in oil refining recycling systems were studied for further development of engineering solutions for water quality stabilization. It is established that elemental sulfur is the main starting material for the formation of sulfuric acid in the recycling system, which is the cause of an emergency. It is shown that the oxidation of elemental sulfur to sulfuric acid can occur both by chemical means and by means of microorganisms that oxidize sulfur.**

**Keywords: water quality, treatment, biological treatment, contaminating substances, pH-value, circulating water supply.**

### INTRODUCTION:

It is known that the water quality of the circulating systems of industrial enterprises is an important factor determining the stability of the operation of technological installations. Changes in the water quality of recycling systems can lead to the failure of not only oil refineries, but also waste water treatment facilities of enterprises, both local (settling tanks, flotators, etc.), and biological treatment facilities. As a result of the unsatisfactory

quality of recycled water, the cooling agent in the recycling system is replaced. This leads to the removal of huge amounts of various substances, such as iron oxides, suspended solids, sulfates and petroleum products, to local and biological structures [1-5]. Therefore, the most important task of technologists and engineers of water management of oil refineries is to develop a system of measures to maintain a stable quality of recycled water that meets technological requirements.

From the analysis of scientific literature, it is known that improper operation and violation of control over the norms of technological processes, as well as the proper organization of production enterprises due to the slip of pollutants in the water, the following processes are observed: a sharp decrease in the pH of recycled water to 5.0-3.5, which increases its corrosion; an increase in the content of sulfates in recycled water to 500 mg/l, and so on. Lowering the pH in recycled water leads to a sharp intensification of the corrosion process, which is accompanied by a global increase in the content of iron and its oxides in recycled water, respectively, to 3.0-6.0 mg/l (with an average of about 0.4 mg/l) and to 100-110 mg/l (with an average of 2-3 mg/l). The nature of such phenomena in the practice of oil refineries has not been studied and is of great scientific and practical interest, since it is associated with increased corrosion of equipment and pipelines of technological installations, the recycled water supply unit, as well as with a multiple increase in

environmental payments for excess discharge of sulfates and the deterioration of other indicators of industrial wastewater treatment due to the destabilization of the entire treatment cycle. When analyzing the water quality of the recycling systems of plants that process hydrocarbon raw materials containing sulfur compounds, it was revealed that not all enterprises control the content of sulfides and elemental sulfur in the recycled water. Monitoring the concentration of sulfates is insufficient to predict and control complex chemical and biochemical processes involving sulfur and its compounds. Sulfur and its compounds are an extremely significant factor affecting the stability of circulating systems. Insufficient attention to this factor can lead to an emergency situation in the revolving blocks. The existing methods of water quality management of circulating systems only indirectly affect the processes involving sulfur and its compounds, and do not provide the required guarantee of the stability of the working units of oil refineries.

The purpose of our research work was to study the chemical and biochemical processes involving sulfur and its compounds occurring in oil refining recycling systems for the development of engineering solutions for water quality stabilization. To achieve this goal, the following tasks were set: - To analyze the concentrations of various sulfur compounds and other components in recycled water; - To find out the possibility of chemical and biochemical oxidation of colloidal sulfur under the action of oxygen; - to find out the main factors that determine the stability of the water quality of the circulating oil refining systems; - to develop technological measures to stabilize the water quality of the circulating systems.

To study the chemical composition of recycled water, samples were taken at various points of Elou-AVT-2 and ELOU-AVT-3 of the Ferghana Oil Refinery. To study the oxidation

of sulfur and sulfur-containing compounds with dissolved oxygen, an experimental setup was used, as shown in Figure 1.

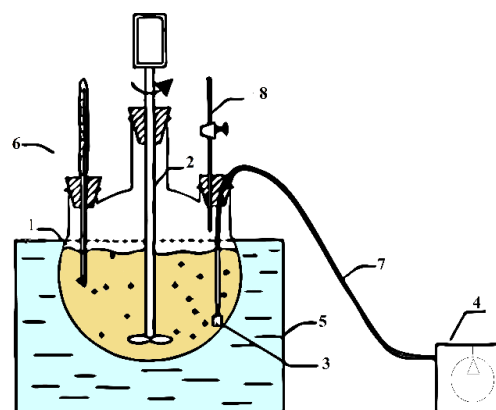


Fig. 1. Laboratory installation for conducting tests for the determination of sulfur and sulfur-containing compounds: 1-three-neck flask, 2-agitator with LATR, 3-bubbler, 4-compressor, 5-thermostat, 6-thermometer, 7-air hose, 8-bypass.

When analyzing the composition of the recycled water of oil refineries in the region, elemental sulfur was found in concentrations up to 40-45 mg/l. In the composition of recycled water, together with iron oxides, there may be elemental sulfur, which, when oxidized, gives the corresponding acid. The amounts of sulfur-containing compounds in water were determined by experiments, the data of which are presented in Table 1.

Table 1. The concentration of sulfates without oxidation and with the oxidation of elemental sulfur in the water supply system.

№	Sample number	pH value	Content, mg/l				
			S <sup>2-</sup>	SO <sub>4</sub> <sup>-2</sup> initial	SO <sub>4</sub> <sup>-2</sup> total	Δ[SO <sub>4</sub> <sup>-2</sup> ]S <sup>0</sup>	Δ[SO <sub>4</sub> <sup>-2</sup> ]S
1	T-1	8,05	2,06	163,00	195,60	6,48	+32,60
2	T-2	7,15	2,04	157,00	178,00	6,12	+21,00
3	T-3	8,00	1,98	136,05	173,40	5,37	+37,35
4	T-4	8,24	2,15	165,60	184,50	6,04	+18,90
5	T-5	8,72	1,73	130,80	241,50	6,71	+110,70

Thus, it is established that elemental sulfur is the main starting material for the formation of sulfuric acid in the recycling system, which is the cause of an emergency. It

is known that in the water of circulating systems there are sulfur-oxidizing microorganisms; TB bacteria Thioparus sp., serobacteria of the genus Beggiatoa sp. and Thiothrix sp. The most common are the TB bacteria Thioparus sp., the number of which varies between 4.5-9.5 cl/ml. It is shown that the oxidation of elemental sulfur to sulfuric acid can occur both by chemical means and by means of sulfur-oxidizing microorganisms. Sulfur-containing organic compounds are oxidized only by biochemical means, similar to the work of the authors. Based on the conducted research, a schematic diagram of the transformations of sulfur and its compounds in the water of circulating oil refining systems has been developed. It is revealed that the ratio of the concentration of elemental sulfur and alkalinity is one of the main factors determining the stability of the circulating systems.

#### REFERENCES:

- 1) Hajdarov F.R., Hiseev R.N. SHajdakov V.V. i dr. Ekologicheskie problemy neftyanoy promyshlennosti. Ufa: OOO «Izdatel'stvo nauchno-tekhnicheskoy literatury «Monografiya», 2005. 190 s.
- 2) Abrosimov A.A. Ekologiya pererabotki uglevodorodnyh sistem / Pod red. d-ra him. nauk, prof. M.YU. Dolomatova, d-ra tekhn. nauk, prof. E.G. Telyasheva. M.: Himiya, 2002. 608 s.
- 3) P.Назирова, С.Таджиев, С.Мирсалимова, Ш.Хамдамова. //Интенсификация процесса получения сложных удобрений из местного сырья//.Монография. отв. ред. Б.С.Закиров. – Уфа: Omega science, 2019, 126 с. <https://www.elibrary.ru/item.asp?id=41588683>
- 4) М.Собиров, Р.Назирова, Ш.Хамдамова, С.Таджиев.//Интенсификация процесса получения комплексных суспендированных удобрений с инсектицидной активностью//. Монография. Фергана-Винница: ОО «Европейская научная платформа», 2020. 137 с. <https://doi.org/10.36074/tad-sob-naz-ham.monograph>
- 5) Икрамов, М., Назирова, Р., Мирсалимова, С., Таджиев, С. //Новые виды суспендированных удобрений на основе местного сырья//. Монография. Фергана-Винница: ОО «Европейская научная платформа», 2020. 123 с. <https://doi.org/10.36074/ik-na-mi-ta.monograph>
- 6) Karelin YA.A., Popova I.A., Evseeva L.A., Evseeva O.YA. Ochistka stochnykh vod neftepererabatyvayushchih zavodov. M.: Strojizdat, 1982. 184 s.
- 7) Beskov V.S., Safronov V.S. Obshchaya himicheskaya tekhnologiya i osnovy promyshlennoy ekologii. M.: Himiya, 1999. 472 s.
- 8) Komissarov YU.A., Gordeev L.S., Nguen Suan Nguen. Analiz i sintez sistem vodoobespecheniya himicheskikh proizvodstv. M.: Himiya, 2002. 496 s.
- 9) ITS 8-2015. Ochistka stochnykh vod pri proizvodstve produktsii (tovarov), vypolnenii rabot i okazanii uslug na krupnykh predpriyatiyah. M.: byuro NTD, 2015. 129 str.
- 10)Nazarov A.V., Bykov D.E., Bykova E.V. Ispol'zovanie kompleksnykh hlорidnykh alyuminijsoderzhashchih sistem v ochistke vysokocvetnykh vod // Tez. dokl. nauch.-tekhnich. konf. posvyashchennoj 100-letiyu Ufimskogo vodoprovoda. - Ufa. - 2001. - S. 99-100.
- 11)Roziqova D.A., Sobirov M.M., Nazirova R.M., Hamdamova Sh.Sh. //Production of nitrogen-phosphorus-potassium fertilizers based on washed hot concentrate, ammonium nitrate and potassium chloride//.Academicia an international

- multidisciplinary research journal. 2020. vol 10. issue 9, September, page 215-220. <https://www.indianjournals.com/ijor.aspx?target=ijor:aca&volume=10&issue=9&article=029>
- 12) Nazirova Rahnamokhon Mukhtarovna, Mirsalimova Saodat Rakhmatzhanovna, Masobirova D, & Khamdamova Shohida Sherzodovna. (2021). CONCENTRATED COMPLEX FERTILIZERS BASED ON LOCAL RAW MATERIALS. European Scholar Journal, 2(2), 71-76. Retrieved from <https://scholarzest.com/index.php/esj/article/view/266>
- 13) Nazirova Rahnamokhon Mukhtarovna, Mirsalimova Saodat Rakhmatzhanovna, Masobirova D, & khamdamova shohida sherzodovna. (2021). CONCENTRATED PHOSPHORUS-CONTAINING FERTILIZERS BASED ON LOCAL RAW MATERIALS. JournalNX - A Multidisciplinary Peer Reviewed Journal, 7(02), 360-365. Retrieved from <https://repo.journalnx.com/index.php/nx/article/view/2506>
- 14) Nazirova Rahnamokhon Mukhtarovna, Mirsalimova Saodat Rakhmatzhanovna, Shamatov Erkin Bahodirovich, & Khamdamova Shohida Sherzodovna. (2021). COMPLEX FERTILIZERS BASED ON LOCAL RAW MATERIALS. JournalNX - A Multidisciplinary Peer Reviewed Journal, 7(04), 14-18. Retrieved from <https://repo.journalnx.com/index.php/nx/article/view/2826>
- 15) Nazirova Rahnamokhon Mukhtarovna, Mirsalimova Saodat Rakhmatzhanovna, Makhmudov Asror Mirzajon ogli, & Khamdamova Shohida Sherzodovna. (2021). DEVELOPMENT OF TECHNOLOGY FOR PRODUCING NP-FERTILIZER BASED ON LOCAL RAW MATERIALS. JournalNX - A Multidisciplinary Peer Reviewed Journal, 7(04), 19-24. Retrieved from <https://repo.journalnx.com/index.php/nx/article/view/2827>
- 16) Atanov N.A., Bykova E.V., Strelkov A.K. Vliyanie sery i ee soedinenij na stabil'nost' raboty oborotnyh sistem neftepererabatyvayushchih zavodov. - M., 2004. - Dep. V VINITI 03.06.2004, No 939-V2004.
- 17) Atanov N.A., Negoda L.L., Bykova E.V., Strelkov A.K., Dyuzhakin M.G., Kuz'mina L.F. Issledovanie vozmozhnosti biohimicheskogo okisleniya sery v oborotnyh sistem neftepererabatyvayushchih zavodov. - M., 2004. - Dep. V VINITI 03.06.2004, No 938-V2004.
- 18) Bykova E.V. Issledovanie vliyaniya sery i ee soedinenij na stabil'nost' raboty oborotnyh sistem v neftepererabotke. Avtoref. diss. kand.tekhn.nauk., Samara 2004, 20 str.
- 19) Назирова Р.М., Таджикиев С.М., Мирсалимова С.Р., Маруфжанов А. //Фосфорно-калийные удобрения на основе камерного суперфосфата// Международный электронный научно-практический журнал «Современные научные исследования и разработки» Изд. «ОЛИМП», 2028. – стр 614-617. <https://www.elibrary.ru/item.asp?id=37033732>