



Systems Clearing Constructions Enterprises of Oil Refining and Petrochemicals the Republic of Bashkortostan at the Present Stage of Planning of Protection Water Resources

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ABSTRACT

The article presents the analysis of technological schemes for sewage purification refineries and petrochemical plants. Shows the approach to the formation of schemes of treatment facilities and wastewater treatment at the present stage of planning of water resources (since 1996). The authors have developed and patented an integrated circuit cleaning heavily polluted wastewater, which can be activated to clear the local shop drains. In order to improve the analysis of effectiveness of environmental measures on oil refining and petrochemical enterprises of the republic developed electronic information databases, which have been introduced and successfully used in scientific research and analytical departments of a number of enterprises of the Republic of Bashkortostan.

Key words: Wastewater, local treatment, sewage treatment, complex purification, refining, petrochemistry.

INTRODUCTION

Republic of Bashkortostan belongs to one of the most industrialized regions of the Russian Federation. The concentration of industrial production in Bashkortostan significantly exceeds the all-Russian figures, especially in the placement of oil refining, chemicals and petrochemicals. Powerful set of chemical, petrochemical and refineries stretched for 270 km along the river Belaya

- from Meleuz to Blagoveshchensk, creating a number of environmental problems can not be solved for decades. In cities such as Ufa, Blagoveshchensk, Salavat, Sterlitamak concentrated chemical, petrochemical and refining industries

Ufa refinery and petrochemical complex includes three oil companies, members of the JSC "Bashneftekhim" - JSC "Ufa Oil Refinery" ("UNPZ")

of "Novo-Ufa refinery" OJSC ("Novoil") and JSC "Ufaneftekhim" as well as plant organic synthesis of "Ufaorgsintez." For total oil refining Ufa refinery is the fifth largest recycling companies in Russia. By the beginning of the current stage of the planning of water resources in the Republic of Bashkortostan is not optimal structure of water. This is due not consistency the interests of various departments, not only in the hydrological regime of water bodies, but also with each other. As a result, found a long preservation of the ecological crisis and economic situations in a number of industrial centers of the republic (Sajfutdinov, 1999).

Tightening of existing environmental legislation, the introduction of new laws for the protection of the environment, rules and regulations, as well as the involvement of the economic mechanisms of nature require new modern approaches to the organization and equipment of water supply, sewerage and wastewater treatment (Nasr, 2010).

The presence of high concentrations in the effluent of various pollutants pose serious difficulties as wastewater treatment, and in the disposal of sludge production. For a more efficient wastewater treatment it is advisable to divide them into streams using local (craft) treatment facilities.

In this regard, the development of an integrated installation of wastewater treatment (local) from difficult-organic compounds and its inclusion on the treatment facilities of various companies is promising and is an important contribution to solving urgent environmental problems.

The work was conducted in accordance with the plan of the Republican target program "Ecology and Natural Resources of the Republic of Bashkortostan (2004 - 2010. And the period up to 2015) " (in red. Decisions of the Government of the Republic of Belarus 1185 of 22.05.2009, approved by Decree of the Government of Belarus 1317 from 29.12.2003, approved. Decree of the President of the Republic of Bashkortostan number UP-103 from 18.02.2004 city).

METHOD

Particularly relevant issue further reduce drainage for areas with a high concentration of refineries, such as the Ufa refinery, one of the largest not only in Russia but also in Europe. Currently, the Ufa industrial center created powerful systems water, sewage and wastewater treatment. However, these systems were built at different times to address the environmental challenges of nature protection, arising at each plant, without reference to common problems in general. As a result, has not yet been achieved indicators of quality of wastewater discharged into the river Belaya, satisfying the requirements of maximum permissible discharges (MPD).

For discharges into water bodies refining and petrochemical industry of the Republic ranks second among other industries, and is thus a powerful polluter. On average, 1 m³ of insufficiently treated wastewater in industrial production makes unusable 10 - 50 m³ of water from surface sources. (Mittal, 2011) Significant discharge of pollutants into the environment with wastewater associated primarily with the inefficiency of treatment plants, or their absence.

Today the refinery are promising schemes of water supply, sewerage and wastewater treatment, developed by the Institute for Oil Refining Academy of Sciences of the Republic of Bashkortostan, as well as complex scheme - at the Ufa refinery, based on the use of modern technologies of wastewater treatment in sealed vehicles. This allows the output sinks, the quality of the relevant regulatory requirements; cut 1.5 times the emissions of harmful substances into the atmosphere, 2.5 times for wastewater treatment area. In integrated circuit construction used aftertreatment of biosorption including filtration units, biosorption, preparation and loading of the sorbent capacity structures with 2000 m³ / h. (Bagajewicz, 2000).

Sealed purification systems are applicable not only to the refinery, but also for the local treatment facilities in various industries and all

enterprises with oily waste water in any amount. Shelf sedimentation and turbidflotatory different sizes, depending on the amount of treated wastewater produced by the domestic industry and staffed on-site (Kupzov *et al.*, 2003).

Remains a pressing problem of disposal of oily sludge, as currently used methods are focused on recycling its light fraction and bottom continues to pile up. One option for disposal of bottom sludge may be their concentration and then stored to the development of methods that provide the desired product in accordance with the requirements of regulatory agencies for the protection of the environment (Smirnov and Mironova, 2001).

RESULTS

Looking to the future, it may be noted that the oil industry will be qualitative deterioration of the raw material base of the industry.

However, in the petroleum industry of Bashkortostan retained a steady increase in the depth of primary oil refining - today it reaches 75-80%. Oil produced in the country for quality and environmental component are consistent with European standards (IA "Bashinform", 2004).

Adopted earlier refinery modernization program in 1993-1995. is poor: the development of capital investments amounted to about 22% of the stipulated. As a result of the planned construction of 35 objects were put into operation only 10, in particular: a complex catalytic cracking unit G-43-107M at the Ufa refinery and production of benzene in Salavat Refinery (Chernysh, 1997).

A new concept of development of oil refining in Russia, based on the rational distribution of updated refinery division for export and domestic consumption, means the creation of a new structure significantly refining, is fundamentally different from the existing.

The studies (CSR, 2002; Mastepanov, 2002) in this area have shown the feasibility of building in Russia seven new refineries with total capacity of 21-29 million tons of oil, the

reconstruction of six plants with reduced power and maintaining the level of processing at the level of 1994 to 14 plants. Implementation of this strategy will significantly reduce range transport of petroleum products to markets, improve the quality of petroleum products and to increase the export of petroleum products by ship.

Reconstruction has touched and refineries of the Republic of Bashkortostan, which in turn should lead to reduction of water consumption, and, consequently, improve the ecological situation in the region.

Today in the republic much is being done to improve the environmental situation (Malmygin, 2006). Improve the environmental situation in the Republic due to the introduction:

- a) Local (craft) of wastewater treatment plants and gas emissions (Filippov *et al.*, 2003; Zinov'ev *et al.*, 2000);
- b) Methods of complex wastewater treatment (Zinov'ev *et al.*, 2001);
- c) After treatment systems sewage treatment plants after the works general;
- d) New methods and technologies for waste disposal from pits and tailings pond (Eldyshev, 2004).

Wastewater petrochemical plants contain significant amounts of organic impurities (oil and oil products, phenols, surfactants) and other compounds. They are characterized by high chemical oxygen demand, toxicity due to the presence of surfactants and phenolic compounds (Abdelwahab *et al.*, 2009). Therefore, prior to discharge of such waters for general treatment facilities require pre-treatment to the local installation.

DISCUSSION

The authors (Zinov'ev and Filippov, 2003) have developed a local sewage treatment plant containing high surfactant concentrations (up to 1000 mg / L), oil (up to 5000mg / l) and the phenols (to 1000mg / l).

The scheme works as follows. The wastewater from the plant or craft comes on sand

trap, where exempt from mechanical impurities. Then, bypassing intermediate tank is fed to ozone flotation. This process proceeds in the device with mechanical dispersion of ozone-air mixture produced by the high-ozone treatment plants in Russia. As a result, the concentration of oil decreases by 90% surfactant - 40-60% phenol and 60% depending on their initial concentration. Was further purified through water enters the intermediate tank with the loading capacity of carbon nanotubes, which is almost completely freed from surfactant and phenolic compounds. Thus purified waste water via an intermediate tank is fed to microbial advanced treatment in the aeration tank, aero, and then enters the general factory wastewater treatment plant. The aeration in the aeration tank by means of dispersed air supplied by the compressor.

The precipitate from the sand trap is discharged and sent to the destination. The precipitate from the intermediate tanks and flotation sludge go to seal the common treatment facilities. Formed in the flotation foam machine enters the skimmer cup leads through splashing-system centrifugal type.

In the proposed scheme, the local wastewater treatment provided additional elements that enable you to process with salvo emissions petrochemical pollution without causing any damage to the environment.

When predicting or determining salvo emission of petrochemical components, developed scheme provides a path that is completed, depending on the components of the discharge capacity to supply: aluminum sulfate; milk of lime; enzyme preparation; vermiculite; hydrogen peroxide, and the filter material "SINTAPEKS" (Samoylov *et al.*, 1999).

Wastewater filtration past contain no more than 25 mg / l of oil (for any volumetric feed rate of waste water) and can be discharged to public sewage treatment plants, even without prior purification microbial.

The calculation of the efficiency of the implementation of an integrated installation of sewage treatment from difficult-organic compounds

in the territory of "Ufaneftekhim" showed that the introduction of the proposed facility is not only socially efficient, but also economically justified.

To ensure the effectiveness of the analysis work performed at refineries and petrochemical RB authors have developed an electronic information database that allows you to trace the development of the technological chain of selected companies - objects of study

For a visual representation of the database used interconnected Web-pages, which are used to create hypertext markup language HTML (Hypertext Markup Language). Database structure can be described in four basic steps:

- a) Step 1 Home Page database. Opened by running the Index.htm. The page contains the names of the enterprises of oil refining and petrochemical complex Bashkiria listed in the database;
- b) Step 2: Opening page with information about a particular company. Produced by clicking the mouse on the selected company. In the window that displays the name of the company, the image of the company, below is a brief description and, finally, the left-hand side allows you to get information on years of development;
- c) Step 3. Viewing information data. Produced by clicking the mouse on the selected year. Table includes complete information on each specific installation equipment. In that case no details may not be represented as a table, a window, designed in the free style. In both cases, work hypertext links you can use to view the flowsheet of installation;
- d) Step 4: Review the installation information. Clicking on a hypertext link get detailed information about the installation (schematic and flow diagram and description to it).

Further development of the analysis of the effectiveness of environmental monitoring at refineries and petrochemical republic associated with the development of two electronic databases:

- a) Database of research carried out and search operations aimed at developing and implementing systems (methods) of water protection purpose at refineries and

- petrochemical Bashkiria;
- b) Database introduction of the water protection measures appointment to refineries and petrochemical plants in Bashkortostan.

Integrated use of the developed electronic information database enables an analysis of efficiency implementation of environmental measures, which creates conditions for the development of corrective actions, as well as the development of proposals and implementation of local treatment and disposal of wastewater at refineries and petrochemical industry of the Republic of Bashkortostan.

Developed electronic information database already implemented and successfully used in scientific research and analytical departments of a number of enterprises of the Republic of Bashkortostan.

CONCLUSION

The scheme of the local sewage treatment petrochemical plants to reduce the concentration of basic components: oil up 0 - 7 mg / l, phenols - 0 - 0.2 mg / l and a surfactant - 0 - 0,002 mg / l.

For the first time as a result of the experiments established the following laws:

- a) To intensify the process of purification of wastewater difficult-matched optimum composition ratio of the components in the granular sponge - carbon nanotube in a ratio of 80:20 wt.%, which was used as feed to the catalytic reactor developed plant;
- b) Found that the use of a modified enzymatic method for the purification of waste water from the phenolic compounds can effectively use it with increasing the initial concentration of phenols, increasing in proportion to the degree of purification of initial contamination.

These patterns were taken into account in the development of an integrated installation of sewage treatment from difficult-organic compounds.

- a) Mathematical processing of the experimental data by the method of experimental design will bring the adequate

mathematical model, which has the form of a polynomial of the first degree 2^8 , which was the basis of software for forecasting the results of a comprehensive installation of sewage treatment from difficult-organic compounds.

- b) Conducted experimental-industrial testing of a pilot plant at the site of treatment facilities of "Ufaorgsintez" and a number of other enterprises of the Republic of Bashkortostan. It is shown that the introduction of the unit, based on the use of the patented method of cleaning dirty water, makes it possible to recycle and reuse products extracted from wastewater treatment, to minimize the intake of highly concentrated wastewater treatment facilities to the general.

According to the results of research for JSC "Ufaneftekhim" was calculated expected annual prevented environmental damage (social benefits), which amounted to more than 1.2 million rub/year. Expected annual net economic effect of the installation on the same companies with the capital and operating costs amounted to more than 5.2 million rub/year.

In order to predict the results of the installation of complex cleaning of local wastewater management decisions technological mode of treatment, as well as the study of the theoretical foundations of the process, developed a software application "Model 2000".

First developed electronic information database:

- a) Development of technological processes at refineries and petrochemical Bashkortostan;
- b) On the introduction of the complex of measures of water protection purpose at refineries and petrochemical Bashkortostan;
- c) Of carrying out scientific research and prospecting for oil refining and petrochemical enterprises of Bashkortostan.

Databases allow for storage and processing of information on the development of technological chains in enterprises, as well as monitoring of the enterprises of the Republic of Bashkortostan, which makes it possible to develop,

propose and implement a system of local treatment and disposal of sewage of oil refining and petrochemistry.

Developed electronic information databases are used:

- Management of Technological and Environmental Supervision Rostehnadzora the Republic of Bashkortostan for operational control over timely implementation of environmental activities at the enterprises of petrochemical processing of the Republic of Bashkortostan;

- a) SUE "Experimental Plant of Academy of Sciences Republic of Bashkortostan" for a more complete understanding of the historical development of the oil refining and petrochemical enterprises Republic of Bashkortostan, the formation processes and the formation of promising findings for their further development;
- b) LLC "Bashhimprom" for aspects of the formation processes and the implementation of timely forecasts of possible changes in supply and demand in the market of the Republic of petrochemical products;
- c) LLC "NT-Center" to significantly reduce the processing time of a priori information, increasing the depth and quality of study material;
- d) Engineering and Innovation Association "Environmental Program of the Republic of Bashkortostan" in the joint implementation of national programs of water protection purposes.

Annual expected economic effect from the introduction of an integrated electronic information database on these enterprises is not less than 3 mln rubles.

Tried and tested and systematic research materials adopted for use:

- a) JSC "Caustic" in the preparation of the project of modernization of treatment facilities;
- b) JSC "Ufaorgsintez" in the development of activities in the field of wastewater treatment and their introduction to the process of mechanical wastewater treatment and preparation of waste to a transfer to the advanced treatment in JSC "Ufaneftekhim";
- c) LLC "Spetssservisremont" in the execution of projects of water protection activities destination, as well as planning the reconstruction process plants other productions of "Ufaneftekhim. "

Today, the republic among the subjects of the federation ranked eighth on emissions, and on discharge of contaminated water - the seventeenth. In Bashkortostan are still many environmental problems, but in recent years the environment has been improving steadily and a small contribution to the implementation of this has a range of environmental activities at the Bashkir refineries and petrochemical plants.

In recent years, significantly improve the quality of wastewater treatment in refineries, which is due to the commissioning of mechanical, physical, chemical and biochemical treatment facilities. Marked reduction in the discharge of polluted and mechanically treated wastewater and increase of biochemically purified.

The refinery has reserves in the further reduction in wastewater pollution while increasing their degree of purification. One of the largest reserves is the elimination of conditionally clean wastewater and return of biologically treated wastewater sewerage system in the first circulating water system.

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