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POLLUTION OF THE IRTYSH RIVER BY OIL WASTE WITHIN THE CITY OF PAVLODAR

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Abstract. The water economy of the north-east of Kazakhstan, which includes the East Kazakhstan and Pavlodar regions, is based mainly on the use of the flow of the rivers of the Irtysh basin. Intensive anthropogenic impact worsens the ecological condition of the Irtysh by increasing

the discharge of untreated water by industrial enterprises. Since the river is of economic importance, maintaining its ecological condition is an urgent task. The results of this work reflect the acuteness of the issue of the influence of anthropogenic factors on p. Irtysh is located within the Pavlodar region. The analysis of the ecological situation in the Irtysh basin in recent years is given. It is noted that an increase in anthropogenic impact will lead to a change in the water balance in the Irtysh River basin.

Keywords: environment, petroleum products, industrial enterprises, anthropogenic impact

The territory of Pavlodar region is located in the north-eastern part of Kazakhstan in the basin of the middle course of the Irtysh River, which stretches for 720 km within the region. The Irtysh River is a vital cross-border artery not only for the Pavlodar region, but also for the whole of Kazakhstan and part of the Eurasian region. This is the largest river in the Republic of Kazakhstan, which provides the population, industry and agriculture with water not only within its basin, but also a huge territory of low-water Central Kazakhstan through the K. Satpayev Canal. Thus, from the water r. Irtysh depends on the life of a large industrial region of Kazakhstan, which includes three regions of the republic - East Kazakhstan, Pavlodar and Karaganda, with a total area of more than 836 thousand km2 and a population of more than 4 million people, which is about a quarter of the population of the whole country [1].

The ecological condition of the Irtysh is deteriorating due to an increase in the discharge of untreated water by enterprises. A large amount of petroleum products, phenols, and synthetically activated substances gets into wastewater. Only on the territory of Kazakhstan 53 large enterprises discharge 260 million m3 of wastewater into the Irtysh. The total load on the aquatic ecosystem in the Pavlodar region already exceeds the available water resources by 21% and is about 30 km3/year, 19.0 km3 /year falls on the share of mandatory navigable releases in the lower reaches, 6.6 km3 - on the share of agriculture and 4.4 km3 - on the share of industrial water supply. Environmentally problematic enterprises: «PTEC-2» LLP, «PTEC-3» LLP, «Pavlodar Petrochemical Plant» LLP (production belongs to the I hazard category), «Pavlodar Chemical Plant» JSC, «Aluminum of Kazakhstan» JSC (PAZ), «Machine-Building Plant» JSC, treatment facilities of the City Water Utility [2].

Substances polluting natural waters include petroleum products, various oils, metal corrosion products, salts, chemicals, the quantitative and qualitative composition of which may vary depending on the time of year, weather conditions. Petroleum products have a negative impact on aquatic ecosystems: for the death of most river fish, a concentration of 0.01 mg of petroleum products per 1 liter of fresh water is sufficient. Due to the special importance of the surface layer of the hydrosphere in the production of aquatic flora and fauna, water pollution with oil and petroleum products causes damage exceeding other types of impact on nature, forming a film, they reduce oxygen access to the water surface, reducing evaporation from its surface by 60%.

The total impact of petroleum products on the hydrosphere can be divided into 5 categories: direct poisoning with a fatal outcome, serious violations of physiological activity, the effect of direct enveloping of a living organism with petroleum products, painful changes caused by the introduction of hydrocarbons into the body, as well as changes in the biological features of the habitat [3].

In the current situation, monitoring the state of the Irtysh ecosystem and the quality of its waters is a very important task. Currently, environmental monitoring and control of water quality is carried out in the RSE "Kazhydromet" mainly by chemical indicators.

The network of observations of the quality of surface waters of the land includes the existing hydro posts of the National Hydrometeorological service. The main criteria for water quality according to hydrochemical indicators are the values of the maximum permissible concentrations (MPC) of pollutants for reservoirs of fishery water use, and the level of pollution of surface waters of the land is estimated by the value of the complex index of water pollution (IZV), which is used to compare and identify the dynamics of changes in water quality. The value of IZV for R.The Irtysh within Pavlodar and the Pavlodar region is equal to an average of 1.44, which makes it possible to characterize the Irtysh River as a reservoir of the 3rd class of water quality –

"moderately polluted". [4].

The study was conducted for the summer period of 2021. 9 samples were selected for research, three samples for each month, within the city of Pavlodar from three points:

- River Station
- River port
- Near the industrial area ("PNHZ" LLP)

The determination of petroleum products in water was investigated by the fluorimetric method. The fluorimetric method for monitoring the content of petroleum products in waters is based on the extraction of petroleum products with hexane, purification of the extract, if necessary, followed by measurement of the fluorescence intensity of the extract resulting from optical excitation. This method is characterized by small volumes of the analyzed sample, the absence of significant interfering effects of lipids and high sensitivity [5].

Table 1. The content of oil products in the studied samples

Gathering place	MPC mg/dm3	June	July	August
River Station	0,05	0,02	0,03	0,02
River port	0,05	0, 07	0,09	0, 07
Near the industrial area ("PNHZ" LLP)	0,05	0,09	0,08	0,09

Based on the results obtained, it can be noted that at the point of research of the river station, the level of oil products does not exceed the norm for three months. The results vary from 0.02 to 0.03 mg/dm3. Compared to the river station, the samples obtained at the point of the river port exceed the MPC level for three months - 0.07, 0.09, 0.07, therefore, the activity of steamships and boat transport is harmful to the aquatic environment. A high level of contamination was detected from samples obtained near the industrial area (PPCR LLP). All three samples exceeded the MPC and amounted to 0.09 in June, 0.08 in July and 0.09 in August, which indicates a significant influence of industry on the composition of the water of the Irtysh River.

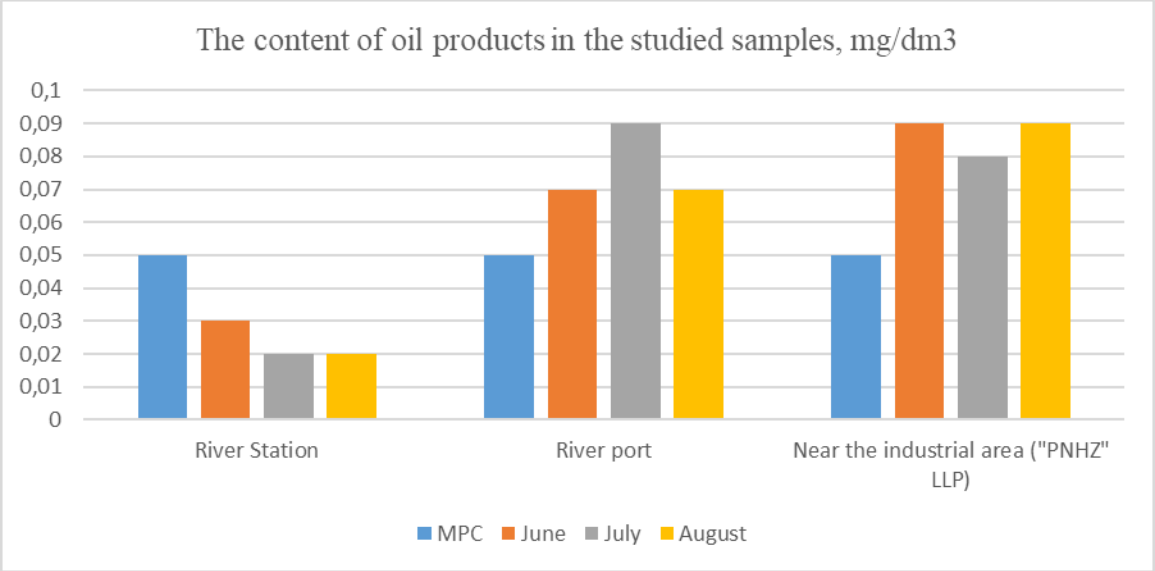

Chart 1. The content of oil products in the studied samples, mg/dm3

In connection with the picture obtained, the problem of oil pollution of the Irtysh River is relevant and requires intervention. To date, there are a number of ways to clean rivers from oil products.

Table 2. Comparative analysis of cleaning methods [6]

Method	Pros	Cons
Mechanical	One of the main methods of oil spill response. The greatest efficiency is achieved in the first hours after the accident, when the oil lies in a thick layer on the surface of the water.	Oil collection is difficult with a small layer thickness, a large spill area and the movement of water under the influence of wind
Chemical	The degree of purification of water from oil can reach 98%. The method is used if mechanical collection is not possible.	The method is applicable for cleaning a limited amount of water
Physico-chemical	The application of the method accelerates the processes of destruction of oil and weakens its toxic effects. When applying activated carbon powder, the stain immediately stops spreading.	Collecting "dirty" powder is a difficult and time-consuming job, polluting ships and harmful to people. Destruction of the collected mass by incineration pollutes the environment
Biological	Among all the methods, it plays the biggest role. Special bacteria feed on oil, quickly penetrate into its layer and restore air access. Microorganisms are non-toxic, work equally well in fresh and salt water.	It is not always clear what side effects on the ecosystem should be

As can be seen from the table, all methods have both their pros and cons. The conducted research allows us to conclude that each method is applicable depending on the specific emergency situation. In my opinion, the most safe and effective is the biological method of purification. The ideal would be to create a method that combines all these advantages. For example, scientists have developed a powder based on activated carbon containing microorganisms-bacteria on its surface. With this method of purification, oil is simultaneously collected by powder and processed by bacteria [6].

Conclusion. In conclusion, I would like to note that according to the results of the data obtained, pollution of the Irtysh River with petroleum products is observed. Based on the results obtained, it can be noted that at the point of research of the river station, the level of oil products does not exceed the norm for three months. The results vary from 0.02 to 0.03 mg/dm3. Compared to the river station, the samples obtained at the point of the river port exceed the MPC level for three months - 0.07, 0.09, 0.07, therefore, the activity of steamships and boat transport is harmful to the aquatic environment. A high level of contamination was detected from samples obtained near the industrial area (PPCR LLP). All three samples exceeded the MPC and amounted to 0.09 in June, 0.08 in July and 0.09 in August, which indicates a significant influence of industry on the composition of the water of the Irtysh River.

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