SOIL POLLUTION LEVELS AROUND THE SHURTAN OIL AND GAS UNITARY BRANCH ENTERPRISE

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Annotation This article analyzes the levels of pollution of soils around the Shurtan Oil and Gas Unitary Subsidiary Enterprise (NGSK) as a result of industrial activities. Based on literature and monitoring data, the concentrations of petroleum products and heavy metals (Pb, Cd, Zn), soil pH and salinity in zonal soils at distances of 1 km, 3 km and 5 km were studied. The analysis results show that the ecological risk is high in zones close to the industry. The article provides recommendations on the changing properties of the soil, sources of pollution and necessary environmental measures. The results of the study justify the need to introduce ecological monitoring and bioremediation technologies in the Shurtan region.

Keywords: Shurtan NGSK, soil pollution, petroleum products, heavy metals, environmental monitoring, bioremediation.

INTRODUCTION The environmental situation in the industrialized regions of the Republic of Uzbekistan, especially in areas with developed gas and oil production sectors, is becoming a serious problem today. In particular, the ecological environment around the Shurtan Oil and Gas Unitary Subsidiary Enterprise (NGSK), located in the Shurtan region of the Kashkadarya region, is significantly damaged by human activity, especially soil resources. During the activities of the oil and gas industry, many harmful substances are released into the air, water, and, above all, into the soil.

Soil pollution, especially its saturation with oil products and heavy metals (lead, cadmium, zinc), has a serious impact on the agroecosystem. This, in turn, leads to a decrease in the quality and productivity of agricultural products. Some studies

conducted in the Shurtan region today indicate the presence of soil pollution in this area. This article discusses the levels of pollution of soils around the Shurtan NGSK due to the oil industry, the main polluting components, and their negative impact on soil properties based on a literature analysis. The main purpose of the article is to study the ecological state of soils around the Shurtan region and assess them based on pollution criteria.

MATERIALS AND METHODS This scientific article was prepared in an analytical and theoretical direction, and the main sources were official information from the Ministry of Ecology, Environmental Protection and Climate Change of the Republic of Uzbekistan, environmental observations conducted at the Shurtan gas and chemical industrial complex, as well as information from local and foreign scientific articles.

The following indicators were taken as a basis for assessing the level of soil pollution:

• The amount of petroleum products (hydrocarbons) - in mg / kg;

• The concentration of heavy metals (Pb, Cd, Zn);

• pH level;

• Changes in salinity and mechanical composition.

The analysis also compared the sanitary standards and maximum permissible concentration (MPC) indicators. The territorial analysis used data on zonal soil samples at a distance of 1 km, 3 km and 5 km from the Shurtan NGSC.

RESULTS Based on the analysis of the literature, it was found that the ecological state of the soil in the areas around the Shurtan NGSK is not uniform. The level of pollution is much higher in the areas closest to the enterprise. Zone within a radius of 1 km: The average content of petroleum products in this area is 2.5–3.1 mg/kg, which is 1.5–2 times higher than the maximum norm established by the sanitary standards of Uzbekistan. The color of the soil is darker, a specific odor is noticeable. The content of heavy metals: Pb – 45 mg/kg, Cd – 2.5 mg/kg, which is considered dangerous in terms of pollution. Zone within a radius of 3 km: The content of petroleum products is

in the range of 1.2–1.8 mg/kg. Although the pH level is close to neutral, changes in the mechanical structure are noticeable. A decrease in organic matter and a decrease in microbiological activity are observed.

Zone within a radius of 5 km: Petroleum products are detected in trace amounts (0.4–0.9 mg/kg). Considering the geological characteristics of the Shurtan Valley, these indicators are considered relatively normal. However, in some places, heavy metals have been detected. Based on these data, it can be said that there is pollution in the soils around the Shurtan NGSK, which decreases with increasing distance. Also, pH and salinity levels are subject to industrial influence. As a result of the conducted studies, it was found that the pollution levels in the soils around the Shurtan NGSK decrease with increasing distance. The concentration of petroleum products in soil samples within a radius of 1 km was on average 1.5-2.1 mg/kg, which is 2-3 times higher than the standard value. In this area, the levels of heavy metals - especially lead (Pb) and cadmium (Cd) - also exceeded the ecological limits. Although the pollution level within a radius of 3 km has decreased relatively, it still remains higher than in the control zones. In soils at a distance of 5 km, the pollution is relatively low, and the impact of anthropogenic pressure has been observed to have significantly decreased there.

The pH value of the soil in the areas near the industry is around 6.2–6.4, and a slightly acidic environment has been observed. Salinity indicators are especially high in areas affected by technogenic wastewater, which negatively affects plant growth.

Also, changes in the state and species composition of the plant cover at the site have been observed, with the dominance of tolerant plant species. This indicates the impact of long-term pollution on natural flora and microbiocenoses.

DISCUSSION The results obtained have important commonalities when compared with other scientific studies. For example, the monitoring conducted by Rasulov M. (2021) in the Shurtan industrial area also showed high concentrations of petroleum

products and heavy metals. The reason for this is the insufficiently treated discharge of industrial waste into the environment, the inefficiency of filtration systems, and the reduced ability of the soil layer to self-recover.

In soils contaminated with petroleum products, plant growth slows down, the soil microflora changes, and the biological activity of the soil weakens. This also leads to the degradation of land resources and the acceleration of the erosion process.

In the current conditions, it is urgent to introduce bioremediation, phytoremediation, and microorganism-based cleaning methods in these areas. Also, a network of established laboratories is necessary to conduct regular environmental monitoring and assess the state of the soil.

CONCLUSION The level of soil pollution around the Shurtan oil and gas subsidiary is characterized by high levels of industrial activity. In areas close to the enterprise, high concentrations of petroleum products and heavy metals are detected. The level of pollution decreases with increasing distance, but traces of some pollutants are found even at a distance of 5 km.

This situation requires taking necessary measures to ensure regional ecological safety. Including:

• Establishing a permanent monitoring system;

• Using biological treatment methods;

• Controlling polluting sources;

• It is necessary to carry out reclamation work in the area.

One of the urgent tasks is to conduct research based on an integrated approach to studying the state of the environment and soil in the Shurtan region.

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