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PHYSICAL AND CHEMICAL BASES OF WATER CLARIFICATION PROCESS IN THIN-LAYER SEDIMENTATION TANKS

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Abstract. Addressing environmental conservation issues and protecting water bodies is crucial in contemporary times. Rational use of water resources and reduction of coarse-dispersed and colloidal pollutants are key objectives. To achieve this, the implementation of physico-chemical technologies, such as water clarification in sedimentation tanks, settlers with suspended sludge, and filters, is essential. Special attention is given to intensifying natural water purification processes, improving technologies, developing new effective purification methods, and adopting resource-saving technologies. In recent years, thin-layer sedimentation tanks have been increasingly utilized for water purification, allowing for a reduction in size and enhancement of purification efficiency.

Keywords: water resources, water treatment, physico-chemical technologies, sedimentation tanks, thin-layer elements, coarse-dispersed pollutants, colloidal pollutants, process intensification, resource-saving technologies.

Solving environmental problems and protecting water bodies in modern conditions greatly depends on the rational use of water resources and reducing coarse-dispersed and colloidal pollutants through the application of physico-chemical technologies, including water clarification in settlers, illuminators with suspended sediment, and filters.

Special attention is paid to intensifying natural water purification processes, improving technologies, and developing new effective purification methods, as well as implementing resource-saving technologies. Recently, thin-layered settlers are increasingly being used in water treatment. The dimensions of thin-layered settlers are significantly smaller compared to other sediment basins and are measured in several meters, allowing them to be placed in enclosed spaces [1].

The distribution of sedimentation occurs under the condition of density inequality between the solid body ρ and the liquid $\rho 0$ in which it is located. When the density difference ($\rho - \rho 0 > 0$) is positive, particles settle; when negative ($\rho - \rho 0 < 0$), they float, which is fundamental for equations like Newton-Retinger, Stokes, and others in determining the settling velocity of solid particles in a viscous liquid.

Studies on surface phenomena indicate the formation of an immobilized layer of liquid around a solid particle immersed in water, characterized by forming a single aggregate with the particle, with the thickness of the immobilized layer ranging from 0.03 μm to 0.4 μm and averaging about 15 μm. This situation is important for as-

sessing the sedimentation of particles in a microheterogeneous system, the size of which ranges from 0.1 to 10 μm, i.e., suspended matter subject to calculations according to the Stokes equation [2].

The justifiable relevance of the use of settlers with thin-layer modules in water treatment systems is established. It is necessary to take into account the physicochemical indicators of the treated water. The possibility of improving water quality by an average of 29-32% in terms of suspended solids and 21-25% in terms of colour has been established.

Analysis of design and operational materials shows that it is very urgent to develop new, more effective methods, both in terms of capital and operational costs, intensifying water treatment processes, which include settling tanks with thin-layer modules, the use of which allows to improve the process of water treatment, improve its quality, reduce the consumption of reagents and the cost of water treatment.

References

1. Stanislav Dushkin, Serhii Martynov, Stanislav Dushkin. The increasing efficiency of upflow clarifiers at the drinking water preparation. (2020) Acta Periodica Technologica, 50, 17-27. DOI: https://doi.org/10.2298/APT2051017D

2. Stanislav Dushkin, Olena Galkina. Thin-Layer Sedimentation Tanks in Water Clarification at Coke Plants. (2021). Coke and Chemistry, 64(8), 380-385. DOI: https://doi.org/10.3103/s1068364x21080020

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СТРАТЕГІЯ БЕЗПЕКИ: АНАЛІЗ РИЗИКІВ ТА АУДИТ ДЛЯ ПІДВИЩЕННЯ ЗАХИЩЕНОСТІ ПРОМИСЛОВИХ ПІДПРИЄМСТВ

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Збільшення обсягів виробництва та використання небезпечних речовин у технологічних процесах призводить до перетворення техносфери на джерело небезпеки для людства.

Аналіз експлуатаційних характеристик та небезпечних факторів є системним підходом щодо складних об'єктів та процесів для виявлення існуючих та потенційних небезпечних факторів та для розробки заходів щодо усунення або зниження виявлених ризиків [1, с.67]. Аналіз ризику аварій на небезпечних