

## **ABSTRACT**

Master's dissertation with the total volume of 85 pages, contains 31 illustrations, 11 tables, 1 supplement and 22 sources under the list of references.

CONTROL, NEURAL NETWORKS, CONVOLUTION NETWORK, DEEP LEARNING, ACTIVATED SLUDGE, PURIFICATION, WASTEWATER TREATMENT, TECHNOLOGICAL OBJECT OF CONTROL.

Actuality of theme. The urgency of the work is related to the need to create modern fast and automated methods for determining the quality of biological wastewater treatment with activated sludge.

The purpose and tasks of the study. The purpose of this work is to develop a subsystem for control of the biological treatment of sewage with the use of activated sludge. Achievement of the set goal is planned by solving the following tasks: filling the database of the subsystem control with the corresponding images of microorganisms; analysis of algorithms of neural networks, justification of model selection and choice of model implementation method; substantiation of the choice of the neural network architecture, which corresponds to the task, and the configuration of the model of the neural network; analysis of the accuracy of recognition, depending on the number of images and learning periods; testing of the control subsystem on real data; principles development of subsystem's construction of the process control in sewage treatment; software development of the interface, the dialogue subsystem and subsystem of the visualization of the subsystem management of the process of biological wastewater treatment.

The object of research is the subsystem of management of the process of biological treatment of sewage with the use of active sludge on the basis of convolution neural networks.

Subject of research: software, mathematical, informational and organizational support of algorithms for recognition of elements of active sludge by means of convulsive neural networks.

Research methods. Methods of mathematical modeling, computational experiments, methods of mathematical statistics and modern theory of automatic control.

Scientific novelty of the results. For the first time, neural networks are used in the task of recognizing active sludge microorganisms during biological wastewater treatment. The obtained results of simulation are the basis of the subsystem of management of the process of biological wastewater treatment with the use of active sludge.

The practical value of the results. Based on calculations and input data, the parameters of the sewage treatment process, the state of active sludge and the quality of cleaning are determined. With this data, operator can continuously monitor the process in the aerotank, saving the resources and time.

Approval of the results of work. The main provisions of the master's thesis were highlighted at the 5th international scientific-practical conference "Computer simulation in chemistry and technologies and systems of sustainable development".

Publications. According to the materials of the master's dissertation an article was published in the professional edition and an article was prepared for publication in the international edition.