

**JUSTIFICATION OF MEASURES TO ENSURE THE RELIABILITY OF
HYDRAULIC RECLAMATION SYSTEMS WITH A LONG-TERM
OPERATION**

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Abstract: *The article describes the relevant scientific research of a first-year postgraduate student in the scientific specialty 4.1.5. "Land reclamation, water management and agrophysics". The main research goals and objectives, its novelty and the intended results' practical application are given. The article also presents the research, already carried out at the reclamation facilities of the Krasnodar Territory and the Republic of Crimea.*

Keywords: *reclamation system, hydraulic structures, water supply, irrigation canal, reduced efficiency.*

Nowadays, there is a situation when costs for maintaining engineering reclamation systems' operation are not rational enough. One of the reasons is the low level of goals and objectives development in the repair or reconstruction of structures, ignoring the requests of organizations directly involved in the operation of hydraulic reclamation systems and interested in regular, sufficient and safe water supply. Hydraulic structures as part of hydraulic reclamation systems are a tool for storing, water intake and transportation of water resources for the needs of an agricultural producer. The provision of irrigated areas with irrigation water, as well as timely discharge with certain irrigation methods, completely depends on the technical state of hydraulic structures. The operability of the entire system depends on the operability of its elements, each of which has its own reliability criteria and service life. If one element fails, the entire hydro-reclamation system fails to fully provide the irrigated areas with the required volumes of water supply or discharge. Competent and timely analysis of the performance of the hydro-reclamation system and its elements, elimination of problems that lead to a decrease in the performance of the entire system and its elements, will allow maintaining or increasing the obtained volume of agricultural production, while significantly reduce the costs on water supply and derivation.

The work is aimed at determining the capacity of channels of various order, building cross-sectional profiles, identifying silted-up areas, determining water losses in the areas of its supply to irrigation facilities, sources of losses, proposing possible cost-effective solutions to problems with further implementation.

My thesis supervisor is a professor, head of the Department of Hydraulic Structures Khanov Nartmir Vladimirovich. In conducting research on the topic of scientific work, I am also assisted by: Head of the Department of Hydraulic Engineering and Hydraulics, Candidate of Technical Sciences Shcherbakov Alexey Olegovich, Candidate of Agricultural Sciences, Head of the Laboratory of Safety of Hydraulic Structures Zhezmer Valentin Borisovich, Candidate of Technical Sciences Buber Alina Alexandrovna, Candidate of Agricultural Sciences Menshikova Snezhana Alexandrovna.

The novelty of the research, first of all, is in the reflection of the actual state of hydro-reclamation systems with a long-term operation, in the observation of deviations in the technical characteristics of structures as part of hydro-reclamation systems, in comparison with their design values. Secondly, in the proposal and implementation of measures for the repair or reconstruction of hydraulic reclamation systems or its elements with the implementation of cost-effective ones. Thirdly in calculation and comparison of the yield of crops grown on the studied agricultural plots and the actual costs of water supply with the design parameters of hydraulic structures as part of the studied hydraulic reclamation systems, with modern actual parameters and with the parameters of hydraulic structures after the proposed repair or reconstruction measures.

The results of the research will be used in the annual reports of the Department of Hydraulic Engineering and Hydraulics and the Laboratory of Safety of Hydraulic Structures. Also, the results of the work will appear in the form of a ready-made case for solving similar problems in the hydro-reclamation systems of the regions of the Russian Federation.

At the moment, research has been conducted at reclamation facilities in the Krasnodar Territory and the Republic of Crimea. The research objects in the Krasnodar Territory were on-farm irrigation and discharge channels of agricultural plots of rice reclamation systems of the Ponuro-Kalininskaya and Petrovsko-Anastasievskaya irrigation systems. The following were carried out: external inspection of the channels; measuring the channels to determine the depth of silt deposits and the cross-section changing; drawing maps of water movement from the source of water supply to the place of water discharge; measurements of water flow velocity in irrigation channels, at the maximum possible discharge. When measuring, a level rod and a rope were used to mark the depth vertical with measurement interval of 1 m. To measure the flow velocities, the Nautilus C 2000 induction flow velocity meter was used, the water flow rate was determined by the "speed-area" method [1].

As a result of the conducted research, it turned out that many on-farm channels are in poor state, water losses are observed at all water supply facilities. The observed phenomena, such as siltation, washouts in the location of water outlets, overgrowth of slopes, destruction of reinforced concrete structures, an increase in slope grade significantly reduce the operability of channels.

The problems of the research areas are a high degree of wear due to a long-term operation. A preliminary brief analysis of the water supply indicates the need for the following repairs on the canals: removal of woody vegetation; cleaning of the

canal profile from reeds; bringing the cross-sectional area of the canal to the design parameters. The quantitative indicators of the repair work will be determined after comparing the values of the main characteristics of the channel with the design values during the continuation of the work [2].

The main object of research in the Republic of Crimea was the North Crimean Canal from the Dzhankoy city to the Kerch city. During the survey, all pumping stations along the canal were examined, as well as the operability of the canal in all its sections was analyzed. In addition, pumping stations and inter-farm channels of the Krasnogvardeysky branch of Krymmeliovodkhoz were examined. According to the results of the inspections, it can be said that the units at the stations are ready to supply the required volumes of water, but it is recommended to replace them with modern analogues. Cracks in concrete and overgrowth of slopes with vegetation are observed on the channels of the inter-farm network. It is necessary to remove vegetation, especially woody and shrubby along the entire length of inter-farm channels.

In the future, trips to other regions of the Russian Federation are planned. The objects will be selected according to the main criterion - the service life of both the hydro-reclamation system and the hydraulic structures in its composition.

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МОДЕЛИ ОБРАЗУЮЩЕЙ СТЕЛОМ СОСНЫ ОБЫКНОВЕННОЙ КОСТРОМСКОЙ ОБЛАСТИ

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Аннотация: По материалам обмера деревьев сосны обыкновенной Костромской области произведён анализ 19 регрессионных моделей образующих древесных стелом с различным количеством параметров. Установлено, что наиболее адекватно изменение диаметра с высотой