

## Scientific works

1. Development of analytical formulas for determining flow parameters: discharge, velocity field for combined dams of unilaterally constrained flow.
2. Flow patterns for symmetrically constrained flow by transverse dams on floodplain.
3. Theoretical and practical research of the influence of dams bilaterally located in river floodplain on flow, as well as determining velocity field for floodplain and channel with the same roughness, developing the methods for determining the distance between dams.
4. Improving the structure and design justification methods for mobile weirs for farmlands.
5. The study of the influence of interdam floodplain on flow parameters, as well as the development of the method for determining the distance between velocity field and dams. Certificate for computer program was received.
6. The study of factors, influencing on rheological properties of heavy concrete mixtures, used in the construction of hydraulic structures.
7. A mathematical model has been developed for determining velocity, pressure and energy distribution for confuser area of vortex shaft spillway and was compared with experimental results.
8. Justification of the use of plasticizing agents for improvement of rheological properties of concrete mixtures.
9. Justification of the use of industrial materials for enriching fine aggregates for preparation of concrete mixtures.
10. Development of software for the study of mudflood retainer structure, conducting experimental research, development of structure model.
11. Improvement of the methods for determining water reservoir area and volume using remote sensing and geoinformation technologies.

### **Fundamental, amaliy va innovatsion grantlar, xo'jalik shartnomalari**

1. Business agreement №6/2019 named "Development of scientifically justified measures to provide reliable operation of protective dams on channel water reservoirs"
2. Government grant QX-A-QA-2018-281 named "Development of codes for estimation of safety category of hydraulic structures under operation" (executor – prof, d.t.s. Bakiev M.R.)
3. In 2018, prof A.A.Yangiev, having participated in UNDP project "Sustainable management of water resources in rural areas of Uzbekistan" as a consultant-trainer, gave training classes for water reservoir and hydrosystem workers in 6 regions of the republic. In March 4-7, 2018 prof. A.A.Yangiev, having participated in UNESCO seminar on water management projects, prepared and turned in to clients module named "Operation and support of hydraulic structure technical condition".
4. In collaboration with Taraz University of the Republic of Kazakhstan prof. Bakiev M.R. and prof. Yangiev A.A. are giving scientific consultation on double PhD dissertation to following students: prof. Bakiev for 2nd year PhD student Kadereshev E.J. and prof. Yangiev A.A. for 2nd year PhD students Smaylov B.Sh. and Djakiev B.D.
5. Surveys of the technical condition, development of recommendations on the reliability and safety of operation of the Takhiyatash hydroelectric complex (contract 65/2022, budget: 90 million sums)
6. Development of safety criteria for Takhiatosh hydroelectric complex (contract 21/2023, budget: 95 million sums)
7. Improvement of drip irrigation technology (water softener facility) in the valley supplied with water through the Zarafshon river (contract 14-06-2022, budget 59 million sum)

### **Patents, licenses and inventions, obtained as the result of scientific research work conducted**

**in the department.**

1. Bakiev Masharif Ruzmetovich, Hayitov Holmurod Jamardovich, Yakubov Kuvonchbek Tajibaevich, Kumakov Muminjon Komiljon ugli. №01348 FAP20160189 Design of target dimensions for flow constrained by floodplain dam with the consideration of interdam area reclamation. Tashkent 2018.
2. Bakiev Masharif Ruzmetovich, Muslimov Turavoy Djuraevich, Djabbarova Shahnoza Akramjonovna, Masaharifov Umidbek Hushnudbek ugli. №01333 FAP20160099 «Device for measurement of soil water yield». Tashkent 2018.
3. Bakiev Masharif Ruzmetovich, Nasirov Chingizhan Sultanovich, Masharifov Umidbek Hushnudbek ugli. Design of unsteady filtration in earth fill dams. № DGU 05098. Tashkent 2018.
4. Bakiev Masharif Ruzmetovich, Kahhorov Uktam, Jahonov Aziz. № FAP20180137 "Bank protection spur dam".
5. Bakiev Masharif Ruzmetovich, Khalimbetov Azat Bayrambaevich, Yakubov Quvonchbek Tajibaevich, Matkarimov Otanazar Madrakhimovich No. FAP20220094 "Bank protection spur" Utility model patent.
6. Bakiev Masharif Ruzmetovich, Oktam Qakhorov, Aziz Jakhanov, Muslimov Turavoy Zduraevich, Khasanov Khojakbar Khamzaevich. 3-step calculation of shallow foundations. No. DGU 15980. Tashkent 2022.
7. Bakiev Masharif Ruzmetovich, Oktam Khakhorov, Azat Bayrambaevich Khalimbetov, Aziz Jakhanov. Calculation of transverse dams in rivers with non-metric flow. No. DGU 14983. Tashkent 2022.
8. Oktam Khakhorov, Masharif Ruzmetovich Bakiev, Aziz Jakhanov. Laws of flow compression in floodplain rivers with the help of two-way dams (for the case of a single dam). No. DGU 1787 Tashkent 2022.

**Department's international achievements on innovation ideas and creations in recent years**

PhD student Choriev J.M. participated in the VI - International scientific conference on March 25-26, 2018, and received a diploma. Bakiev M.R., Choriev J.M. participated in the XV - International scientific and practical conference and received diplomas. Choriev J.M. participated in the III - International contest among bachelor's, master's, and PhD students and won the honored first place. Shukurova S.E. participated in the III - International contest among bachelor's, master's, and PhD students and won the honored second place.