

PAPER • OPEN ACCESS

Measures to reduce negative effects of waste using the Amu-Bukhara machine channel

To cite this article: A A Shomurodov *et al* 2023 *IOP Conf. Ser.: Earth Environ. Sci.* **1138** 012010

View the [article online](#) for updates and enhancements.

You may also like

- [Assessment of wind and hydropower potential of Bukhara region](#)
N N Sadullaev, A B Safarov, R A Mamedov *et al.*
- [Stationary deformation of cylindrical shells with viscoelastic filler](#)
I I Safarov, M X Teshaev, Z I Boltayev *et al.*
- [Effect of deep softeners on irrigation, salt washing and cotton yield on soils whose mechanical composition is heavy and meliorative status is difficult](#)
A K Juraev, M Kh Khamidov, U A Juraev *et al.*



244th Electrochemical Society Meeting

October 8 – 12, 2023 • Gothenburg, Sweden

50 symposia in electrochemistry & solid state science

Abstract submission deadline:
April 7, 2023

Read the call for papers &
submit your abstract!

Measures to reduce negative effects of waste using the Amu-Bukhara machine channel

A A Shomurodov¹, K Qurbonov¹, X E Ergashev², D D Baratov², Sh Qurbonov¹

¹ Bukhara Institute of Natural Resources Management of the National Research University of Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, Bukhara city, Gazli Avenue, 32, Uzbekistan

² Karshi Institute of Irrigation and Agrotechnology of “TIAME”, National Research University, Karshi city, Gazli Avenue, 32, Uzbekistan

E-mail: anvar.shomurodov.90@mail.ru

Abstract. The work discusses the state of use of the Amu-Bukhara canal. It also considers the number and size of suspended watercourses that affect existing hydraulic structures. The large amount of suspended runoff creates problems such as turbidity of the canal during operation, overflow of front runoff. Solving the problem through modern technologies and innovative proposals is a requirement of today. The application of the proposed collection mechanism can reduce labor costs for waste disposal by 30–35% and operating costs by 45%. In addition, proposals and recommendations were given to improve the existing suspension treatment facilities.

1. Introduction

Today, the total length of irrigation canals in the country is 28.458 km, including 18.718 km of ditches, 9.203 km of concrete pavements, 536 km of trays. And the number of hydraulic structures is 54.432. In particular, there are 1721 km of irrigation canals in Bukhara region, the largest of which Amu-Bukhara is a car canal [1, 2, 3, 4]. Its total length is 384.8 km, which supplies Amu Darya water to Bukhara and Navoi regions for irrigation. Water for the canal is taken from the Amu Darya through the first and second artificial streams, depending on the seasonal variation of water [5, 6, 7]. The length of these canals is 22 km. The artificial streams open and close seasonally as the Amu Darya water level changes [8, 9].

2. Materials and Methods

It is known that the level of turbidity of the Amu Darya water is very high, and at the same time the large amount of suspended runoff creates problems such as turbidity of the canal during operation, overflow of front runoff.

The Amu-Bukhara main canal is 10.97 km long from the main dam PC28 + 00 to the secondary water distribution facility PC137 + 00. It is no secret that the problems listed above in this part of the channel are very topical and lead to high costs. One example of this is that in 2019, 8504 m³ of earthworks were planned, and in practice 9539.8 m³ of earthworks were carried out, and about 10 billion soums were spent on the work.





Figure 1. The first and second artificial streams that receive water from the Amu Darya.

3. Results and Discussion

As a result of water changes in the Amu Darya, tree stems and roots flowed and stood in front of the fence in a transverse and longitudinal position. At the Amu-Bukhara-2 pumping station, the accumulated effluents in front of the fences installed in front of the avancameras were removed, and the following results were obtained when their components were studied. Reed stalks and roots are 53%, tree branches and roots are 29% and other types of waste (animals, legumes and various local wastes) are 18%.

Analysis of the data obtained from the measurement of the dimensions of the waste shows that the thickness of the main part of the mouthpieces is from 20 mm to 60 mm (49%) (Table 1) and their length is from 201 mm to 600 mm (57%). In addition, the degree of clearance of the nozzles will also depend on the installation angle of the waste [10–14].

Table 1. Distribution of waste by diameter.

diameter mm.	0--20	21–40	41–60	61–80	81–100	>100
share %	12%	25%	24%	15%	14%	10%

Table 2. Distribution of waste along the length.

length mm.	0–200	200–400	400–600	600–800	800–1000	>1000
share %	8%	26%	31%	18%	11%	6%

The data obtained on the ABK-2 channel show that the amount of debris accumulated in front of the bars per day is in some cases 350–500 kg.

A large amount of sediments was found to flow at 65–70% of the water surface and at a depth of 0.5 m during the experiments. 20–25% flows at a depth of 0.5–2.5 m above the water level, 5–15% at a depth of 3–4.5 m above the water level and accumulates in front of the fences. Analysis of the data obtained as a result of observations allows one to correctly select the parameters of the device to clean and remove debris accumulated in front of the grilles [15, 16].

Basically, the effluents accumulate in front of the grilles installed in the inlet duct section of the pump station in the machine ducts, directly affecting the flow rate. As a result, turbid subsidence is observed along the entire channel route due to the decrease in flow rate. As a result, the accumulated effluents affect the flow rate, leading to water stagnation in the canal [17]. A decrease in the flow rate

of a canal with very high turbidity and stagnation of turbid water in the canal are in turn the main causes of turbid subsidence. Solving the problem through modern technologies and innovative proposals is a requirement of today.



Figure 2. The process of cleaning up wastes that has accumulated in front of a structure.

Today, one of the most important tasks in the Amu-Bukhara machine canal is to capture and clean the wastes using modern energy and resource-saving technologies.

After an in-depth analysis of the existing problems, a number of proposals and recommendations were developed to improve the treatment plant with a capacity of $N = 6.5$ kW in the model HQN4.8x5.5–75°, developed on the basis of Chinese technology [18, 21].

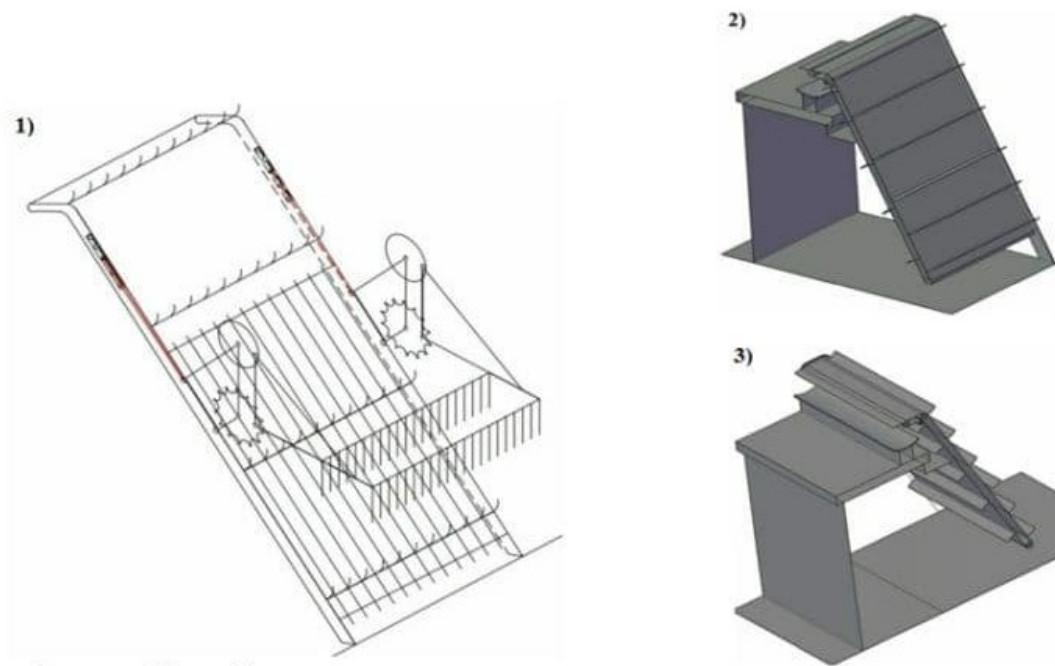


Figure 3. An improved version based on Chinese technology cleaning device (author's suggestion): 1 is the schematic drawing of the device; 2 is the front view; 3 is the rear view.

In particular, the cleaning device of the model HQN4.8x5.5-75° has a small length of the tooth part (15 cm) that collects the debris, so the range of coverage of the debris is small, and its efficiency is very low [19, 20]. Additional leaks from the front of the device to overcome this shortcoming the collecting mechanism must be installed (Figure 4).

In addition to the device, a mechanism for collecting debris collects surface debris on the teeth and increases the efficiency of the device.

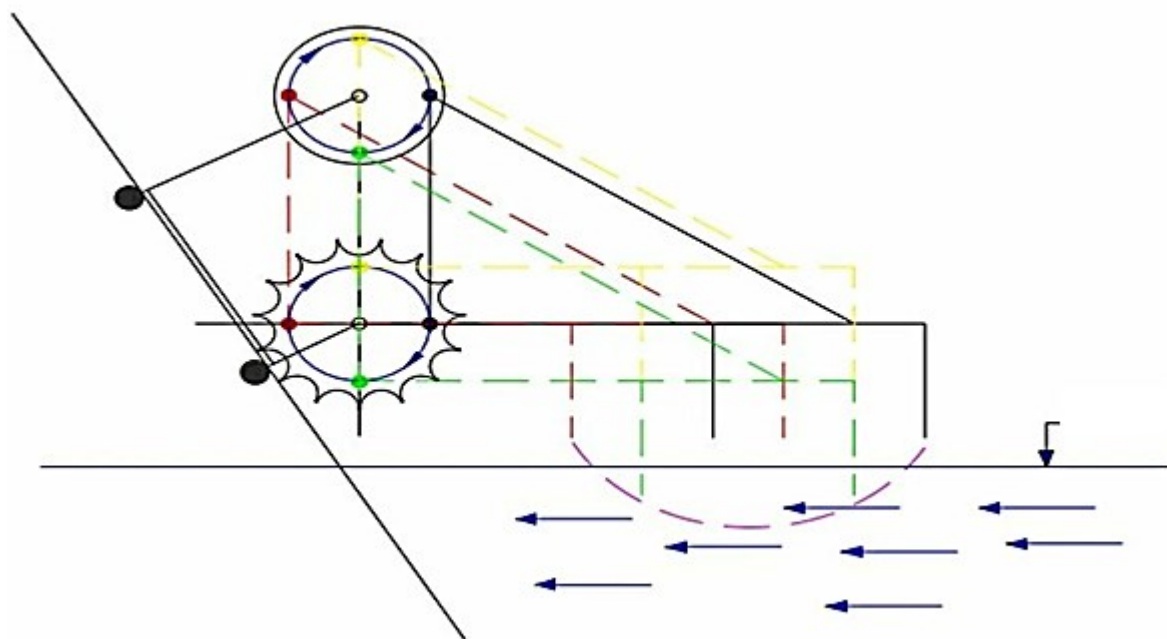


Figure 4. The scheme of operation of the collecting mechanism.

4. Conclusion

The application of the proposed collection mechanism can reduce labor costs for waste disposal by 30–35% and operating costs by 45%. Due to this, the annual economic efficiency increases. Leaks also accumulate in the front of the structure, preventing water stagnation in the canal, resulting in a reduction in the factor that directly affects turbidity. At the same time, cavitation operation of pumping equipment installed in the Amu-Bukhara machine channel is prevented, and mechanical failure of the valves is eliminated.

References

- [1] Ibragimov I A, Juraev U A and Inomov D I 2021 *IOP Conference Series: Earth and Environmental Science* **949** 012090
- [2] Qurbonov K, Ro'ziqulov Q 2016 *The Ninth International Conference on Eurasian scientific development. Proceedings of the Conference* (Vienna, 20 May) pp 135–138
- [3] Kurbanov Sh 2020 *Economy and society* **11** 841–846.
- [4] Ismagilov H and Ibragimov I 2013 *Conference "Cadastre and Law" Scientific papers* (Chisinau, Moldova) **33** 69–72
- [5] Egamberdievich I M 2021 *Euro-Asia Conferences* **4** (1) 265–268
- [6] Krutov A, Choriyyev R, Norqulov B and Shomurodov A 2021 Mathematical modelling of bottom deformations in the kinematic wave approximation *IOP Conference Series: Materials Science and Engineering* **1030** 012147

- [7] Norkulov B, Safarov F, Kosimov J, Shodiev B and Shomurodov A 2021 Reduce the intensity of siltation of bulk reservoirs for irrigation and hydropower purposes *E3S Web of Conferences* **264** 03052
- [8] Shuhratovich K S and Shohzod T 2021 *Euro-Asia Conferences* **4** 252–256
- [9] Imomov Sh, Nuriddinov K and Nuriddinov O 2021 Thermal regime for convective drying products *E3S Web of Conferences* **264** 04055
- [10] Eshev S, Rahmatov M, Khazratov A, Mamatov N, Sagdiyev J and Berdiev M 2021 Critical flow velocities in cohesive saline soils *E3S Web of Conferences* **264** 03071
- [11] Umurzakov U, Obidov B, Vokhidov O, Musulmanov F, Ashirov B and Suyunov J 2021 Force effects of the flow on energy absorbers in the presence of cavitation *E3S Web of Conferences* **264** 03076
- [12] Khidirov S, Oymatov R, Norkulov B, Musulmanov F, Rayimova I and Raimova I 2021 Exploration of the hydraulic structure of the water supply facilities operation mode and flow *E3S Web of Conferences* **264** 03024
- [13] Bazarov D R, Norkulov B E and Jamalov F N 2021 Conducting channel control works in the area of the damless water intake of abmk *Agro processing journal* **3** (4)
- [14] Ibragimov I A, Inomov D I and Jumaboeva Sh Y 2021 *International Journal of Innovative Analyses and Emerging Technology* **1** (5) 253–257
- [15] Rakhmatov N, Maksudova L, Jamolov F, Ashirov B and Tajieva D 2020 The concept of creating a new water management system in the region *IOP Conference Series: Materials Science and Engineering* **883** 012007
- [16] Norkulov B, Sejtimbetov A, Vohidov O, Kurbanov A and Zhamalov F 2021 Analysis of channel processes in the bottom of the dam *National Association of Scientists* **2** (68) 32–36
- [17] Bazarov D, Shodiev B, Norkulov B, Kurbanova U and Ashirov B 2019 Aspects of the extension of forty exploitation of bulk reservoirs for irrigation and hydropower purposes *E3S Web of Conferences* **97** 05008
- [18] Bazarov D, Norkulov B, Vokhidov O, Jamalov F, Kurbanov A and Rayimova I 2021 Bank destruction in the middle section of the Amu Darya River *E3S Web of Conferences* **274** 03006
- [19] Norkulov B, Jumabaeva G, Uljaev F, Jamalov F, Shomurodov A and Qurbanov A 2021 Channel bed processes experimental modeling in the area of damless water intake *E3S Web of Conferences* **264** 03067
- [20] Glovatskiy O, Djavburiyev T, Urazmukhamedova Z, Gazaryan A and Akhmadov F 2019 Interconnection of influent channel and pumping station units *E3S Web of Conferences* **97** 05011
- [21] Kattakulov F, Artikbekova F, Gafurov Z, Jumabaeva G and Musulmanov F 2021 Consideration of climatic factors in the operating mode of hydraulic facilities in the Amu Darya river basin *E3S Web of Conferences* **264** 03068