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# FROM THE HISTORY OF KHANBANDI WATER STRUCTURE AND ITS OPERATION

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**Annotation**

This article talks about the Khanbandi reservoir, which is considered a unique hydrotechnical structure built in the X century in the Jizzakh oasis, as well as the history of its construction and operation. The construction of the Khanbandi water structure is a clear proof that the engineers of our country formed the concept of the "water pressure law" seven centuries before the Europeans.

**Keywords:** Ustrushona country, Jizzakh oasis, Forish district, Mokhandaryo archaeological expedition, Khanbandi reservoir, "water pressure law", A. Mukhammadjanov, Z. Khusankhojayev, 1 million 600 thousand cubic meters of water, B. Pascal.

## INTRODUCTION

As a political structure, the country of Ustrushona, which was first mentioned in the written sources of the early Middle Ages, emerged from the point of view of geographical location between Fergana, Choch, and Sughd, mainly in the areas on the left bank of the Syrdarya. Its natural geographical conditions were of great importance in the development of Ustrushona. In fact, the Ustrushona region is one of the oases in Central Asia that has been considered favorable for human habitation, economy and life activities since ancient times. The oasis has different climatic conditions. Here you can find hot, harsh desert-steppe regions, subalpine juniper forests with a temperate climate, eternal glaciers on high mountain peaks, soils and terrains of different composition of the Quaternary period. In the basin of the rivers and streams, streams and springs that originate from the mountains on the southern borders of Ustrushona and flow down to the valley, people have been living in settlements since ancient times, engaged in agriculture based on artificial irrigation.

## MAIN PART

The geographical and climatic conditions of the oasis were extremely favorable for the establishment and development of the livestock sector. Cattle were grazed in

mountain and sub-mountain hills, vast desert-steppe areas, cattle herders conducted their life activities in a nomadic style. They moved from one place to another depending on the supply of fodder and water resources for the season, and spent the winter in the pastures around mountain ridges and gorges, where the weather was relatively warmer, surrounded by strong winds [Gafurov J. 2020 p. 6-7].

In general, it can be noted that nature itself has created a number of comforts for people in the studied cultural region. In particular, in the earliest times, the first ancestors had the necessary conditions for hunting and gathering, and in later times, there were conditions for dry farming, irrigated agriculture and cattle breeding.

Reservoirs, which are considered to be ancient water structures preserved in the territory of Uzbekistan, were first studied by the members of the Mohandaryo archaeological expedition of the Republican FA Institute of History and Archeology in 1950-1962. The expedition staff found and examined the remains of several reservoir dams and water separation bridges in the Zarafshan valley and the adjacent Nurota, Zarafshan ridges. “Khonbandi” was built in the 10th century in Forish district, “Gishtband” was built in the 12th century near the village of Jom in the Kattakorgan district, and it was built in the 16th century in the Akchobsoy region of the Nurota district. Old reservoirs like “Abdullahkhan Bandi” are among them. The oldest of such constructions, which is a high example of medieval engineering construction and has been fully preserved to this day, is the 10th century water reservoir “Khonbandi” [Suyunov S. 1999. p. 31].

The facility is 12 km from the center of Forish district. on the north side, it was built in the gorge crossed by Osmonsoy of Pastog. This building is made of stones and joined together with a special water-resistant construction compound. The length of this reservoir, built in the Osmonsoi gorge, is 1.5 km, the width is 52 m in front of the dam, and 200 m at the mouth of the gorge. The length of the dam is 51.75 m at the top, 24.35 m at the base and 15.25 m high. is equal to Khanbandi Reservoir created a water reserve of 1,600,000 cubic meters and provided water to approximately 1,500 hectares of land. 6 km from the dam. In the distance, a village rose [www.wikipedia.uz. website].

Further research shows that archaeological findings from the late Middle Ages found around the Kaltepa caravanserai show that life continued in later periods. But according to the conclusion of the accomplished archaeologist, academician A. Mukhammedjanov, life here did not continue after the conquest of Genghis Khan [Mukhammedjanov A. R. 1968. p. 57-58].

According to the results of the observations of A. Muhammedjanov, nine pipes installed in a low and high position on the western edge of the dam were used to release the water accumulated in the reservoir. Depending on the water level, the pipes are opened one after another. When installing the pipes, the irrigators skillfully used the slightly lower rocky bank of the gorge. Because the water falling from the dam at a high speed does not damage the bottom of the water structure by washing the riverbed and the slope, each of the pipes is installed with a certain accuracy. The water from the pipes hit the rock of the mountain, and then flowed from it into a ditch dug along the dry bed of the stream. The pipes of "Khonbandi" are designed in a conical shape against the dynamic effect of water flowing through the structure. Their inner opening, where water enters, is 25x25 cm, and the outer opening is 45-70x50-100 cm. is equal to [Mukhammedjanov A. 1968. p. 46].

16 m. irrigators of the 10th century collected in front of the dam during the construction of this structure. analyzed the vertical pressure force of deep water and the horizontal displacement of the building overturning on the basis of accurate engineering calculation. According to the technical scientist Z. Kh. Khusankhuzhayev, the technical scientist of this engineering type construction, the eccentricity of the "Khonbandi" dam with a common center is 1.38, and the equal-acting dam is close to the core of the foundation. [Khusankhojayev Z. X . 1968. p. 27-31].

In the conditions of the Middle Ages, when a strong binding mixture such as cement was not invented, it was important to find and use a moisture-resistant construction mixture in the construction of water dams. According to some information provided in Badriddin Kashmiri's "Ravzatur Rizvan Hadikatul Gulman" from the 16th century manuscripts, in the Middle Ages, when building "cisterns" from brick and stone water structures, lime, ganch and It is said that building from the mountains used construction mixtures made of several components. The architects of Samarkand and Bukhara called such a construction mix "kir" [Suyunov S. 1999. p. 32].

The ridges used in the construction of dams made of stone and brick were also recorded in historical sources of the 19th century. For example, according to the information included in the book "History of Central Asia" by Mir Abdulkarim Bukhari, one of the Bukhara authors of the 19th century, Sultan Sanjar (1118-1158), the ruler of the Seljuk state, built a dam of bricks on the Murgob River, during the construction "kir" and ceramic pipes are said to have been used.

## RESULTS AND DISCUSSIONS

In his treatise on the history of the rule of the Mangit dynasty, Ahmed Donish thinks about digging a canal to release water from the Amudarya to Bukhara, and he writes about strengthening the head of the canal by building a dam of stones and rocks. "Kir" is a strong binding construction mixture that was used in place of various types of cement in different types of medieval constructions in its time, and it was widely used in the architecture of Central Asia[ Suyunov S. 1999. p. 35-36 ]. Due to the high quality of construction materials used in the Middle Ages, ancient hydrotechnical works have been preserved intact for many centuries.

Historical works of medieval authors did not record any information about the type of components used in the preparation of construction mixtures and their strength. However, according to the chemical analysis of the "Khonbandi" hydrotechnical facility, the mixture used in the construction of the irrigation facility, which is always under water, is mainly two-component.

It was determined that the "Khonbandi" hydraulic structure contained 2 types of mortar; lime and sand. Plants growing in water: reeds, reeds, and rice husks were burned and turned into charcoal. The mixture of ash and lime formed a high-quality hydraulic mortar. Such a mortar was waterproof and was useful in installing parts of irrigation structures that were constantly exposed to moisture [www.wikipedia.uz. website].

Thus, the medieval builders of the Zarafshan Valley, when constructing water structures, discovered building mortars suitable for each structure, taking into account the effects of moisture, dryness, and heat on the building materials of the structure.

## CONCLUSION

In conclusion, it can be said that the historical and archaeological study of the medieval water structure "Khonbandi" made it possible to create a history of the struggle for water in Central Asia for centuries and a very rich history of the wonderful irrigation techniques created along the way. Currently, similar structures are being built in the foothills of Uzbekistan.

Judging by the mathematical measurements of the Khanbandi dam, the 10th-century irrigators who built it, when building this structure, determined the vertical pressure force of the water at a depth of 16 m, which would accumulate in front of the dam, and the horizontal force that would overturn the structure based on precise

engineering calculations. That is why the base of the Khanbandi dam was made 4 times thicker than the upper part. The thickness of the base is 8 m below and 2 m above. This dam was built on a special project.

The “Khonbandi Dam”, considered the oldest and most magnificent irrigation facility in Central Asia, is impressively constructed with great skill. It is the first water structure in Central Asia to be built based on this law by engineers from Transoxiana, seven centuries before the discovery of the law of "water pressure" by the 17th-century French physicist Blaise Pascal.

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