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Technical Condition of Reservoirs and Scientific Analysis of Their Parameters

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Abstract

The region where the Andijan Reservoir is located has hot summers and relatively cold winters, with an average annual air temperature of +13.3°C. In summer, the absolute maximum air temperature reaches +40.8°C, while the average temperature in July is +24.8°C. In winter, the absolute minimum temperature drops to –31°C. The winter season lasts relatively long.

Keywords:

Introduction

The region where the Andijan Reservoir is located has hot summers and relatively cold winters, with an average annual air temperature of **+13.3°C**. In summer, the absolute maximum air temperature reaches **+40.8°C**, while the average temperature in July is **+24.8°C**. In winter, the absolute minimum temperature drops to **–31°C**. The winter season lasts relatively long.

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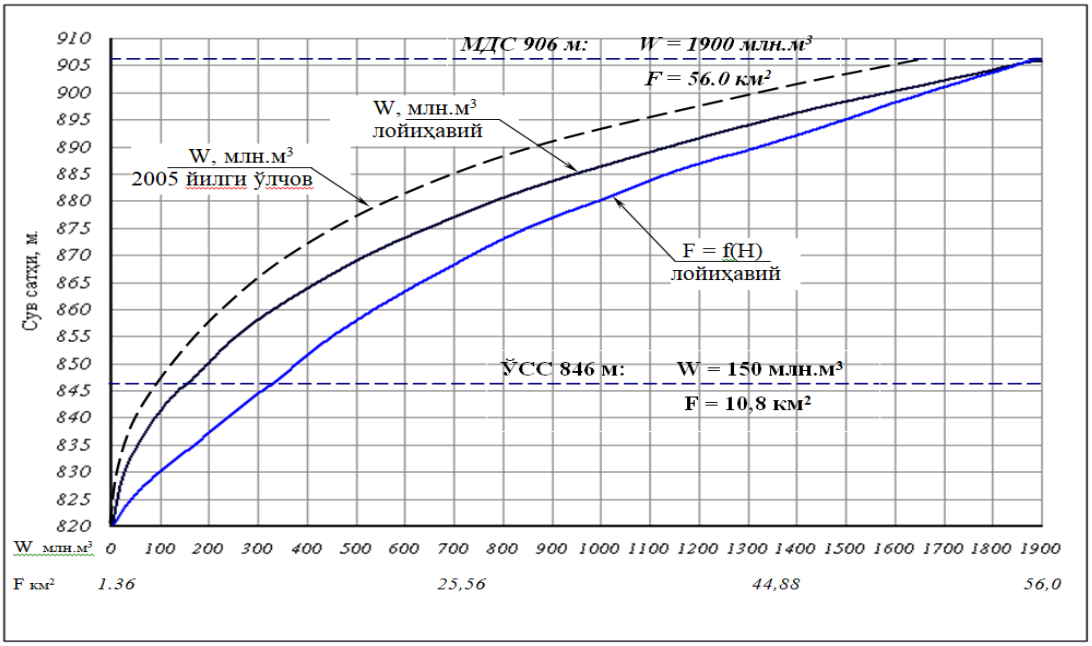
Precipitation mainly occurs during the winter and spring months. The average annual precipitation ranges from **250 to 400 mm** (according to the project documentation, it is accepted as **520 mm**). Most of the precipitation falls between **November and April**, with the peak occurring in **March–April**. The average annual evaporation is **1090 mm**.

Morphometric characteristics of the reservoir (as per design):

Volume, million m3			Length, km (MDS)	Width, max/avg, (km) (MDS)	Depth, max / avg (m), (MDS) (м), (МДС)	The surface of the reservoir, km2		Up to 2 m of water in MDS depth area (km2)	Coastal length (MDS), km	Water level marks, m.	
full	useful	dead				in MDS	at OSSS			Standard humidity level, (MDS)	Dead water level, (O'SS)
1900	1750	150	14	4	98,5 31,2	56,0	10,8	2,2	65,0	906,0	846,0



2-расм. Сув омбори ҳажми ва юзасининг сув сатҳига боғлиқлик графиги.

Hard freezes have not been observed since the Andijan Reservoir has been in operation. Sometimes in December-January, freezing and flow of ice fragments was observed in the lower part of the river, but only during the period of use of the reservoir, i.e. in 2007, freezing was observed in the reservoir and the ice thickness was 20-25 cm.

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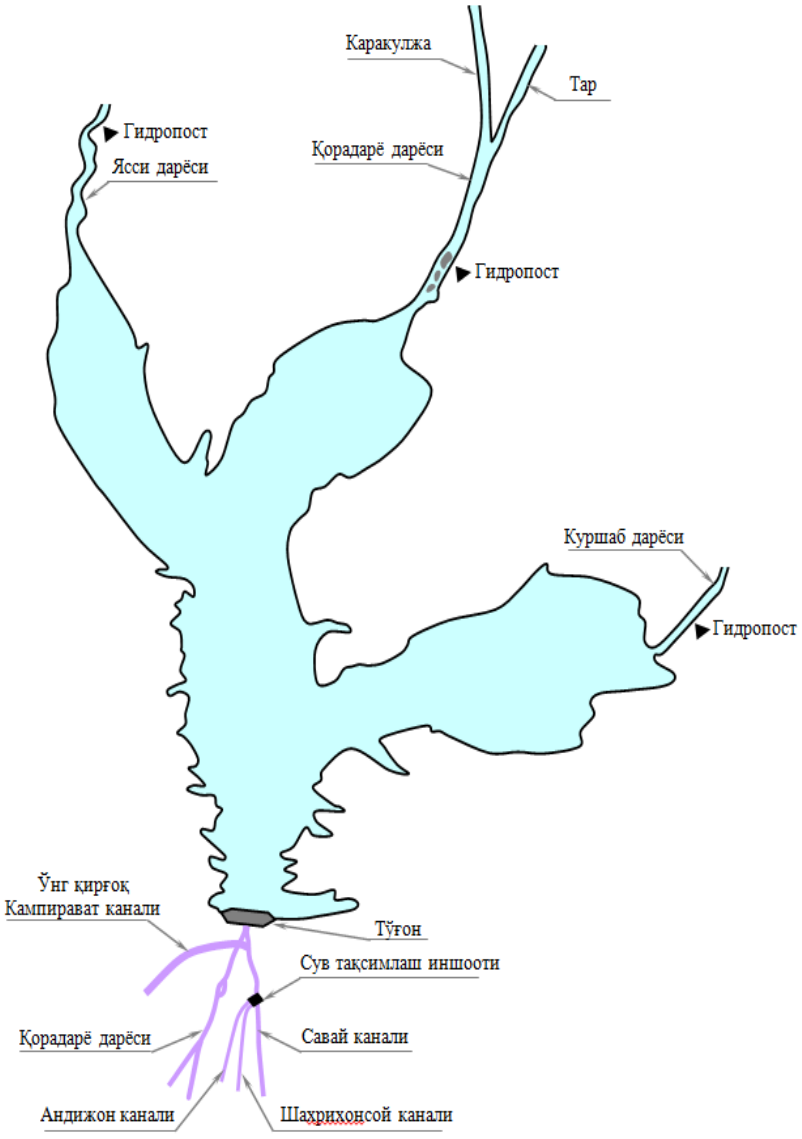

1-расм. Андижон сув омборининг жойлашиш схемаси.

In the area where the reservoir is located, the air temperature decreases in autumn-winter and starts to rise in spring-summer, therefore, the minimum drop in water temperature in the reservoir is from +2oS to +5oS degrees in December-January, while the water temperature rises to +10oS to +17oS degrees in April. **Water Temperature and Meteorological Conditions**

During the summer season, the maximum water temperature in the reservoir reaches **+22°C**. In autumn, particularly in **November**, the water temperature varies from **+7°C to +12°C**.

Wave and Wind Characteristics

According to the project data, the **maximum calculated wave height** of the Andijan Reservoir is accepted as **2.3 meters**.

Based on observations during the operational period, the prevailing winds over the reservoir surface are predominantly from the **west and southwest** (especially in winter months).

- The **average wind speed** is **3.4 m/s**,
- While the calculated extreme wind speeds are:
  - **V_1% = 32.0 m/s**,
  - **V_2% = 28.0 m/s**,
  - **V_{10}% = 22.0 m/s**.

Wave observation in a reservoir is carried out during strong winds or storms in order to determine the wave height for future calculations and protective measures. The wave height can be measured using a **wave gauge ruler** or by measuring the **run-up length** of the wave as it strikes and climbs up the **concrete-lined slope of the dam**..

$$h_{1\%} = \frac{l_{zun}}{1{,}4m} \qquad (1)$$

In this case:

- **H1%H_{1\%}H1%** – Wave height with 1% probability of exceedance, in meters.
- **lll** – Run-up length of the largest wave in the sequence of observed waves as it strikes the slope, in meters.
- **m=cotαm = \cot \alpham=cotα** – Coefficient of the dam's upstream slope, where α\alphaα is the slope angle.

A more accurate method can also be used to determine the wave height. After stable wave formation, the wind direction is determined, its speed is measured using a handheld anemometer, and the wave fetch (the distance over which the wind blows across the water surface) is determined from the reservoir basin plan. Then, the wave height is calculated using the following *SANIIRI* formula:

$$h_{1\%} = 0{,}0027 V_w \sqrt{\frac{L}{g}}, \text{ м} \qquad (2)$$

Where:

- **Vw** – Wind speed at a height of 10 meters (or measured at the nearest meteorological station), m/s
- **L** – Wave fetch length (the distance over which the wind blows across the water surface), m
- **g = 9.81 m/s²**

Wind speed conversion:

Vw=1.26·Vw2V_w = 1.26 \cdot V_{w2}Vw=1.26·Vw2

where **Vw2** is the wind speed measured with a handheld anemometer at a height of 2 meters, m/s. For the Andijan Reservoir, the dangerous wave heights generated by eastern winds are **3.1 meters**.

Hydraulic Structures of the Andijan Reservoir

The Andijan Reservoir consists of the following components:

- Reservoir basin
- Concrete dam
- Earth-fill dam
- Water outlet structure
- Spillway
- Hydroelectric power station located within the dam structure

The reservoir basin is located at the confluence of the **Kara Darya**, **Yassy**, and **Kurshab** rivers, situated within the bed of the Kara Darya. At the *Normal Retention Level (NRL)*, the basin has the following morphometric characteristics (according to design data):

- **Total storage capacity** – 1900 million m³
- **Active (useful) storage capacity** – 1750 million m³
- **Basin length** – 14.0 km
- **Maximum width** – 4.0 km
- **Maximum depth** – 98.5 m
- **Surface area** – 56 km²
- **Shoreline length** – 65.0 km

- **Area with depth up to 2 meters** – 2.2 km²

At the *Dead Water Level (DWL)*:

- **Storage volume** – 150 million m³
- **Surface area** – 10.8 km²

Description of the Concrete Arch Dam

The dam is constructed from concrete in the shape of an arch, with paired buttresses (counterforts) installed at the lower section along its full curve. Each section consists of two counterforts, each 5 meters thick, connecting the upper and lower zones. The internal spacing of the counterfort sections is 7.5 meters. The width of the sections increases toward the upstream side and decreases toward the downstream side.

- Upper head section slope coefficient: **m = 0.5**
- Downstream slope varies from **m = 1.0 → 0.5 → 0** (from bottom upward)

(Vertical height measured from elevation mark 886.0 up to the crest of the dam.)

The arch consists of **33 sections**, connected at both ends to the banks.

- **Width of sections along dam axis:** 25.0 m
- **Width at lower part (to diaphragm):** 17 m
- **Crest length:** 875.0 m
- **Maximum height:** 119.7 m

Parapets with a height of **1.2 m** are installed on both upstream and downstream sides.

All watertight sections of the dam have identical internal and external configurations. The upper part of each section is circular, while the intermediate spaces between sections consist of two semi-circular flattened shapes. The lower parts are not interconnected. The maximum thickness of the upper part of the section is **14.1 m**, and the minimum is **8.1 m**.

References

1. Beleskov, B.I., Gapparov, F.A., & Sadykov, A.Kh. Filling and Drawdown of Reservoirs under Low-Water Conditions. In: Reclamation and Water Management: Collection of Scientific Papers / SANIIRI. Tashkent, 1997, pp. 130–133.
2. Gapparov, F.A., & Sodiqov, A.Kh. Model Guidelines for the Technical Operation of Reservoirs. Tashkent, 2007. 75 p.
3. Cadastre of Hydraulic Structures of the Andijan Reservoir. Gosvodkhoznadzor, Tashkent, 2008.
4. Rules for the Operation of the Andijan Reservoir. Sredazgiprovodkhlopok, 1981. 164 p.
5. Sodiqov, A.Kh., & Gapparov, F.A. Dispatching Schedule for the Operation of the Irrigation Reservoir. Collection of Scientific Works of SANIIRI. Reclamation and Water Management. Tashkent, 2000, pp. 56–59.