

**Increase of operational efficiency hydroelectric power station of Akhangaran
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Повышение эксплуатационной эффективности Ахангаранской ГЭС
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Abstract: *in this article it is offered the main technical characteristics of the hydropower equipment of Akhangaran hydroelectric station and it is given fetters of increase of operational efficiency of hydroelectric power station.*

Аннотация: *в данной статье рассматриваются вопросы повышения эксплуатационной эффективности Ахангаранской ГЭС и технические характеристики гидроэлектрической станции.*

Keywords: *consumption, reservoir, consumer, efficiency, hydrotechnical, construction, tunnel, flow, source, power.*

Ключевые слова: *потребление, резервуар, потребитель, эффективность, гидротехника, конструкции, туннель, расход, источник, мощность.*

Gross consumption of primary energy resources since the beginning of the 20th century has increased more than by 10 times. All majority of mankind begins to realize an extremity, exhaustibility and nonregenerability of traditional power sources (coal, oil, a gas), and also the brought damage to environment from their use. According to scientists, there will be enough oil and gas only for the next several decades, coal for 5 – 6 centuries. The share of these sources in modern balance of energy consumption makes: oil – 38 %, gas of 20 %, coal – 27 %, i.e. in general – 85 % of the general consumption. It is obvious that on the one hand it is necessary to save and reduce world-wide energy consumption, and with another – to open and use new power sources.

Estimating a current state of technical means of an used of renewables, (except hydraulic), it isn't possible to replace in power supply the available traditional power sources, renewable. According to the available data at the level of 2010 extent of replacement with renewable sources of traditional ways in world power supply can make no more than 6-12 %. For the Republics of the CIS such share is even less. In too time use of the renewed source for satisfaction of needs of small, especially isolate consumer, is very effective and profitable [1, 2].

For effective use of a hydroenergy potential of water currents of the Republic of Uzbekistan by the Cabinet the Resolution No. 476 «About development of a small-scale power generation in the Republic of Uzbekistan» is accepted on December 28, 1995.

The resolution has approved «The program of building of hydrotechnical installations at the operated water management objects». Among the fast paid-back power objects it is offered to design and construct hydroelectric power station at the reservoir of Akhangaran.

The reservoir of Akhangaran has been created water retaining 80 by a meter dam in 1980. As a part of constructions of the water-engineering system there is water waste a tunnel including pressure head and free-flow sites.

In the place of transition of pressure head part of the tunnel to free-flow the fountain well in which clearing of energy of water flow upon transition to the free-flow mode is carried out is constructed.

The resolution offers to construct the hydroelectric power station developing the electric power for her use in a national economy instead of aimless clearing of energy of a stream.

The present working draft offers in the location on the water waste tunnel (the tunnel of "removal" of water from coal mine) to construct hydroelectric power station, use energy of a water waste stream.

On design of hydroelectric power station in the location on the water waste tunnel of a fountain well Minvodkhozy RUZ the task for development of «The working draft of hydroelectric power station at the reservoir of Akhangaranis given to JSC «Hydroproject».

In the presented approved part of the working draft of hydroelectric power station at the reservoir of Akhangaran configuration, a design of constructions of hydroelectric power station at the reservoir of Akhangaran are considered, the hydropower equipment is picked up, power economic calculations are executed, the project of the organization of construction is executed and estimated cost of hydroelectric power station is determined.

◇ Location of object - the Tashkent region, Angren, near coal mine of the city of Angren.

◇ the reservoir of Akhangaran - irrigational appointment, with a useful volume of 188,34 million m³. are a part of constructions of a reservoir:

- a stone and earth dam, up to 100 m high and length on a crest of 1653 m;
- deep water intake;
- the pressure head tunnel, with the room of locks;
- fountain well;
- free-flow tunnel, 3352 m long.

◇By the present project it is provided instead of aimless clearing of energy of the water flow created by a reservoir in a fountain well to construct the hydroelectric power station developing the electric power for her use in a national economy.

Table 1. Technical indicators of MHES at the reservoir of Akhangaran

Normal Retaining Level (NRL), m	1072,5
Level of Dead Volume (LDV), m	1011,44
Minimum level of drawdown of a reservoir (GVB), m	1024,0
Rated capacity, MW	21,0
Settlement expense, m ³ /s	41,6
Pressure, m	
- maximum	70,0
- minimum	27,0
- settlement	58,0
Mean annual development, GW-h	66,5
Number of units, piece	2

Table 2. Technical characteristic of the hydropower equipment Water-wheel

1	Type	HLJF 3001 B-LJ-160
2	Rated power at a settlement pressure of $N_r = 58,0$ The maximum efficiency (without transfer)	10,9 MVt
3	Maximum power	10,9 MVt
4	Rotation frequency Nominal angle speed	375 RPM 870 RPM
5	Nominal diameter of the driving wheel	1,6 m
6	Expense via the turbine at N_r and N_{nom}	20,8 m ³ /s
7	Suction height at N_r and N_{nom}	Minus 1,908 m
8	The maximum efficiency (without transfer)	94,2%

At the reservoir of Akhangaran are a part of constructions of MHES:

- the water bringing path consists consists from: two junction points of turbine conduits of hydroelectric power station to the existing tunnel of «Branch», two strings of turbine conduits;
- the open building of station, with two units of hydroelectric power station;
- the taking-away hydroelectric power station path, including: the interfacing site, a diversion channel and a junction point of hydroelectric power station to the existing free-flow tunnel of «Branch»;
- constructions of delivery of power of hydroelectric power station;
- on hydroelectric power station the hydropower and electrotechnical equipment of production People's Republic of China is installed;
- delivery of the hydropower and electrotechnical equipment of hydroelectric power station of production by CNEEC People's Republic of China corporation on the basis of a soft loan of the Chinese Government.

Table 3. Hydrogenerator

1	Type	SF10.5-18/3250
2	Ratedpower	13,1258 MVt
3	The power factor is nominal	0,8
4	Rotation frequency Nominal angle speed	333,3 RPM 656,0 RPM
5	Rated voltage	6,3 kV
6	Currentfrequency	50 Hz
7	The maximum efficiency of the generator at the rated power and	97%

	$\cos\varphi = 0,80$	
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