OPPORTUNITIES OF GEOTHERMAL ENERGY FOR HEATING BUILDINGS IN THE REPUBLIC OF UZBEKISTAN

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Abstract . This article presents a scientific approach to calculations on the use of geothermal water located at the Noviy guzar mine in the Bukhara-Khiva region, as well as a drop in water temperature during the extraction of this water.

Keywords: Geothermal energy, hydrotherm , geyser.

Introduction. The continuous growth of energy consumption and the depletion of hydrocarbon reserves require the increasing use of renewable energy.

The development of alternative energy sectors using renewable energy sources includes:

1) geothermal energy - the use of the deep heat of the earth
2) use of wind energy
3) solar energy
4) use of flow and flow energy.

Renewable energy sources, in addition to their economic benefits, also help prevent further pollution of the biosphere, which is becoming increasingly important in the context of the deteriorating environmental situation. Today, geothermal energy is considered the most developed and economically efficient.

Geothermal energy is heat energy that has been released from the Earth's core for hundreds of millions of years. This temperature radiates from the Earth's core and decreases as you move away from the center. Based on the results of geophysical research, the temperature in the core of the earth reaches 3000-6000°C. This temperature gradually decreases as it approaches the surface of the planet from the center of the planet (see Figure 1) [1].

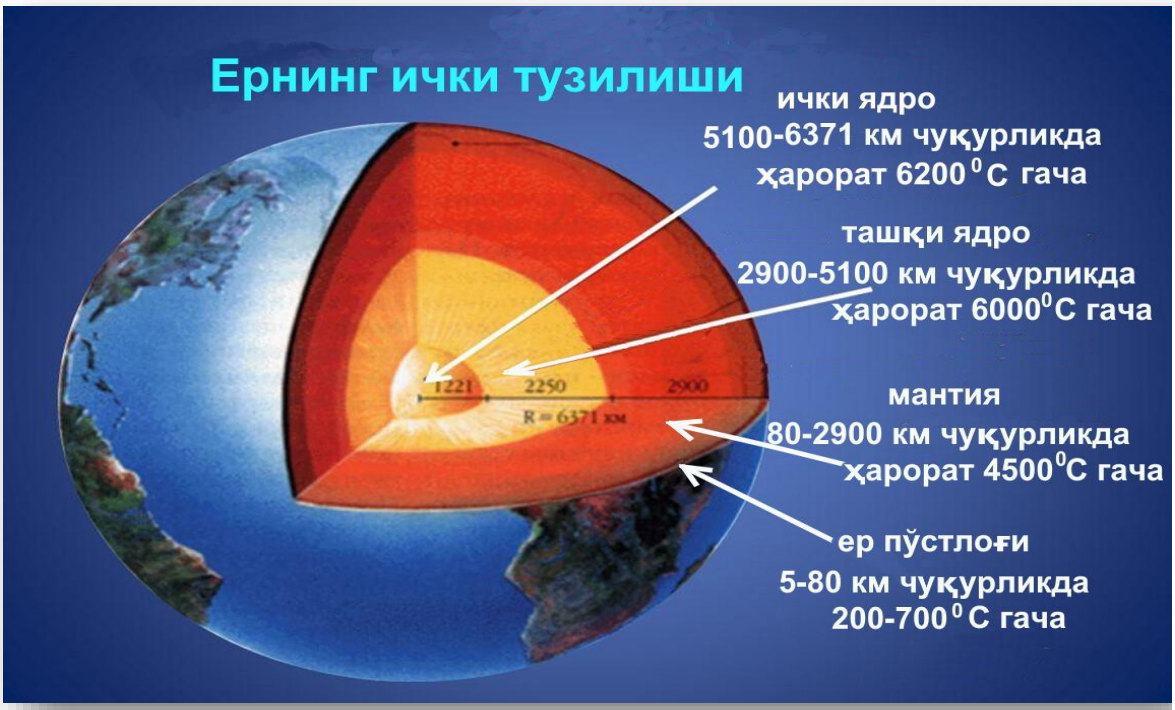

Figure 1. Earth's geothermal temperature.

Thousands of volcanic eruptions, movements of tectonic plates, and earthquakes indicate the presence of high-energy energy deep within the Earth. Scientists around the world believe that the planet's thermal field is caused by the decay of radioactive elements underground, as well as the gravitational separation of nuclear matter [2].

To date, mankind has used geothermal energy in the near-surface part of the Earth, i.e. in active volcanic and seismic areas. These countries are the USA, Italy, Iceland, Mexico, Japan, New Zealand, Russia, the Philippines, Hungary and El Salvador. In these areas, the Earth's internal heat, with temperatures of up to 300°C, rises to the surface in the form of boiling water or steam and, in most cases, erupts outward in the form of hot fountains (geysers). Geysers in Yellowstone Park in the USA, Kamchatka, and Iceland are world famous [3].

While emerging geothermal energy is being used in several leading countries of the world, scientific research in the field of geothermal energy is also being conducted in Uzbekistan, and the time has come to use the available energy.

The main part. As a result of the research of the authors of the article, with the assistance of the " Institute of Geology and Exploration of Oil and Gas Fields of the Republic of Uzbekistan ", it was determined that the following geothermal resources exist in the Republic of Uzbekistan:

Hydrogeological data in the Bukhara-Khiva oil and gas region

Table 1.

No.	Field and mines	Well No.	Test range, m	Density of geothermal water, kg/l	Geothermal water pressure, 1/10 MPa	Temperature, ^{0}C
1.	New guzar	3	2987-3003	1.06	319.99	114
2.	New Guzar	1	3192-3284	1,075	346.57	113
3.	Chilgumbaz	1	3041-3035	1.04	583.15	113
4.	Kamashi	8	3320-3312	1.07	571.92	124
5.	New Karatepa	7	3572-3569	1.06	485.00	116
6.	Mangit	3	3596-3590	1,065	471.30	121.5
7.	East Aizavot	1	3660-3550	1.06	351.62	120
8.	Chatyrtepa	1	3523-3510	1,059	375.13	128
9.	Jambulak	2	3760-3748	1.14	513.13	115
10.	Buzahur	3	3486-3478	1,065	389.16	126
11.	Kuruksay	2	3157-3340	1.06	459.73	110
12.	Mavlyankuduk	1	3522-3504	1,075	357.58	123
13.	Finally	1	3182-3166	1.07	576.12	116

When these hydrothermal reserves are extracted from the earth, the temperature naturally drops. Below, we calculate the temperature of the geothermal water coming out of the Novy Guzar mine from a depth of about 3300 meters before it rises to the surface of the earth.

A SE 2500-60-11-1 series pump is selected for water circulation [4] in the system (see Figure 2). The design features of this pump are as follows:

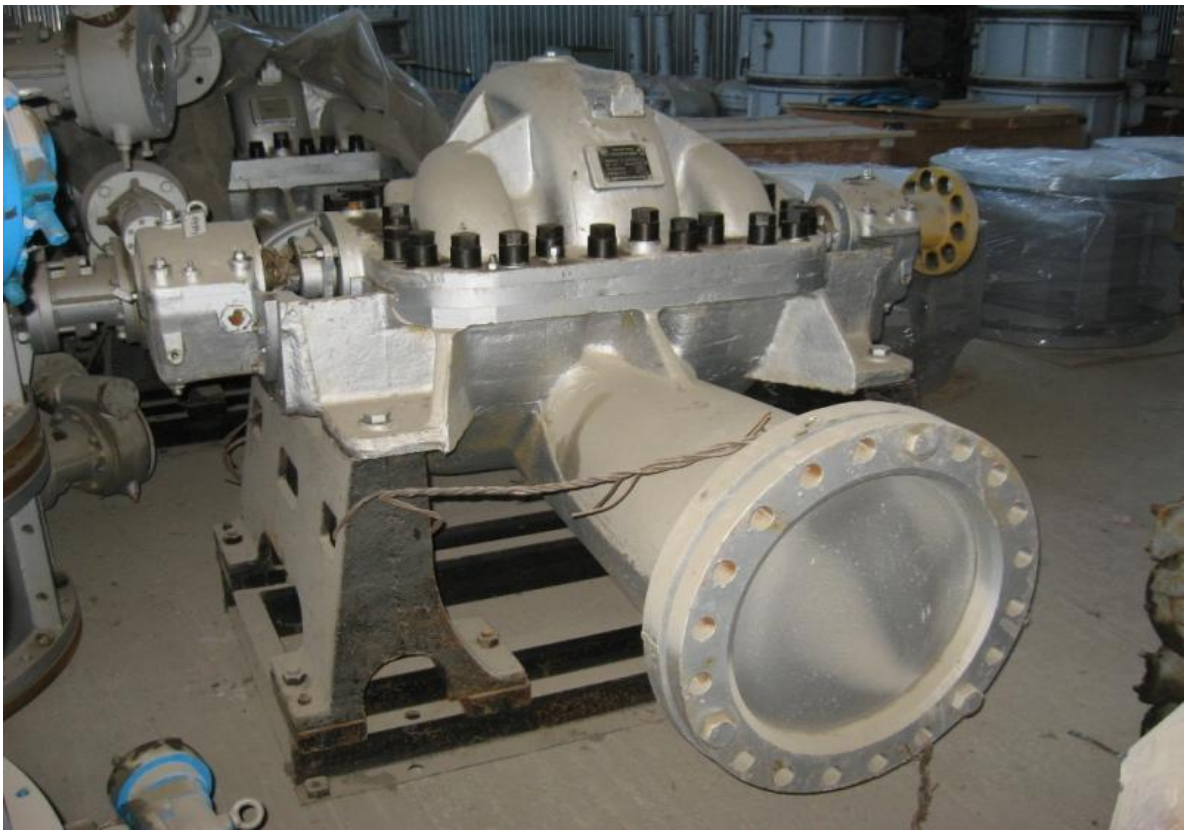

Figure 2. SE2500-60-11-1-Hot Water Pump.

- Pump name: SE2500-60-11-1
- Volume speed 2500 m3/hour
- Head 60 m
- Power 630 kW
- Weight 6430 kg
- The rotation frequency is 1500 rpm
- Overall dimensions are 3690x2305x2010 mm
- Liquid temperature up to 180°C
- The inner diameter of the pressure pipe is 500 mm
- The inner diameter of the suction pipe is 600 mm
- The inlet pressure to the pump is 11 kg.force/cm2

The temperature drop of water flowing through the pipe $\tau_{охир} = t_{ў.м} + (\tau_{даст} - t_{ў.м}) * e^{-\left(\frac{(1+\beta)*L}{C_p*G*R_{из}}\right)}$ is determined by the formula [5].

Novyy guzar geothermal the depth of the mine is about 3300 meters. In practice, it has been found that the temperature increases by approximately 30 C every 100 meters into the ground . Therefore, to ensure an accurate calculation, we divide the total height into 33 sections of 100 meters each. The surface temperature is defined as:

The water temperature change in the system is calculated as follows for the first 100 meters:

$\mathbf{t_{ў.м}}$ —ambient temperature in the geothermal field, 111.5 ^{0}C;

$\boldsymbol{\tau_{даст}}$**-** the average initial temperature of geothermal water is 113 ^{0}C;

β- the coefficient taking into account the length of the pipe is 0.2;

L- pipe length-100 m;

$\mathbf{C_p}$ —heat capacity of water 4 207 J /(kg· ^{0}C) ;

ρ- water density according to the table of physical properties of water - 948.31 kg/m ^{3};

$\mathbf{V_{тез}}$ —volume speed of water - 0.6944 m3/sec;

$\boldsymbol{\lambda_{из}}$ —thermal conductivity coefficient of used glass cotton heat insulating material - 0.07 W/m ^{0}C;

$\mathbf{D_{кув}}$ —pipe diameter - 500 mm = 0.5 m ;

$\boldsymbol{\delta_{из}}$ —insulating material thickness - 6 cm=0.06 m;

According to the above information, the resistance of heat insulating material to heat transfer:

$$\mathbf{R_{из} = \frac{1}{2 * \pi * \lambda_{из}} * ln\left(\frac{D_{кув} + 2 * \delta_{из}}{D_{кув}}\right) =}$$

$$\mathbf{= \frac{1}{2 * 3,14159 * 0,07} * ln\left(\frac{0,5 + 2 * 0,06}{0,5}\right) =}$$

$$\mathbf{= 0,4891 м^0 С/Вт;}$$

Of water mass flow rate :

$$\mathbf{G = \rho * V_{тез} = 948,31 * 0,6944 = 658.51\ kg/sec}$$

Of water temperature at the end of the pipe

$$\tau_{охир} = t_{ў.м} + (\tau_{даст} - t_{ў.м}) * e^{-\left(\frac{(1+\beta)*L}{C_р*G*R_{из}}\right)} =$$

$$111,5 + (113 - 111,5) * e^{-\left(\frac{(1+0,2)*100}{4207*658,51*0,4891}\right)} = 113^0C$$

When calculating the change in water temperature for the second 100 meters, the final temperature of the previous 100 meters is taken as the **initial temperature** τ and is recalculated in the above sequence. and the results are tabulated.

Results. Novyy guzar geothermal The results of calculations for the mine are summarized in the following table:

Account point number	Distance from the well to the calculation	$t_{ў.м}$- Ураб standing ambient temperature	T_{hand} - the temperature of the water leaving the	L-pipe length	S_r- heat capacity of water	ρ-water density	V_{is} the volume velocity of water .	l_{iz}- the thermal conductivity of the	$D_{qu\ v}$- pipe diameter	d is the thickness of the insulating material	G-water massive speed	R is the heat transfer coefficient of the material . resistance	$T_{axis\ r}$- temperature at the end of the pipe
1	100	111.5	113	100	4207	948.31	0.6944	0.07	0.5	0.06	658.51	0.4891	113
2	200	108.5	113	100	4207	948.31	0.6944	0.07	0.5	0.06	658.51	0.4891	112,999
3	300	105.5	112,999	100	4207	948.31	0.6944	0.07	0.5	0.06	658.51	0.4891	112,999
4	400	102.5	112,999	100	4207	948,311	0.6944	0.07	0.5	0.06	658.51	0.4891	112,998
5	500	99.5	112,998	100	4207	948,312	0.6944	0.07	0.5	0.06	658.51	0.4891	112,997
6	600	96.5	112,997	100	4207	948,313	0.6944	0.07	0.5	0.06	658.51	0.4891	112,995
7	700	93.5	112,995	100	4207	948,314	0.6944	0.07	0.5	0.06	658.51	0.4891	112,993
8	800	90.5	112,993	100	4207	948,315	0.6944	0.07	0.5	0.06	658.51	0.4891	112,991
9	900	87.5	112,991	100	4207	948,317	0.6944	0.07	0.5	0.06	658.51	0.4891	112,989
10	1000	84.5	112,989	100	4207	948,318	0.6944	0.07	0.5	0.06	658.51	0.4891	112,987
11	1100	81.5	112,987	100	4207	948.32	0.6944	0.07	0.5	0.06	658.51	0.4891	112,984
12	1200	78.5	112,984	100	4207	948,322	0.6944	0.07	0.5	0.06	658.52	0.4891	112,981
13	1300	75.5	112,981	100	4207	948,325	0.6944	0.07	0.5	0.06	658.52	0.4891	112,978
14	1400	72.5	112,978	100	4207	948,327	0.6944	0.07	0.5	0.06	658.52	0.4891	112,974
15	1500	69.5	112,974	100	4207	948.33	0.6944	0.07	0.5	0.06	658.52	0.4891	112.97
16	1600	66.5	112.97	100	4207	948,333	0.6944	0.07	0.5	0.06	658.52	0.4891	112,966
17	1700	63.5	112,966	100	4207	948,336	0.6944	0.07	0.5	0.06	658.52	0.4891	112,962
18	1800	60.5	112,962	100	4207	948.34	0.6944	0.07	0.5	0.06	658.53	0.4891	112,957
19	1900	57.5	112,957	100	4207	948,343	0.6944	0.07	0.5	0.06	658.53	0.4891	112,952
20	2000	54.5	112,952	100	4207	948,347	0.6944	0.07	0.5	0.06	658.53	0.4891	112,947
21	2100	51.5	112,947	100	4206.9	948,351	0.6944	0.07	0.5	0.06	658.53	0.4891	112,941
22	2200	48.5	112,941	100	4206.9	948,355	0.6944	0.07	0.5	0.06	658.54	0.4891	112,936
23	2300	45.5	112,936	100	4206.9	948,359	0.6944	0.07	0.5	0.06	658.54	0.4891	112.93
24	2400	42.5	112.93	100	4206.9	948,364	0.6944	0.07	0.5	0.06	658.54	0.4891	112,924

25	2500	39.5	112,924	100	4206.9	948,369	0.6944	0.07	0.5	0.06	658.55	0.4891	112,917
26	2600	36.5	112,917	100	4206.9	948,374	0.6944	0.07	0.5	0.06	658.55	0.4891	112.91
27	2700	33.5	112.91	100	4206.9	948,379	0.6944	0.07	0.5	0.06	658.55	0.4891	112,903
28	2800	30.5	112,903	100	4206.9	948,385	0.6944	0.07	0.5	0.06	658.56	0.4891	112,896
29	2900	27.5	112,896	100	4206.9	948.39	0.6944	0.07	0.5	0.06	658.56	0.4891	112,888
30	3000	24.5	112,888	100	4206.9	948,396	0.6944	0.07	0.5	0.06	658.57	0.4891	112,881
31	3100	21.5	112,881	101	4206.9	948,402	0.6944	0.07	0.5	0.06	658.57	0.4891	112,872
32	3200	18.5	112,872	102	4206.9	948,408	0.6944	0.07	0.5	0.06	658.57	0.4891	112,864
33	3300	15.5	112,864	103	4206.9	948,415	0.6944	0.07	0.5	0.06	658.58	0.4891	112,855

Novyy passes through the proposed system geothermal The temperature of the water coming out of the mine drops to 0.145 ^{0}C and rises to the surface.

Conclusion / recommendations. In conclusion, it can be said that Novyy will pass in the proposed system geothermal The temperature of the water emerging from the deposit rises to the surface almost unchanged. Taking into account the sharp decrease in natural fuel reserves in recent years, in most of the considered deposits in the Republic of Uzbekistan, geothermal waters emerge to the surface almost unchanged in their temperature. The use of these geothermal waters for heating buildings is an urgent problem of today. It creates the opportunity to solve.

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