Development of Simulation Model of Power Installations for power Supply for Agricultural Consumers

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ABSTRACT

This problem is urgent, since, according to the forecasts of most scientists, the reserves of natural resources used in the electric power industry have been rapidly declining lately, due to the growth of human energy needs. The development of energy is a very important task that can solve the problem of lack of fuel to meet the needs.

Keywords: Renewable Energy Policy Network, hydroelectric power station, RES, Wakelocks, Low Memory Killer, Alarm, Logger

I. Introduction

In the depleted oil fields in the southern part of the Fergana intermountain depression, where the Altyaryk region is located, it is often found in wells with manifestations of geothermal mineralized water [1-3].

Geothermal water located on the territory of the Republican sanatorium for veterans of war and labor "Altyaryk" is also formed as a result of the penetration of infiltration water into the aquifer of the Chimion anticline structure, more in the northern part of the structure, and much less in the southern part. Therefore, in the northern part of the Chimion anticline structure, chloride-bicarbonate and chloride-sulfate waters with low and medium mineralization are formed. However, due to the slow water exchange in the southern part of the anticline structure, sodium chloride waters with a brine concentration are formed. The content of hydrogen sulfide in underground water is from 112 to 476 mg/l, i.e. the concentration of hydrogen sulfide water is strong or very strong. The ratio between sodium and chlorine varies from 0.61 to 0.82 [4-9].

A schematic map of the tectonics of the southern edge of the Fergana intermountain depression and prospective areas for geothermal hydrogen sulfide waters is shown in Figure 1.

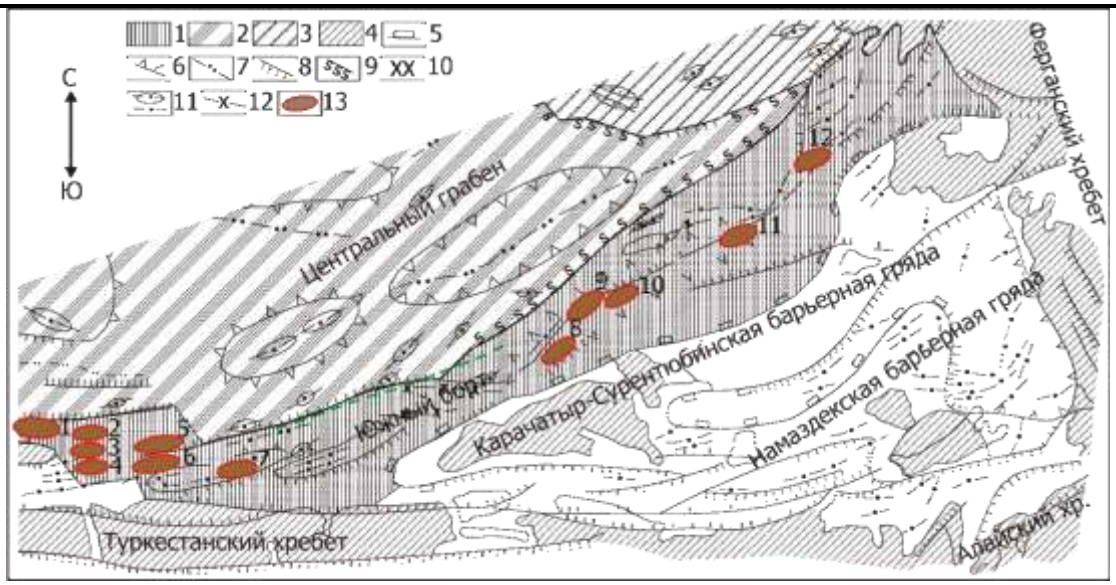

Fig. 1. Schematic map of the tectonics of the southern side of the Fergana intermountain depression and prospective areas for geothermal hydrogen sulfide waters.

1 - South side; 2 – central graben; 3 - North side; 4 – outcrops to the surface before the Mesozoic formations; 5 - boundaries of barrier ridges; 6 - boundaries of anticlinal zones, uplifts; 7 - axes of deflections; 8 – discontinuities expressed on the surface up to the Mesozoic basement and in the cover; 9 - flexures; 10 - structures of the third order; 11 – anticlinal folds in Paleogene and Mesozoic deposits; 12 – axes of non-root anticlinal folds only in Cenozoic molasses; 13 - promising areas for geothermal waters (numbers in the figure).

II. Methodology

The geothermal waters of the southern edge of the Fergana depression belong to the group of infiltration waters and leaching brines with the modern process of biochemical sulfate reduction. The class of these waters is defined as infiltration waters formed in anticlinal half-open oil-bearing structures, similar to the Chimion structure. Water-bearing rocks are carbonate and terrigenous rocks, oil-bearing. The nature of the water exchange is more or less significant in various geostructural conditions. At the deposits of hydrogen sulfide waters, the main processes are: leaching and dissolution of sulfate minerals of water-bearing deposits; biochemical sulfate reduction using dispersed bitumen and accumulation of hydrocarbons. The value of the redox potential varies from 105 to 370 MW in the waters of the oil-bearing horizon, in which hydrogen sulfide waters are formed. The temperature of hydrogen sulfide waters at the deposits of Northern Sokh, Chimion, Palvantash, Southern Alamyshik and Chimion ranges from 15 to 40 ℃; Andijan - from 30 to 40 ℃. The main components of hydrogen sulfide waters in the waters of the oil-bearing horizon are formed from the dissolved gas of hydrogen sulfide, carbonate-anhydride, nitrate and hydrogen sulfide water [10-14]. The main components of the ionic composition of water are chloride and sodium.

Thermal waters are formed in a number of oil fields of the southern side of the Ferghana artesian basin due to the fulfillment of natural specific geological conditions. These natural specific geological factors are:

- Lithofacies composition of water-bearing rocks, first of all, the presence of sulfate-bearing sediments and oil and gas bearing complexes;
- Geostructural conditions and stratigraphic confinement; hydrogeochemical situation;
- hydrodynamic conditions;
- geothermal environment.

Based on the analysis of these factors, a schematic map of the distribution of various types of hydrogen sulfide geothermal water

deposits in the southern part of the Fergana artesian basin was compiled. The map shows the boundaries of the development of thermal hydrogen sulfide waters, oil fields that form hydrogen sulfide thermal waters, the separation of the anticlinal structure by hydrogeological groups, the distribution of hydrogen sulfide waters by concentration and by main types [12-14].

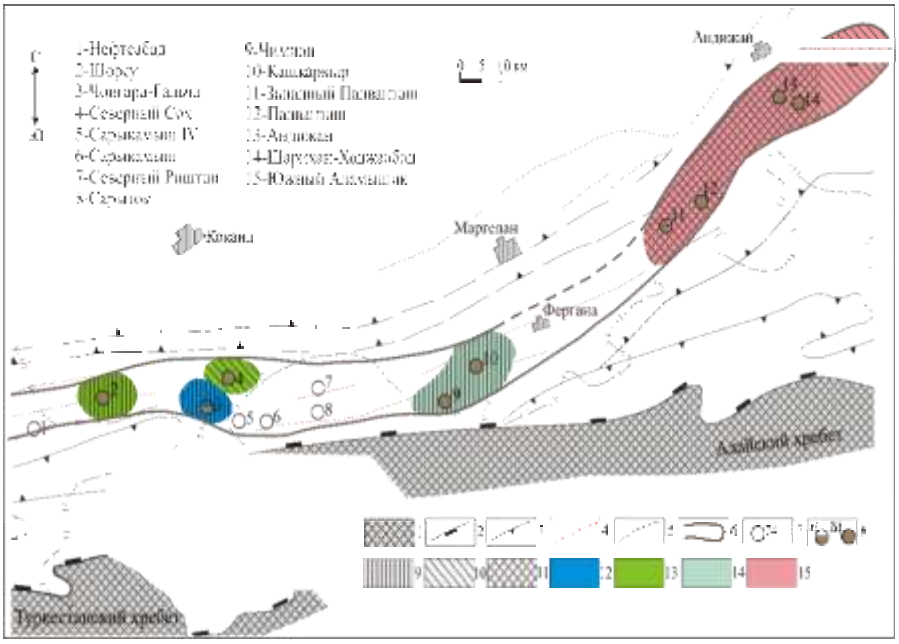

Fig.2. Schematic map of the distribution of various types of deposits of geothermal hydrogen sulfide waters in the southern part of the Ferghana artesian basin.

1 - outcrops of folded basement rocks on the surface; 2 - the boundary of the depression; 3 – boundary of tectonic zones; 4 - main violations; 5 - state border; 6 - boundary of the zone of development of hydrogen sulfide waters; 7 - deposits where hydrogen sulfide waters are formed; 8 – hydrogen sulfide content, (mg/l):
a - 10-50 and 50-100; b - more than 100.

Selected structures by groups:

9 – hydrogeological open structures; 10 - deeper deposits of artesian slopes; 11 - deep deposits of artesian basins and closed positive structures.

The main types of hydrogen sulfide waters:

12 - bicarbonate-sulfate calcium, chloride-hydrocarbonate sodium, chloride-sulfate sodium waters with weak and low mineralization;

13 - chloride-sulfate sodium, chloride sodium-calcium waters of high salinity and brines;

14 - chloride-hydrocarbonate sodium, chloride-sulfate sodium, chloride sodium-calcium waters with mineralization from low to brine;

15 - chloride sodium-calcium waters with brines.

The results of a genetic analysis of the potential of geothermal waters in the territory of the Republican sanatorium for war and labor veterans "Altyaryk" showed that there are practically large reserves of heat from the bowels with a temperature of 39 to 50 ℃. Drilling for oil and gas, and partly for water, discovered these underground artesian pools of thermal waters, covering an area of several hundred square kilometers.

As a rule, artesian basins located in the plains and foothills contain water with a temperature of 50-100 ℃ at a depth of 3-4 km.

Calculations of thermal water reserves are based on available data on the volumes of gravitational waters contained in the layers, the volumes of the aquifers themselves, and the reservoir properties of the rocks that compose them. Thermal water reserves represent the total amount of identified thermal waters located in the pores and cracks of aquifers, having a temperature of 40-200 ℃,

mineralization up to 35 g/l and a depth of up to 3.5 thousand m from the day surface.

III. Results And Discussion

The geothermal energy of the sanatorium, available in the form of heat released from the bowels of the Earth, in the form of hot water, the main advantage of which is the possibility of its use in the form of geothermal water or a mixture of water for the needs of hot water heat supply, for generating electricity or simultaneously for all three purposes, its practical inexhaustibility, complete independence from environmental conditions, time of day and year. An important advantage of using geothermal energy should be highlighted, which consists in ensuring a stable generation of a consumer's supply of thermal or electrical energy compared to solar, wind and even water energies, with their significant variability during the seasons of the year and day. The advantage of the geothermal system is the effective long-term,

The use of geothermal energy for space heating has a beneficial effect on the environment. Geothermal water sources of energy are considered renewable in contrast to carbonaceous fuels such as coal, oil and gas.

Electricity supply, space heating, heating of therapeutic pools is one of the main usesgeothermalenergy. That's why,emerging by gravity to the surface and rising up to 20 m from the Earth's surface under a pressure of 2 kg / s in the form of hot artesian geothermal water with a temperature of up to 40 ℃ and a capacity of 37 l/s is relevant forRepublican sanatorium for war and labor veterans "Altyaryk".

The water body (Figure 3) for the installation of a hydroelectric unit (geothermal well) is located directly on the territory of the Republican sanatorium for war and labor veterans "Altyaryk".

Fig. 3 - Geothermal borehole tower of the sanatorium "Altyaryk".

Currently, in the Republican sanatorium for war and labor veterans "Altyaryk" and in the adjacent territories, geothermal water is mainly used for medicinal purposes. Industrial buildings of the sanatorium are heated by burning natural gas and coal. Due to shortages of natural gas and electricity in the winter, space heating problems and power outages

often occur. The electrical energy generated by the Micro-HPP is used to power the buildings and territories of the sanatorium. Therefore, no costs are required for the construction and operation of overhead power lines.

The following parameters of a geothermal well are determined for the placement of a Micro-HPP (Fig. 4.):

Fig. 4 - View of the geothermal well of the sanatorium "Altyaryk" and pressure readings in the well.

- The volume of water that can be passed through the hydraulic unit (culvert) without causing damage to the environment and will provide the maximum efficiency of the turbine is determined by the maximum well productivity, which corresponds to 37 l/s or 133.2 t/h or 3,200 t/day;
- Water pressure - the outlet of geothermal water from the well by gravity, at a temperature of up to 40 ℃, rises up to 20 m in height from the earth's surface, while the pressure reaches 2 kgf/cm^2.The above parameters are basic when choosing the type of unit and its installed capacity.

The choice of the end consumer is one of the decisive factors in the selection of a hydroelectric unit, since its parameters may not be able to meet the required needs.

Conclusions

Currently, there are a number of methods for collecting geothermal and solar energy. However, they do not fully study the use of geothermal and potential energy, evaluate the conduct of research in the field of energy of industrial, municipal and agricultural installations, the development of small hydro units that require increased technical consumption, rational control systems for solar energy - geothermal energy installations.

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