

Khankala thermal water deposit of the Chechen Republic and resources for the implementation of geothermal circulatory systems

MAGOMED SHAVALOVICH MINTCAEV, KHASAN ALIMULTANOVICH TAYMASKHANOV, TATIANA GEORGIEVNA CHURIKOVA, Chechen Republic, Russia

In the article, the perspective development of geothermal resources in the Chechen Republic is considered and data on the perspective Khankala deposits of thermal waters is stated. For the estimation on the feasibility of the creation of circulatory systems, the authors have created a 3D model of the most productive

XIII layers of this deposit. This allows for proposals of possible locations of water-intake and water injection wells. In conclusion, recommendations for the location of the wells and the creation of a circulatory scheme of intake of deep heat in the Khankala deposit of thermal waters are given.

1 Introduction

Quick growth in consumption of different types of energy and the increase in prices of hydrocarbon material in the last years increases the need for alternative sources of energy [1].

The North Caucasus has a lack of sufficient fossil fuels needed to fulfill the growing energy demand from the economy and social sphere of the region. However, the region hosts substantial resources of geothermal water, which may be utilized as an energy supply. Specifically, this water can be used as a heating supply, which would allow a reduction in the consumption of hydrocarbon material. The Chechen Republic has vast potential in geothermal water power production [2].

The Chechen Republic takes the third place among regions of the Russian Federation in abundance of deposits of geothermal water, giving way only to the Dagestan and Kamchatka regions. The developed deposits of geothermal water in the republic are made up of 14 deposits producing 64,680 m³/d. Presently, only two deposits are stock approved by SRC in volume, 16,250 m³/d (Khankala – 15,100 m³/d and Goytinsk – 1,150,000 m³/d), making ~ 25 % of the developed deposits [3, 4].

The most studied perspective deposit of thermal water is Khankala, due to its potential, geological construction, and its physico-chemical characteristics of thermal water.

Technical and scientific problems, regarding deposit exploitation, are connected with the complex configuration of the geothermal water reservoir, insufficient information on level of hydro-geological characteristics of the reservoir, and physico-chemical characteristics of the fluid.

The impact of thermal waters on the environment is uncertain, as they contain such substances and elements as selenium, mercury, and phenols, arsenic, lead, etc. [5-7]. Toxic gases are also emitted from geothermal water, specifically hydrogen sulfide, methane and ammonia. The discharge of such waters to the earth's surface and in the natural reservoir after processing may pose environmental hazards [8]. The thermal waters of the Khankala deposit have increased mineralization and corrosive activity that can lead to corrosion and damage to pipes and wells. Thus, the task of effective utilization of the Khankala deposit is complex and requires realization of the revised utilization and reinjection of the circulatory scheme (SS), and multi-level utilization of the thermal waters. It is possible to consider the following as the basic obstacles to the application of circulatory technology: high requirements for the geologic-geothermal characteristics in the natural collection process, such as depth, temperature, capacity, penetration and injection, which determine the economic appropriateness of geothermal power supplies [9-11].

A study on the experience of circulatory scheme implementation in France (Dogger reservoir) shows that the most complex technological area in the realization of the circulatory scheme is the process of reinjection. Aspects of geological conditions in the French deposits are the most favorable, related to aspects of power input on reinjection. These conditions are characterized by the availability of homogenous fractured rocks with increased penetration potential. The Khankala deposit is characterized by complex geological construction, conditioned by an inter-layering of collector rocks and impermeable rocks [12, 13].

Information about geological construction and hydro-geological peculiarities of the Khankala deposit and the chemical content of its thermal water, stated in this article, has been prepared within the research of the project of the state task under No. 13.1738.2014/K from June 17, 2014.

2 Materials and methods

The Khankala deposit of thermal water is the biggest on the territory of the ChR and is located 10 km south-east of Grozny.

Prof. Dr. MAGOMED SHAVALOVICH MINTCAEV,
Street GSP-2, pl. Ordzhonikidze, house 100 (364051), Grozny,
Chechen Republic, Russia
Tel. +89286420606
e-mail: ranas@rambler.ru

Prof. Dr. KHASAN ALIMULTANOVICH TAYMASKHANOV,
Street GSP-2, pl. Ordzhonikidze, house 100 (364051), Grozny,
Chechen Republic, Russia
Tel. +89286430606
e-mail: rectorgntu@gmail.com

Dr. TATIANA GEORGIEVNA CHURIKOVA,
Street GSP-2, pl. Ordzhonikidze, house 100 (364051), Grozny,
Chechen Republic, Russia
Tel. +7 926 100 83 73
e-mail: tchurikova@mail.ru