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USE OF GEOTHERMAL ENERGY SOURCES FOR HEATING AND HOT WATER SUPPLY OF RESIDENTIAL BUILDINGS IN THE SOUTHERN REGIONS OF THE REPUBLIC OF UZBEKISTAN

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ABSTRACT

The paper examines the possibilities of reducing energy consumption through the introduction of heat pumps installations for heating and cooling residential buildings in rural areas from well water in some regions of the Surkhandarya region of the Republic of Uzbekistan. Some observations of changes in the temperature of water from a well throughout the year are given . It uses the heat of well water as thermal energy.

KEYWORDS

Heat pumps , well water, geothermal heat sources.

Introduction

The use of geothermal energy is one of the most effective methods reducing energy consumption for heating and hot water supply. In world practice, heat pumps have long been used for heating and cooling various types of buildings. For example, in the USA, more than 30% of residential buildings are equipped with heat pumps. In Sweden, from 1984 to 1986 alone, 74 large heat pump plants were put into operation. Nowadays, heat pumps with capacities ranging from several kilowatts to 11 MW are produced in different countries of the world. With the help of these pumps in foreign countries, heat is obtained from open reservoirs where the water temperature is in the range of 5-7 C^0.

Heat installations with pumping units operate by circulating in the evaporator-compressor-condenser-throttle system, removing and condensing low-temperature heat. Heat is extracted from:

1) air outside buildings or individual rooms inside a building;
2) waters of rivers and lakes;
3) soil and groundwater.

The design of a principle diagram of a heat pump heat supply should be carried out taking into account the climatic characteristics and structure of the fuel and energy complex of the region, the energy level of natural and secondary low-potential heat sources, the requirements for the parameters of systems for the consumption and production of heat and coolants, and the characteristics of the heat and humidity balance of the serviced premises.

In Uzbekistan, the use of geothermal energy is not observed, although the climatic conditions of the region allow the widespread and efficient use of this cheap energy.

In all regions of Uzbekistan, including the Surkhandarya region, natural gas, solid fuel (coal, firewood) or electricity are mainly used for heating and hot water supply to residential buildings. This increases the need for non- renewable natural resources every year. Extracting and processing these natural resources is becoming more difficult and expensive every year.

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The populated areas of the Surkhandarya region are located mainly in the plains where groundwater is shallow from the surface of the earth. The temperature of these waters remains almost unchanged throughout the year and is in the range of 19-20 C^0. Not very cold winters make it possible to obtain a sufficient amount of heat from groundwater using heat pumps operating on a water-to-water system. That is, 10-12 C^0 of heat is extracted from well water and transferred to the water of the building's heating system. Cooled well water is returned to the ground through a second well.

I studied the change in water temperature from a well 8 meters deep throughout the year. This well is located in the regional center of the Angora district of the Surkhandarya region. According to my observations, it was established that the temperature of the water from the well did not change during the year and was 20 C^0. The measurement was carried out three times on one day of each month. It was also determined that the water from the well was hard. This means that the thermal conductivity of this water is greater than that of ordinary water.

To ensure a continuous supply of a heat source, two wells are drilled at a distance of 30-40 meters from each other. One heat pump with low power can heat 200-250 m2 ^{of} area. That is, one heat pump can be installed on two households.

I came to the conclusion that for heating in mild winter conditions and cooling in sultry hot flying conditions of the Surkhandarya region, the most effective from an economic point of view is heating and cooling residential buildings with geothermal energy. Although installing a heat pump is more expensive than the existing method, the low operating costs are well worth the cost. Receiving heat from a source with a temperature of 20 C^0 requires much less cost than from a heat source with a temperature of 5-7 C^0 in European regions. When cooling buildings, it is also much cheaper to obtain cold from a source of 20 C^0 than from atmospheric air with a temperature of 40-42 C^0.

From an economic point of view, due to lower operating costs, it is advisable to heat or cool residential buildings with water-to-water heat pumps.

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