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INSTALLATION AND ANALYSIS OF SOLAR WATER HEATER IN ANDIJAN

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Abstract

The article describes the methods of efficient use of some non-traditional energy resources and the optimal placement of a solar water heater and its features in the case of Andijan.

Key words

Collector, electricity , vacuum , tube, intensity, air humidity.

Enter. Hot water is now very necessary in industrial and domestic conditions. There is no hot water supply in many regions of our republic. Permanent hot water supply is available only in some cities. According to statistics, one person in Uzbekistan needs an average of 15-20 liters of hot water every day. Currently, hot water requirements are mainly met by using electric heaters and natural gas. In fact, this type of energy is in great demand for other purposes during the day. As a result, the price of hot water increases. Rising energy prices, environmental concerns, and dwindling reserves of primary energy sources require less use of electric heaters. This is because the main energy sources of electricity are mainly fossil fuels. In addition, with the increase in the population, the demand for electricity is growing rapidly. During periods of peak demand for hot water, power generation facilities are overloaded, resulting in power outages. These problems can be solved by getting hot water without using electricity. For this, solar hot water supply systems can be widely used for domestic and commercial purposes. These systems use solar energy to generate hot water. It is possible to get hot water at low prices with the help of current technologies.

Method. With the help of vacuum tube collectors, it is possible to obtain hot water with a temperature of up to 100°C at normal atmospheric pressure. Such a solar hot water system usually transfers heat by natural circulation due to the buoyancy of the temperature difference between the two regimes (Figure 1). Therefore, they do not require the use of pumps. They are the most commonly used solar water heaters for domestic use.

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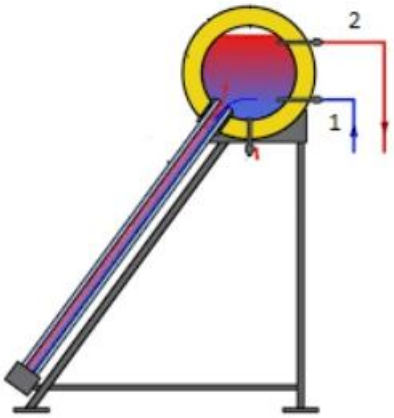


Figure 1.

In order for the amount of rays coming from the sun to reach the collector well, the collector is installed at an angle of 35-50° relative to the horizon, depending on the geographical location of the city of Andijan. A heat-absorbing material is placed inside the vacuum tube to ensure a large amount of solar radiation is absorbed.

We studied solar collectors in the Comsol multiphysics program. The pressure is 101330 Pa, the solar intensity on the surface of the collector is 1000 W/m ^{2} , the radius of the pipe is 2 cm, the length is 10 cm,

New. Part of the incident light energy (30-40%) is not used in the existing solar collectors. This work deals with the development of an innovative experimental technology of increasing the efficiency of a modern solar water heater by installing a reflective base between the base and pipes (Fig . 2) . A typical solar water heater uses only the light that falls on the tubes on the top of the unit. In the device we propose, the beam passing through the tubes falls on the underside of the tubes as a result of hitting the base and returning. And this his efficiency to increase help will give .

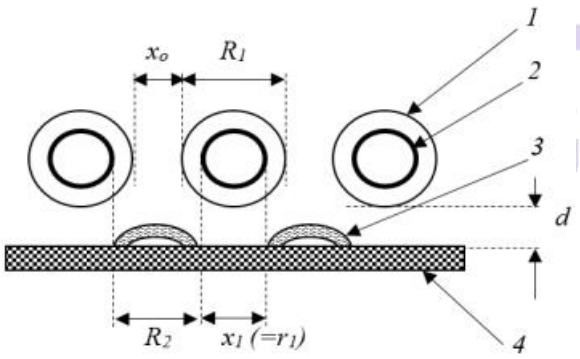


Figure 2 : *An improved solar water heater. 1) The outer shell of the device tube, 2) The inner shell of the device tube, 3) The reflective base.*

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The result. It is known that the sun shines less in the winter months in our Republic. With the help of a simple solar water heater, it is possible to get hot water even in the winter months. The experimental tests were observed for a year in the Andijan State University "Renewable Energy Sources" laboratory, and the results were analyzed. If we conclude from the obtained results, it is possible to get hot water at an average of 35-47°C in the winter season when the air temperature is 10°C, air humidity is 34%, and the intensity is 221 W/m ^{2} . Now, in the improved solar collector that we offer, this temperature is 45-63° C . This is enough to meet part of the demand for hot water in everyday life. In the spring season, when the air temperature is 35°C on average, air humidity is 10%, and the intensity is 887 W/m ^{2} , the average temperature of hot water in a simple collector is 70-87°C, and in the improved version, it is 90-110°C. was equal to Due to the high air temperature in the summer season, the temperature of the outgoing water reached 100°C in both types, the water temperature in the ordinary collector reached 120°C, and the improved solar collector reached 145-150°C.

In addition, the changes in the temperature of both collectors (in a simple collector and an improved collector) over time were measured when the average air temperature was 17°C, air humidity was 30%, and the intensity was 310 W/m ^{2} , and the following results were obtained: has been achieved.

Name↓	t min →	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
Simple collector	T, gradus	20	21	22	24	25	26	27	28	29	30	31	31	31	31	32	32
Improved collector	T, gradus	20	22	24	26	28	30	32	33	35	36	37	37	38	39	40	41

Table 1: Time dependence of heating temperature of ordinary and improved solar collectors.

It can be seen from Table 1 that the water in the improved solar collector reaches a higher temperature faster and higher than the conventional collector.

Summary. From these results, it can be seen that 70-80% of the need for hot water can be covered with the help of water heaters - collectors with the help of non-conventional, ecologically clean solar energy without using traditional energy resources.

Conclusions from the results suggest that more research and experimentation is needed to increase the efficiency of existing non-conventional means of hot water production.

List of used literature:

1. Nnamdi Ogueke, Val Ekechukwu, Emmanuel E. Anyanwu, (2009) A review of solar water heating systems, Journal of Renewable and Sustainable Energy, 1, 043106. DOI: 10.1063/1.3167285

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