# RESEARCH OF WORKING HEAT SUPPLY SYSTEMS BASED ON CONVENTIONAL AND RENEWABLE ENERGY SOURCES.

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**Abstract:** *This article presents the issues of using solar collectors in solar heating systems and traditional heating systems.*

**Key words:** *heat, sunlight, heat exchange, hot water.*

In our country, special attention is paid to the conservation of natural resources and the introduction of ecologically clean technologies in production sectors. Experts say that in the climate of our country, there are great opportunities for the use of non-traditional types of energy such as solar, water, wind, and biogas. Almost 310-320 days of the year are sunny in the territory of our republic, and there is a constant wind blowing in most of the open areas. Such a natural opportunity comes in the effective use of renewable energy sources, which are becoming increasingly popular in the world today. According to the climate of Uzbekistan, the sun is the most alternative renewable energy source, and a heat carrier is prepared due to its heat. For this purpose, the issue of creating a centralized heat supply system based on solar-air and solar-water collectors made in different designs is distinguished by its urgency. (Qt,Vt/m2).Currently, traditional heating systems are widely used for heating buildings.

New technology of combined use of traditional and renewable energy sources for heating buildings.

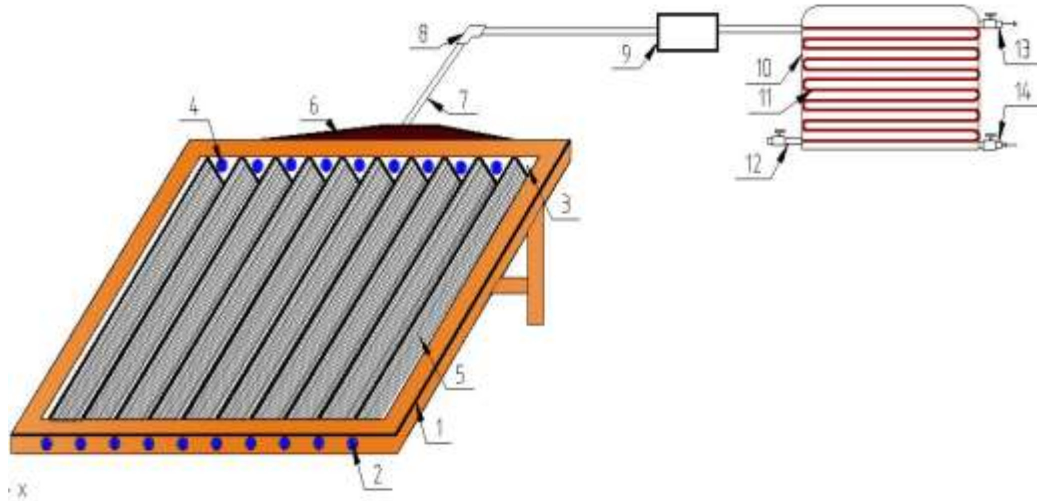


**Figure 1. Heating system based on traditional and renewable energy sources.**

1-body, 2-air inlet pipe, 3-transparent window, 4-air outlet pipe, 5-roughened absorber, 7-heated air pipe, 8-coupling, 9-fan, 10-water tank, 11-heater air pipe, 12-heated air outlet, 13-hot water outlet pipe, 14-cold water inlet pipe.

In this proposed technology, thermal energy is obtained using solar energy. (Fig. 1) the air flow from the inlet pipes to the working chamber (2) of the solar air heater moves through the collector absorber (5), its temperature increases due to the air flow washing the heated absorber. The heated air (9) is sent to the heating pipe (11) with the help of a suction fan, and then heats the water in the water tank (10).

Hot water is sent to the boiler in the winter season, and to the hot water supply in the summer season.

In the proposed technology, hot water consumption and solar collector surface are determined as follows.

$$Q = GCp(t_2 - t_1) \quad (1)$$

Here:G -water consumption l/s,$C_p$-heat capacity of water kj/kg degree, t-water temperature °C

Water consumption is determined as follows.

$$G = \frac{M}{\tau} \quad (2)$$

Here: M-water quantity l, τ-time.

The amount of hot water is determined as follows.

$$M = n \cdot N \quad (3)$$

Here: required for one person

$$Q = \frac{60}{18000} \cdot 1(50 - 15) = 1200\, vt$$

Solar collectors with auxiliary air for local boilers

Analyzing the various structures of solar collectors, their heat exchange materials, solar collector reliability, technical economic cost and ease of assembly factor are taken into account. The most reliable are metal pipes, for example, thin-walled copper or steel, but they are expensive and their assembly takes a lot of time. In addition, the heat device working with metal pipes has a significant weight, which requires a heavy box and, in turn, complicates the installation. Taking this into account, a solar collector with an optimal structural scheme is selected.

Solar air collectors provide water temperature up to +50 °C. Such collectors are used when it is necessary to bring water to a low flow rate. We calculate the collector in stationary conditions for use together with a local boiler for heating buildings.

$$q = 400\frac{vt}{m^2} \qquad t_{st} = 50\ °C \qquad t_k^{'} = 15\ °C$$

We calculate the heat of the solar collector in stationary conditions. For the calculation, we take the temperature of the collector pipes as constant, and thus we find the average temperature difference from the graph.

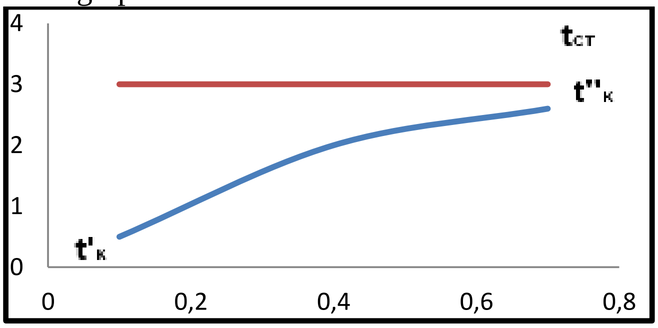


Figure 2. Heat transfer of the collector in stationary conditions

$$\Delta t_b = t_{st} - t_k^{'} \qquad \Delta t_m = t_{st} - t_k^{''} \quad (4)$$

We determine the amount of heat given in the collector with a certain given surface.

$$Q = \alpha F \Delta t = \alpha F\left(t_{st} - \frac{t_k^{'} + t_k^{''}}{2}\right); \quad (5)$$

To calculate the amount of heat, we calculate the consumption of heated water.

$$Q = GC_p(t_k^{'} + t_k^{''}); \quad (6)$$

(from the water supply network)

$$t_k'' = \frac{Q}{GC_p} + t_k' ; \quad (7)$$

From equation (7), we get the following

$$\frac{Q}{\alpha F} = t_{st} - \frac{t_k' + t_k''}{2}; \quad (8)$$

We put equation (7) into equation (8)

$$\frac{Q}{\alpha F} = t_{st} - \frac{t_k' + \frac{Q}{GC_p} + t_k''}{2} = t_{st} - t_k' \frac{Q}{2GC_p}; \quad (9)$$

$$Q\left(\frac{1}{\alpha F} + \frac{1}{GC_p}\right) = t_{st} - t_k'; \quad (10)$$

$$Q = \frac{t_{st} - t_k'}{\left(\frac{1}{\alpha F} + \frac{1}{GC_p}\right)}; \quad (11)$$

We take the heat transfer coefficient in laminar flow as follows;

$$\alpha = 300\ \frac{Vt}{m^2 ℃}; \quad G = 0{,}05\ \frac{kg}{s}; \quad C_p = 1000\ \frac{Dj}{kg°C}; \quad F = 10\ m^2$$

$$Q = \frac{t_{st} - t_k'}{\left(\frac{1}{300 \cdot 10} + \frac{1}{2 \cdot 0.05 \cdot 1000}\right)} = \frac{35}{0{,}0003 + 0{,}01} = 3500\ Vt = 3{,}5\ KVt$$

The results of the above calculations show that when the proposed flat solar collector is installed on the roof of buildings and its surface is 10 m2 on average, its capacity is 3.5 kW.

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B.A. Abdukarimov., Yo.S.Abbosov., Sh.R.O'tbosarov. International Journal of Advanced Research in Science, Engineering and Technology Vol. 7, Issue 5 , May 2020 y. 13545-13549 p.