EXPERIMENTAL RESULTS OF THE PARABOLOID CONCENTRATOR

Sohib Amonovich Temirov
Assistant, Bukhara State Medical Institute
sohibamonovich@mail.ru

ABSTRACT

This article deals with the experienced results of a paraboloid-type concentrator designed as a solar kitchen for personal use.

Keywords: Solar Concentrator, Reflective Coefficient, Focus Distance, Focus dimension, temperature, mirror-window.

Manufacturing industry around the world has evolved so much in the last decade that the demand for non-traditional sources of energy has grown tremendously. This is especially true in transport and agriculture. Traditional sources of energy are generated from natural sources of fuel such as coal, firewood, oil products and natural gas. This, in turn, leads to the depletion of natural resources. This is a very global environmental problem and the use of clean energy in the national economy is now the focus of world scientists. In many publications has written that the emergence and use of alternative energy sources such as solar, wind, geothermal energy, potential energy of rivers, and rising and flowing of ocean water energy would be the solution to the problems above[1].

This article provides information about solar kitchen especially for home-based cooking and boiling water for small families. The device is a paraboloid-type concentrator and consists of multi-numerous mirrors. The base of the solar concentrator is made of plaster (alabaster). Because gypsum is a substance that can harden within 1-2 minutes after being mixed with water, the mold used to form a paraboloid is cut from a metal plate to make it simple, lightweight and easy to move. For this, a metal plate is drawn on a metal plate with a focal length of 90 cm. The cutting process of the metal plate on the parabola drawing requires precision in millimeters, otherwise the mold may not meet the requirements.

The focus length is 0.9 m, the base plane equals to 0.635 m2. The surface is covered by a total of 256 small mirrors with 0.05x0.05 metre width. The sunlight that falls on these mirrors, returning from each mirror, accumulates in the light receiver, which is within the focus of the concentrator. In the light receivers the temperature is recorded to rise to 4000C. Schematic view of the device (Figure 1).

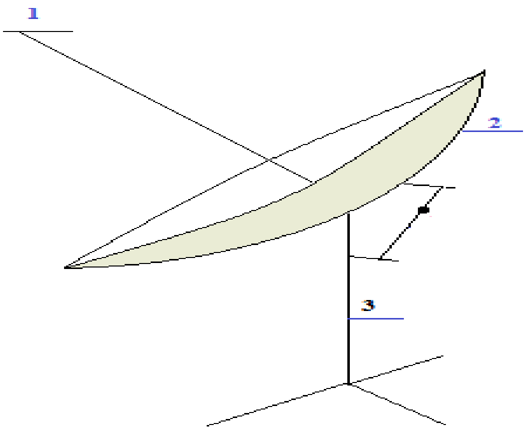

Figure 1. Schematic view of the device: 1-focus point (light receiver), 2-base of concentrator , 3-base of device .

The wheels were set under the base of the hinge to make it easier to glide the sky around the globe. Local, inexpensive and easy-to-find materials are used for this device. The concentrator tends to rotate every 30-60 minutes in the direction of the sun's movement so that the sun's rays reach the surface of the device. A special angle converter was installed to make it easier to move the paraboloid part of the device to the required angle than the horizon.

Analysis of the results: The time and temperature dynamics of the device's boiling 0.5 liters of water were analyzed for two cases. In the first case the mouth of the water tank was open. [Picture 3]

Knowing the initial water temperature, we determine the useful energy by the following formula:

$$Q_f = c_p m(T_o - T_b) \quad \textbf{(1)}$$

The total amount of available solar radiation is calculated as follows:

$$Q_{um} = A_y \cdot G_{yr} \quad \textbf{(2)}$$

G_{yr}- summation radiation;
A_y- irradiation coefficient

Thermal efficiency is found by the equation:

$$\eta = \frac{Q_f}{Q_{um}} \quad \textbf{(3)}$$

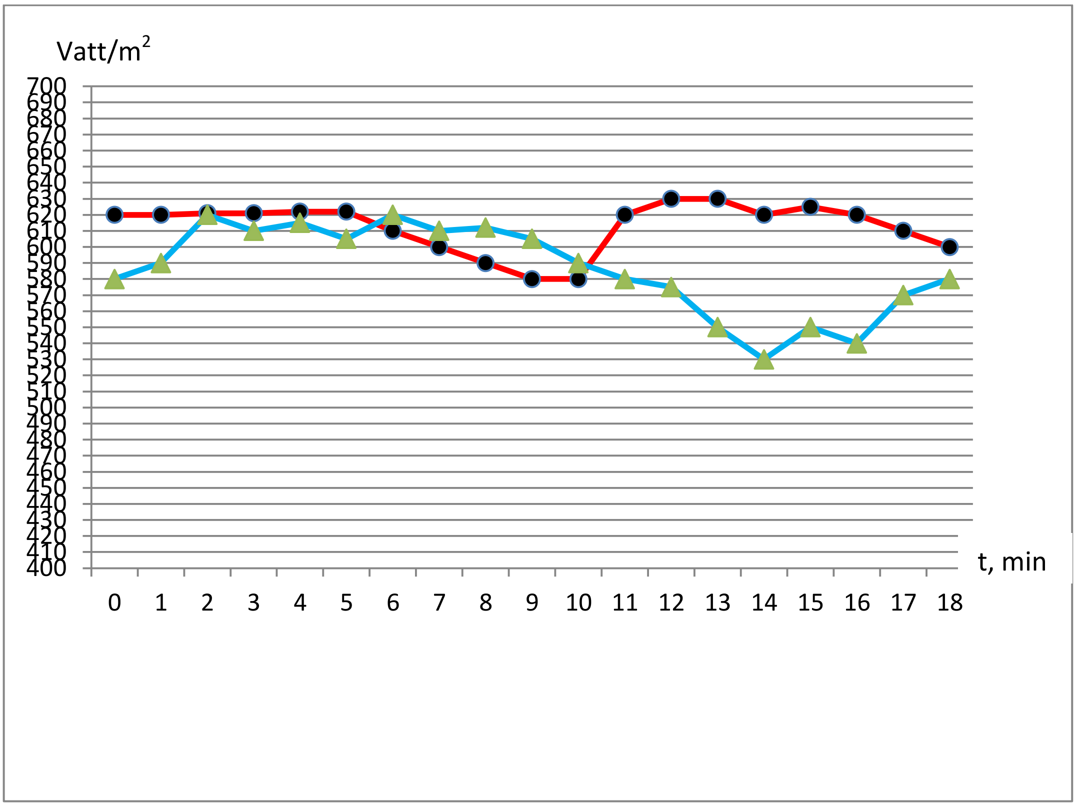

Figure 2: Solar radiation change according to the time dynamics

Time, min	11:30		12:20		14:55	
	Changes in temperature of 0.5 liters of water in focus	The amount of solar radiation	Changes in temperature of 0.5 liters of water in focus	The amount of solar radiation	Changes in temperature of 0.5 liters of water in focus	The amount of solar radiation
0	18	622	15	570	17	620
1	25	610	30	550	28	610
2	38	600	42	565	50	612
3	44	590	48	500	58	605
4	50	580	58	450	65	590
5	55	580	67	400	72	580
6	59	620	77	480	80	575
7	66	630	86	520	85	550
8	73	630	90	510	91	530
9	81	620	96	430	94	550
10	87	625	97	450	96	540
11	92	620	97	440	98	570
12	96	610	98	460	98	580

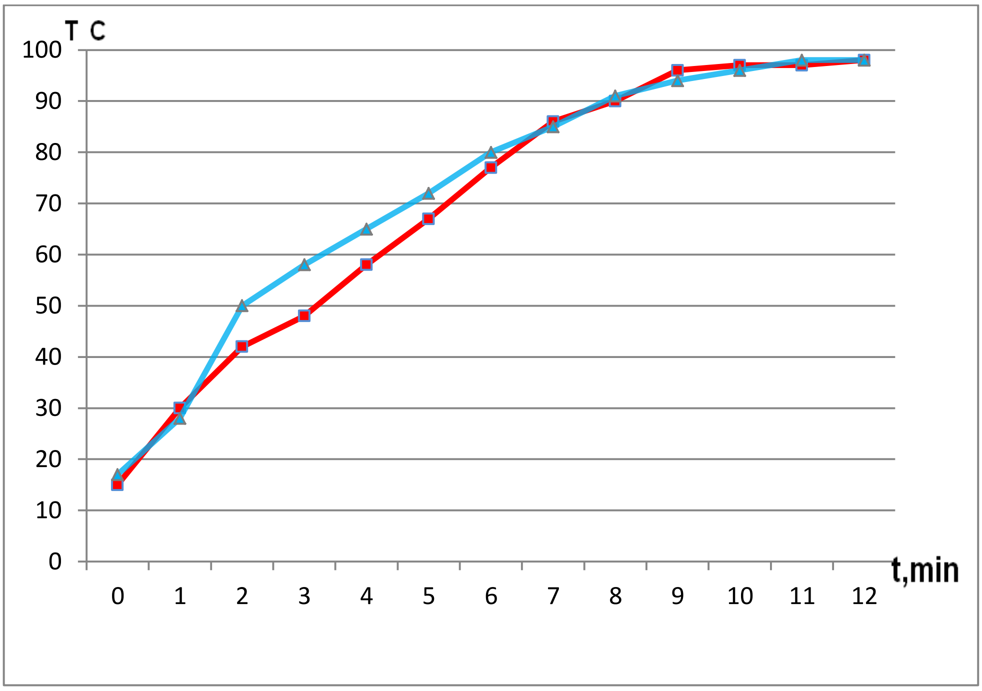

Figure 4. Dynamics of 0.5 liters of water temperature change in the device.

During the experiments on the provided device, thermal parameters of the device were analyzed. The dynamics of bonding time and temperature of 0.5 liters of water are presented in the graphs for two cases.

The results show that the water in the closed container is boils faster . Liquid gases are always present and they form small bubbles in the bottom and walls of the vessel and in the dust particles that are floating in the liquid. As the temperature rises, the saturated vapor in the bubbles and the pressure increases. The bubbles bounce upwards under the force of the pushing Archimedes force. If the temperature of the upper layers of the fluid is lower, the pressure in the rising bubbles will rapidly decrease and will not reach the top. The saturated vapor pressure in the bubbles equals the fluid pressure, the bubbles reach the top layer and the boiling process begins. In a closed container with high temperature the heat is absorbed and boiling process becomes faster.

REFERENCES

1. Temirov S. A. Paraboloid quyosh konsentratori //Academic research in educational sciences. – 2022. – T. 3. – №. 8. – С. 95-103.
2. Temirov S. A. PARBOLOIDLI QUYOSH KONSENTRATORINING ISH REJIMI //Results of National Scientific Research International Journal. – 2022. – T. 1. – №. 8. – С. 377-382.
3. Erkin o'g'li D. S. FTORID-IONLI VA SUPER-IONLI QOPLAMALARNI O'RGANISH. – 2022

4. Temirov S. A. PARBOLOIDLI QUYOSH KONSENTRATORINING ISH REJIMI //Results of National Scientific Research International Journal. – 2022. – Т. 1. – №. 8. – С. 377-382.
5. Темиров С. А., ўғли Камолов Ж. Ж. ҚУЁШ КОНЦЕНТРАТОРИНИ ХОССАЛАРИНИ ТАДҚИҚ ҚИЛИШ //Results of National Scientific Research International Journal. – 2022. – Т. 1. – №. 8. – С. 369-376.
6. Amonovich T. S. How to make a paraboloid solar concentrator //Gospodarka i Innowacje. – 2022. – Т. 24. – С. 596-605.
7. Темиров С. А. Геометрическая конструкция параболоидного концентратора //Academic research in educational sciences. – 2022. – Т. 3. – №. 7. – С. 353-357.
8. Темиров С. А., Тураев О. Г. Построение солнечного концентратора и исследование тепловых свойств //Главный редактор: Ахметов Сайранбек Махсутович, д-р техн. наук; Заместитель главного редактора: Ахмеднабиев Расул Магомедович, канд. техн. наук; Члены редакционной коллегии. – 2021. – С. 44.
9. Temirov S. A. YORUG „LIK INTERFERENSIYASINI O‛‛ RGANISHDA “PHET” DA TUZILGAN DASTURLARDAN FOYDALANISH //Academic research in educational sciences. – 2023. – Т. 4. – №. 4. – С. 274-277.