American Journal Of Applied Science And Technology
(ISSN – 2771-2745)
VOLUME 02 ISSUE 05 Pages: 99-105
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705)
OCLC – 1121105677 METADATA IF – 5.582

Publisher: Oscar Publishing Services

Journal Website: https://theusajournals.com/index.php/ajast

Copyright: Original content from this work may be used under the terms of the creative commons attributes 4.0 licence.

Research Article

TESTING THE INNOVATIVE CAPACITY SOLAR WATER HEATER 200 LITERS

Submission Date: May 09, 2022, Accepted Date: May 18, 2022,
Published Date: May 30, 2022
Crossref doi: https://doi.org/10.37547/ajast/Volume02Issue05-19

P.R. Fayziev
Candidate of Technical Sciences, Associate Professor, Department of Land Transport Systems and Their Exploitation, Fergana Polytechnic Institute, 150107, Fergana, Uzbekistan

Z.M. Khametov
PhD in Technical Sciences, Head of the Department of Land Transport Systems and Their Exploitation, Fergana Polytechnic Institute, 150107, Fergana, Uzbekistan

ABSTRACT

This article presents the results of field tests of an innovative capacitive solar water heater for 200 liters. Which has a number of advantages unlike standard water heaters in low cost, ease of manufacture, ease of operation, reliability, local materials, long service life, ease of repair, transportability, lighter weight, no heavy tubular structures, the capacitive innovative solar water heater design developed by us is necessary in rural areas for dekhkans and farmers.

KEYWORDS

Capacitive solar water heater, solar energy, container, polyethylene film, absorber, matte paint, support table, thermal insulation, individual households, tubular collectors.

INTRODUCTION

In the nineteenth century, there were no simple and comfortable methods of heating water; wood-burning stoves were used. In cities, lighting gas was used to heat water. Swiss scientist, botanist Horace de Sausure

American Journal Of Applied Science And Technology
(ISSN – 2771-2745)
VOLUME 02 ISSUE 05 Pages: 99-105
SJIF IMPACT FACTOR (2021: 5.705) (2022: 5.705)
OCLC – 1121105677 METADATA IF – 5.582
Publisher: Oscar Publishing Services

in 1767 created the world's first solar water heater for 25 gallons of water. The solar water heater consisted of a wooden box covered with glass on top, the box was thermally insulated and blackened from the inside, and placed a flask with water inside [1-4].

THE MAIN PART

First commercial solar water heater. patented by K. Kemp and went on sale in 1891 under the name "Chimax Solar Water Heater". In 1904, Charles Haskell bought the rights from Kemp to improve the design. Then in 1909, William J. Bailey revolutionized the market. He created a new design, divided a single solar water heater into two parts. The heating element-solar collector is located outside under the influence of sunlight, and the storage tank is located inside the building. By the end of World War I, J. Bieli had sold 4,000 solar water heaters on the market. The modern type of solar water heater was created in 1953 in Israel by engineer Levi Issar and improved by Dr. Zvi Tavor in 1955, for which he received an award of 1000 Israeli lira from the country's Prime Minister David Ben-Gurion. Currently, solar water heaters of various modifications [5-9] are widely used in Israel, China, Spain, Saudi Arabia, Korea, Russia, Portugal, Egypt, Dubai, France, Morocco, Egypt, Turkey, Italy, Greece, USA and other countries about the production of solar water heaters China is the world leader. Solar water heaters can be active or passive types. The active system uses an electric pump to circulate the fluid. The passive system does not have a pump, the process proceeds due to natural circulation. The solar water heater developed by us is recommended for use in household plots, rural areas, individual and farm households, hospitals, laundries, college dormitories, schools, colleges, and auto maintenance. The ease of operation of the developed solar capacitive water heater is its extraordinary simplicity and reliability, long service life, the possibility of acquiring a storage tank in any market of regions. The absence of bulky tubular solar collectors, which quickly scale up on the inside in hard water, with their large areas and heavy weight, gives our solar water heater great advantages. Handles are installed on the side for the convenience of carrying an empty barrel, there is a tap for draining hot water. The cost of industrially produced solar water heaters on the market is from 4-6 million soums or more, the proposed solar water heater is an order of magnitude cheaper than domestic and foreign ones. Does not demand special service and is easily repaired [10-14]. The tests were carried out in the city of Fergana. They showed, that the 200 liter solar DHW tank can provide hot water around 45-55 degrees °C for a large family, especially in remote areas where there is no gas line and electricity [15-19]. The temperature of hot water meets the standards for use in domestic and household needs. The solar water heater consists of a conventional commercial barrel with a capacity of 200 liters, a lid, a polyethylene bag, a special metal support table with a built-in absorber, painted in black matte paint, on which a barrel of water is installed. A special heat-insulated table with an absorber simultaneously serves as a support and an additional heating device. All parts of the water heater are available and are available in rural stores and are painted with black matte paint. The heat of the sun's rays heats the unit from 3 sides, on top is the lid, the body of the barrel itself and a special heat-insulated support table with an absorber. The lid of the barrel is painted with black matt paint and fits snugly to the edges of the barrel, this ensures that heat enters due to heat conduction from above. Thus, using BU barrels, it is possible to produce energy-efficient, cheap and reliable solar water heaters with a long service life for rural residents who are in dire need of hot water for washing clothes, bathing and other household purposes. On the inside, the barrel has a polyethylene coating (polyethylene bag) that protects the metal body of the barrel from corrosion and at the same time serves as a water reservoir. The water is inside a plastic bag, which allows you to maintain the high quality of the heated water, the inner surface of the barrel and its coloring do not matter. We choose ready-made tanks produced by the industry for fuels and lubricants, as it is convenient, cheaper and takes little time than inventing and manufacturing ourselves [20-17]. Solar water heater complies with environmental standards does not use fuel, electricity, natural gas, coal, firewood and other fuels, so it is recommended for residents of remote areas without energy sources, as well as cemetery workers to improve service. The proposed simple solar water heater can be made from simple locally available materials and manufactured in large quantities for customers in any rural area, is unusually easy to repair, so it is unmatched in low cost, ease of maintenance and efficiency. The installation has passed many years of full-scale tests, which showed that it is suitable for a large Uzbek family living in rural areas. It is known that about 400 kg of firewood is consumed to heat a barrel of water with a capacity of 200 liters, this barrel of water is heated by free solar energy supplied to the helio-water heater during a sunny day [26-30]. By the evening, when the family is assembled, 200 liters of hot water are ready for use. Approximately 400 kg of firewood is consumed to heat 200 liters of water. Within one month, there is a saving of fuel equivalent of 400 kg * 30 days = 12,000 kg of fuel in terms of soums, which is 12,000,000 soums of conventional fuel, a decrease in carbon dioxide emissions of CO_2, and the absolute environmental friendliness of the process. this barrel of water is heated by free solar energy supplied to the solar water heater during a sunny day. By the evening, when the family is assembled, 200 liters of hot water are ready for use. Approximately 400 kg of firewood is consumed to heat 200 liters of water. Within one month, there is a saving of fuel equivalent of 400 kg * 30 days = 12,000 kg of fuel in terms of soums, which is 12,000,000 soums of conventional fuel, a decrease in carbon dioxide emissions of CO_2, and the absolute environmental friendliness of the process. this barrel of water is heated by free solar energy supplied to the solar water heater during a sunny day. By the evening, when the family is assembled, 200 liters of hot water are ready for use. Approximately 400 kg of firewood is consumed to heat 200 liters of water. Within one month, there is a saving of fuel equivalent of 400 kg * 30 days = 12,000 kg of fuel in terms of soums, which is 12,000,000 soums of conventional fuel, a decrease in carbon dioxide emissions of CO_2, and the absolute environmental friendliness of the process.

American Journal Of Applied Science And Technology
(ISSN – 2771-2745)
VOLUME 02 ISSUE 05 Pages: 99-105
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705)
OCLC – 1121105677 METADATA IF – 5.582
Publisher: Oscar Publishing Services

Fig.1. General view of the developed innovative capacitive solar water heater

The service life is decades, since it does not have moving parts during operation, it is possible to replace a plastic bag, which can be purchased at any hardware store in the countryside. A general view of the developed innovative capacitive solar water heater is shown in Fig.1. For ease of operation on cloudy days, the solar water heater has a backup heater, an electric heating element with a power of about 400 watts.

Specifications:

1. Tank volume, - 200 l.

Height - 87.98 cm.

Inner diameter-55cm

Barrel weight-14-26 kg

The area occupied by the barrel, m^2-0.5

Absorber area, m^2-0.5*1

The maximum temperature is -45- 55℃.

The area occupied by the solar installation, m2-0.5*0.5

Warranty 1 year. Service life 20 years

One set of support-thermotable

American Journal Of Applied Science And Technology
(ISSN – 2771-2745)
VOLUME 02 ISSUE 05 Pages: 99-105
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705)
OCLC – 1121105677 METADATA IF – 5.582
Publisher: Oscar Publishing Services

Dimensions, m 0.5*0.5*0.4

Styrofoam—0.5*0.5m

Payback period - 6 months.

Backup water heater-TEN

Power-400W

Wind 3m/sec, Air temperature T= 23 °C.

Table 1. Test results of a solar storage water heater on May 20, 2020

watch	*eight*	*9*	*ten*	*eleven*	*12*	*13*	*fourteen*	*fifteen*	*16*	*17*	*eighteen*
Experimental temperatures in the solar water heater °C											
absorber	34	47	54	58	81	80	82	72	36	33	32
lid	31	41	47	58	62	61	63	64	42	41	33
tank body	24	24	28	31	35	39	41	41	38	34	32
Water in the tank	22	22	28	31	33	38	40	40	38	32	30

The solar storage water heater was located on a site surrounded by neighboring houses, and the sun's rays illuminated the solar plant in the morning from 9 o'clock, in the evening at 17 o'clock the sun was hiding behind the neighboring houses, and therefore the solar installation did not receive enough free energy during daylight hours.

REFERENCES

1. Р.Р. Авезов, Ф.Ш. Касимов, Э.Ю. Рахимов. Ш.К.Ниязов, А.А. Абдуллаев. (2022). Емкостные солнечные водонагреватели: Научно-теоретические и экспериментальные исследования. под. Редакцией проф. Н.Р Авезовой Ташкент. Монография, 108 стр.

2. С.Ф. Эргашев, А.Тоджибаев. (2011). Результаты исследования солнечного водонагревателя. Материалы республиканской конференции «Энергосбережения и эффективное решение электроснабжения» Фергана.

3. Мухитдинов М.М., Эргашев С.Ф. Дастлабки патент Рузгорбоп куеш сув иситкич №3259 талабнома»1 НДР 95000327.

4. Эргашев С.Ф. (1997). Перспективы развития солнечной энергии в Ферганской долине». Материалы международной конференции, «Нетрадиционные методы техники и технологии. Фергана.

5. Умаров Г.Я., Авезов Р., Икрамов А.М. (1978). Использование солнечной энергии для сушки фруктов и овощей. Консервная и овощная промышленность, Ш. с. 22-23.

6. Файзиев П.Р.Турдиев М. (2018). Солнечная многофункциональная сушилка для сушки сельскохозяйственной продукции. «Истемол бозорини сифатли озик-овкат махсулотларини билан таьминлаш фаравонлик ва таракиетининг мухим омили». Республика илмий ва илмий-амалий анжумани, Фаргона, Ферпи.

7. Умаров Г.Г. Мирзияев Ш.М.,Юсупбеков О.Н. (1994). Гелиосушилка сельхозпродуктов. Ташкент. Фан. 152 с.

8. Клычев Ш.И. Мухаммадиев, М .М. Авезов Р.Р.и др. (2010). Нетрадиционные и возобновляемые источники энергии. Ташкент. Изд. «Фан» ва технология. 192 с.

9. Эргашев С.Ф.» Перспективы развития солнечной энергии в Ферганской долине» «Материалы международной конференции» Нетрадиционные методы техники и технологии 21-24 май фергана,1997г

10. Земсков В.И. (2014). Возобновляемые источники энергии в АПК: Санк-петербург. Лань. 368 с.

11. Г.В. Печорин и др. (2017). Экологическая оценка возобновляемых источников энергии. Санк-петербург. Лань. 236 с.

12. П.П. Безруких, С.М. Каребанов. (2017). Состояние и перспективы развития возобновляемой энергетики в мире. Энергетик. №12 С.41

13. Файзиев, П. Р., Исмадиёров, А., Жалолдинов, Г., & Ганиев, Л. (2021). Солнечный инновационный бытовой водонагреватель. Science and Education, 2(6), 320-324.

14. Эргашев С.Ф. Тоджибаев А. (2011). Результаты исследования солнечного водонагревателя. Материалы республиканской конференции, Энергосбережение и эффективное решение электроснабжение. Фергана.

15. Renewables 2011. Global Status Report. 2012. http://www.ren21.net. (дата обращения: 30.07.2012 г.).

16. Попель, О. С., Фрид, С. Е., Коломиец, Ю. Г., Киселева, С. В., & Терехова, Е. Н. (2010). Атлас ресурсов солнечной энергии на территории России.

17. Коломиец, Ю. Г., Попель, О. С., & Фрид, С. Е. (2009). Эффективность использования солнечного излучения для нагрева воды на территории Российской Федерации. *Альтернативная энергетика и экология*, (6), 16-23.

18. Duffie, J. A. (1991). WA, Solar Engineering of Thermal Processes. *John Wiley & Sons, Ind.*, 250-330.

19. Xujamkulov, S., Abdubannopov, A., & Botirov, B. (2021). Zamonaviy avtomobillarda qo'llaniladigan acceleration slip regulation tizimi tahlili. Scientific progress, 2(1), 1467-1472.

20. Meliboyev, A., Khujamqulov, S., & Masodiqov, J. (2021). Univer calculation-experimental method of researching the indicators of its toxicity in its management by changing the working capacity of

the engine using the characteristics. Экономика и социум, (4-1), 207-210.

21. Fayziev, P. R., Tursunov, D. M., Khujamkulov, S., Ismandiyarov, A., & Abdubannopov, A. (2022). Overview of solar dryers for drying lumber and wood. American Journal Of Applied Science And Technology, 2(04), 47-57.

22. Xujamqulov, S. U., Masodiqov, Q. X., & Abdunazarov, R. X. (2022). Prospects for the development of the automotive industry in Uzbekistan. In E Conference Zone (pp. 98-100).

23. Xujamqulov, S. U. O. G. L., & Masodiqov, Q. X. O. G. L. (2022). Avtotransport vositalarining ekspluatatsion xususiyatlarini kuzatish bo'yicha vazifalarni shakllantirish. Academic research in educational sciences, 3(4), 503-508.

24. Masodiqov, Q. X. O. G. L., Xujamqulov, S., & Masodiqov, J. X. O. G. L. (2022). Avtomobil shinalarini ishlab chiqarish va eskirgan avtomobil shinalarini utilizatsiya qilish bo'yicha eksperiment o'tkazish usuli. *Academic research in educational sciences*, 3(4), 254-259.

25. Khujamkulov, S. U., & Khusanjonov, A. S. (2022). Transmission system of parallel lathe machine tools. ACADEMICIA: An International Multidisciplinary Research Journal, 12(2), 142-145.

26. Qobulov, M., Jaloldinov, G., & Masodiqov, Q. (2021). Existing systems of exploitation of motor vehicles. Экономика и социум, (4-1), 303-308.

27. Fayziyev, P. R., Ikromov, I. A., Abduraximov, A. A., & Dehqonov, Q. M. (2022). Organization of technological processes for maintenance and repair of electric vehicles. *International Journal of Advance Scientific Research*, 2(03), 37-41.

28. Fayziyev, P. L. R., O'G, G. O. U. B., & Jaloldinov, L. (2021). Avtomobil texnikalariga servis xizmat ko 'rsatishning bosqichlari. *Academic research in educational sciences*, 2(11), 1114-1120.

29. Fayziyev, P. R., Ikromov, I. A., Abduraximov, A. A., & Dehqonov, Q. M. (2022). Timeline: History of the Electric Car, Trends and the Future Developments. *Eurasian Research Bulletin*, 6, 89-94.

30. Fayziyev, P. R., Ikromov, I. A., Otaboyev, N. I., & Abduraximov, A. A. (2022). The Analysis of Gas Balloon Supply Systems. *Eurasian Journal of Engineering and Technology*, 4, 115-122.