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Research Article

Performance of Mylar and Teflon as compound parabolic concentrators in solar desalination system

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ABSTRACT

The water-energy nexus is an important and difficult issue and must be resolved for present and also for the future. The process of producing freshwater requires a lot of energy, therefore a workable solution to this issue is crucial. In the current situation, solar energy is one of the best options for desalination as it is inexpensive, environment friendly, and widely accessible. In general, flat plate collectors and evacuated tube collectors have been used as solar collector for desalination. In this study, a single-stage hybrid groundwater solar desalination system has been used for experimental investigation. Compound parabolic concentrator is positioned to gather solar radiations and transfer heat to evacuated tubes, for improving the performance under various weather conditions in Pune, India. The ideal distance between evacuated tube collector and compound parabolic concentrator was 20 mm. The current study primarily focuses on the performance of two polymeric materials, Teflon and Mylar, as reflector, on the rate of soft water production. It was observed that when mylar was used reflecting material the rate of soft water production amounts to be 3.5 litres per day whereas teflon was used as reflecting material the rate of soft water prodcution amounts to be 3.0 litres respectively. As per the validation of results for hybrid solar desalination system gives better results than solar-wind hybrid energy system. Thus Mylar shows more promising result than Teflon for production of soft water. It shows 20 % increase soft water production using mylar material on compound parabolic concentrator as comparied to the teflon.

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INTRODUCTION

The worldwide need of solar energy, to produce power and perform other beneficial tasks, is constantly increasing. The largest global problems are the growing population, the need for fresh drinking water, and the demand for power to meet the needs studied by Ghorbani et al. [1]. Since, there is less freshwater and electricity available in rural areas, life of human beings is very tough. Solar energy is an attractive alternative, particularly in rural regions, for producing drinking water at low cost. In globe scenario, the major source of water (roughly 97%) is ocean, and about 2% water is from variety of sources, including lakes, rivers, and groundwater studied by Baci et al. [2]. The remaining 1% or less of the freshwater will be used for people and animals, some of which is in the form of ice. Freshwater delivery to urban and rural communities is one of the biggest global problems studied by Ahmadi et al. [3]. The development of cutting-edge technologies like desalination and recycling, as well as investments in water infrastructure, are some of the strategies being used to overcome the shortage of water. Ensuring that everyone has access to clean and sufficient water is an important concern that requires international cooperation and coordination argued by Kalogirou [4].

Desalination, the process of purifying salt and other contaminants from saltwater to make it fit for farming and human use, is receiving more attention as a long-term response to the world's water shortage. Use of solar energy in desalination is a potentially beneficial approach. Through solar stills or solar-assisted reverse osmosis systems, solar desalination system uses the sun's abundant power to generate sufficient power for the process of purification. Seawater is heated by sunlight in solar stills, which causes evaporation of water and leaves behind impurities and salt, after that water vapour condenses into freshwater. On the other hand, solar-powered pumps in solar-assisted reverse osmosis systems pressurise seawater across membranes to separate contaminants and salt. Using solar energy for desalination offers a viable way to meet the growing demand for fresh water in an environmentally responsible way while simultaneously reducing dependency on fossil fuels and contributing to the global movement towards sustainable and renewable energy sources.

Devices called solar collectors are made to collect sunlight and transform it into useful heat or power. They are essential for the process of using solar energy for a variety of purposes. Solar thermal collectors and solar photovoltaic (PV) collectors are the two primary categories of solar collectors. The solar thermal collectors are further classified into flat plate collector and concentrating collectors. Among the two, concentrating collectors increase the strength/intensity of the sun rays by concentrating them onto a smaller area using mirrors or lenses. Heat is subsequently produced due to the concentrated light. Concentrating collectors are available in variety of forms, such as solar power towers, parabolic dishes, parabolic trough concentrator (PTC) and compound parabolic concentrators (CPC). Among all these, CPC has highest efficiency because of its geometrical shape. It limits the wastage of solar energy from ETC tube by concentrating it back to the evacuated tube. Desalination systems including reverse osmosis (RO), electro-dialysis (ED), and multistage flash (MSF) have been created by engineers and scientists, however, the high cost of the produced energy is one of the major limitations. Use of fossil fuels to a large extent will have an adverse effect on the environment studied by Ali et.al [5]. Kedar et.al [6] had mainly studied effect of reflecting material on CPC to improve the performance of hybrid groundwater solar desalination system. Immersed fins were the subject of an experimental study by Moungar et al. [7] that will affect the generation of double slope stills. Their findings demonstrate that the authors organized the entire study for south Algeria for a variety of meteorological and environmental circumstances in order to attain superior soft water production utilizing a double slope solar still. The traditional solar still was created by Sathyamurthy et al. [8] using a sand heat energy storage method. While Morad et al. [9] worked on improving thermal performance in the solar still, their experimental results demonstrate high heat storage capacity in the solar still. Bhambare et al. [10] primarily investigated solar thermal desalination as a viable and environmentally friendly option for the Sultanate of Oman. The research primarily demonstrates the viability of solar thermal desalination for Oman. Moh'd A. Al-Nimr et.al [11] primarily investigated a solar wind water desalination system. The findings primarily indicate that the hybrid desalination system produces 0.5 litres of soft water per day. Franz Trieb [12] primarily focused on researching concentrated solar power for the purpose of desalinating seawater in the Middle East and North Africa. Experimental research was conducted on the use of concentrated solar electricity for desalinating saltwater. Enas Taha Sayed et al. [13] primarily investigated desalination methods using renewable energy in the Middle East and North Africa (MENA) region. An investigation was conducted on desalination facilities in the Middle East and North Africa (MENA) region that are powered by renewable energy sources (RES). Renewable energy technologies are rapidly advancing and becoming more affordable, making them a promising alternative to conventional fuel-powered facilities. An exergy-based optimization of solar thermal collectors was done by Grosu et al. [14]. For forecasting the effectiveness of flat-plate solar collectors, Sadeghzadeh et al. [15] used smart models based on machine learning techniques. The use of nanofluids has been considered as a potential method of enhancing the efficiency of solar parabolic collectors by Olia et al. [16]. ANN model to predict the performance parabolic dish collector entirely studied by Loni et al.[17] whereas solar heat flux distribution in hybrid combination through heat pipe and biomass gasifier analysed by Jilte et al.[18]. A parabolic trough collector's operating parameters were tracked, and a unique sensitivity analysis was carried out by Rafiei et al.

[19] under specific conditions. Sampathkumar et al. [20] thorough study of active solar distillation provides insight into the direction of future research in the area of composite materials. Thermal performance of the desalination system was studied by Siddiqui et al. [21] utilizing a solar air heater. Their findings demonstrate that the observed productivity improved to 72% and the gained output ratio (GOR) increased up to 57%.

Kabeel et al. [22] had mainly studied hybrid solar desalination system of air humidification, dehumidification and water flashing evaporation. He argued that air humidification and water flashing evaporation get good agreement in solar desalination system in urban areas whereas Sapre et al. [23] mainly studied the design and manufacturing of absorber for solar desalination system. Zheng et.al [24] mainly experimentally investigated multi-effect tubular solar desalination devices whereas Khalil et al. [25] mainly analysed solar water desalination using an air bubble column humidifier. Ahmed et al. [26] mainly studied the characteristics of multistage evacuated solar distillation whereas Wu et al. [27] had mainly studies on the heat and mass transfer in air-bubbling enhanced vacuum membrane distillation. Jahangiri Mamouri et al. [28] experimentally investigated the effect of using thermosyphon heat pipes and vacuumglass on the performance of solar still whereas Dwivedi et al. [29] had mainly studied internal heat transfer coefficients in passive solar stills by different thermal models. Rahbar et al. [30] had mainly focus on experimental study of a novel portable solar still by utilizing the heat pipe and thermoelectric module whereas Kargar Sharif Abad et al. [31] had developed a novel integrated solar desalination system with a pulsating heat pipe.

In order to create a desalination machine for residential usage, Praveen Hunashikatti et al. [32] combined solar stills and evacuated tubes. Using renewable energy sources, Soteris A. Kalogirou [33] primarily investigated saltwater desalination. This report also reviews various desalination methods that employ renewable energy sources. The monthly averages of a sunlight hour and the monthly variance of total solar radiation are primarily covered by Ashok Kumar Rajput et al. [34]. Low-temperature, multi-effect desalination system was used by X.H Liu [35]. The article basically focussed on the energy deficit in Pune's district round the year. Thermal and economic analysis was conducted and it was found that the multi-effect desalination system proves to have better thermal performance. Hanane Ait Lahoussine Ouali et al. [36] had mainly studied integrated desalination unit. Morocco has experienced several years of drought, conventional water resources were insufficient to meet the needs of the population, which prompted the kingdom to seek other resources to ensure the supply of drinking water to this population. The most suitable solution was the desalination of seawater. In this context, the design and investigation of concentrated solar power (CSP) plant integrated with a desalination unit in Morocco are presented in this paper. The results mainly shows that the lowest freshwater production cost is 0.84$/m^3 in Dakhla, followed by 0.98$/m^3 in Saidia, with the highest production cost at 1.20 $/m^3 in Agadir. Brenda Kalista [37] et al. had mainly studied current development and future prospect review of freeze desalination. In this paper few post treatment techniques have also been developed for the productivity of fresh water. This research trends in freeze desalination as an comprehensive review along with the future prospectus utility for freeze desalination process.

Qichao Sun [38] et al. had mainly investigated research process on the integration and optimal design of desalination process. In this paper various challenges in the integration and optimal design of desalination process have been presented. The paper mainly focus on valuable insights for the enhancing the efficiency of the desalination plants. The control strategies of RES desalination for reducing environments had been discussed in the paper. Argyris Panagopoulos et al. [39] had mainly studied comparative study on minimum and actual energy consumption for the treatment of desalination of brine. Developed model for calculating the minimum energy consumption. The results showed that an increase of 5 °C in feed temperature results in an increase of 1.6 % in the minimum energy consumption whereas the actual energy consumption is at least two times higher than the minimum energy consumption for the desalination brine treatment. Dongpeng Zhao et al. [40] had mainly developed a new energy analysis model of seawater desalination based on thermodynamics. The results showed that minimum energy consumption for the ideal desalination process decreases with increases salinity of sea water and operation temperature. Author had efforts should be made to develop the new desalination techniques which can operate under the low temperature. Kedar et al. [41-48] had mainly studied hybrid solar desaliantion system using evacuated tube collector and compound parabolic concentrator. He had developed mathematical model of hybrid system and their exprimetal results mainly shows that 27 – 28 L of soft water geneeated through enlarge 50 evacuated tube collector system. Tony et al. [49] had mainly studied recents developments for solar water desalination technology whereas Elfaqih et al. [50] had mainly reviewed solar photovoltaic power for desalination system. Their study mainly shows that solar photovoltaic system is the better option for solar desalination ststem for better future.

Most of the investigations had been focussed on single basin solar still as well as hybrid system solar still. The current research focuses on ETC and CPC hybrid desalination system with comparison of different reflecting materials. On the basis of reflectivity of the material used the overall production of soft water changes. Now-a-days soft water is demand of the society with ever increasing population. Due to this it is very essential to consider the production of soft water with economic and inexhaustible resources. Many investigators have studied solar desalination system experimentally, and numerically by numerous methods but it involved consumption of fossil fuel and electric power. Among the various classes of materials, polymers were found to exhibit better results. Hence, this investigation was focussed on the production of soft water using polymeric materials as reflectors, in depth. The favourable factors of polymers in comparison of metals, in certain aspects of solar desalination systems, are weight, portability, corrosion resistance, flexibility, formability, cost effectiveness, thermal insulation, ease of manufacturing and dielectric properties. The current work presents comparison of the performance of the two polymeric materials, Mylar and Teflon, as reflector. It was observed that production of soft water with Mylar as reflecting material is higher in comparison with Teflon for ETC tubes. The reason behind this may be attributed to higher reflectivity of Mylar, which maximizes heat transmission and increases the output of soft water.

MATERIALS AND METHODS

Components Used During Experimentation

Single ended ETC is used as a main component of solar desalination system. Rows of parallel tubes are made of borosilicate glass for the ETC. The inner tube, also known as absorber, is coated with selective black coating. This coating absorbs solar energy efficiently and prevents radioactive heat losses. Air in the space of ETC tube was removed to create vacuum to check conductive and convective heat losses. ETC tubes are primarily suitable for cold ambient temperatures and are widely used for various industrial applications. The basic use of ETC tube is to generate steam from sea water. There is an insulated tank of water kept at 10 ft height and sea water from the tank flows to the evacuated tube solar collector by natural thermosyphon (natural flow). ETC is built to have a cold-water inlet, and when solar radiations fall on it, the water gets heated. The heated water moves up due to decrease in density. The ETC used in experiment gets heated up and condenses into the condenser. For single tube ETC experimentation surface condenser is not used because for the single tube ETC, naturally steam flows through the tubes and on cooling small droplets of water fall in the jar. The ETC used is circular in shape having length of 1500 mm and inner and outer diameter of 47 mm and 65 mm respectively. A copper tube is there in the Evacuated Tube Collector, through which water flows and gets heated and heated steam comes out from the other side. Use of copper tube inside ETC increases the rate of heat transfer. Aluminum, silver, and steel can be used for this purpose. The various instruments used during experiments are explained in Table 1 along with their model name and range. For their entire experimentation four instruments were used such as pyranometer, infrared thermometer, water flow meter and anemometer. For all instruments measured parameter and range of the instrument mentioned in Table 1.

Experimental Uncertainty Analysis

The experimental measuring system, which included instruments such as a solar power meter, anemometer, water flow meter, thermocouple, and infrared thermometer, was not without uncertainties. Uncertainty measurements were carried out. The uncertainty in estimating daily performance efficiency and litres of soft water was roughly ± 2% and ± 4%, respectively.

Various parameters such as ambient water temperature, wind speed, solar radiation intensity, evacuated tube temperature, and water vapor were measured at half-time intervals. The inflow mass flow rate of water was maintained constant. Figure 1 mainly shows that schematic of compound parabolic concentrator and evacuated tube collector used for solar desalination system. Both were mounted on stand with the proper basement to the horizontal. For the

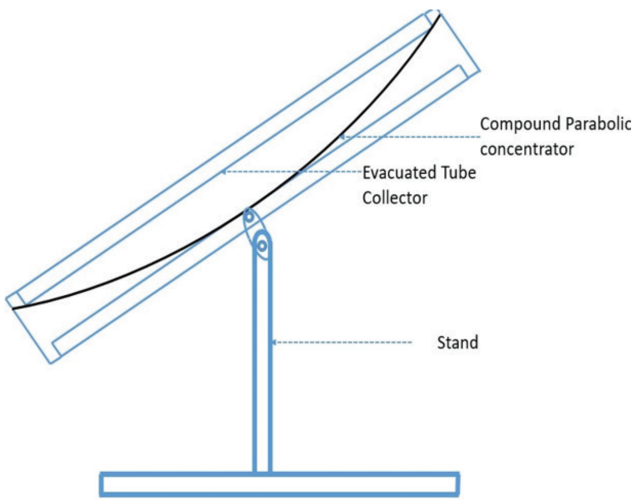

Figure 1. Schematic of CPC and ETC solar desalination system.

Table 1. Instruments used during experimentation with their specified range.

S. No.	Instrument used	Type/Model	Parameter	Range	Accuracy
1	Intensity of solar radiation	Pyranometer (Solar Power Meter)	KM-SPM-530	0 – 2000 W/m^2	+/- 0.2 W/m^2
2	Temperature	Infrared Thermometer	IRL-380	-50 – 380 ^{0}C	< 1000 ^{0}C +/- 2 ^{0}C
3	Flow rate of water	Water Flow Meter	STD	0.01 – 100 lpm	+/- 1% lpm
4	Wind Velocity	Anemometer	KM-910	0.0 - 45 m/s	+/- 3 m /s

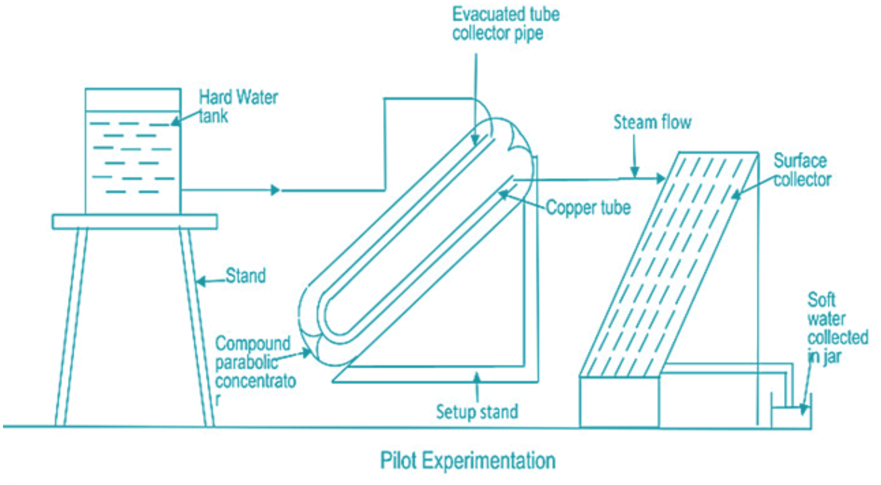

Figure 2. Complete schematic solar desalination system

Figure 3. Photographs of CPC and ETC solar desalination system.

stand there is an arrangement for angle variation depending on location. The entire setup mounted CPC - ETC combination was designed and implemented at terrace of Cummins College of Engineering for Women in Pune, India. Figure 2 mainly shows that complete schematic of solar desalination system whereas Figure 3 shows photographs of CPC and ETC solar desalination system. Figure 4 mainly shows that a view of compound parabolic concentrator during the actual experimentation whereas Figure 5 mainly shows that compound parabolic concentrator with mylar material. For the compound parabolic concentrator mylar material wrapped in such way that solar rays reflected back to ETC and within less time more amount of hot water generated.

Experimental Procedure

Several experiments were conducted in March 2023 on the campus of MKSSS's Cummins College of Engineering for Women in Pune, Maharashtra, India. The detailed experimental procedure is as follows.- Fill the hard water tank to the operational level. After that, change the test case parameters (temperature and flow rate). A compound parabolic concentrator is situated below a set of evacuated tube collectors. All measuring instruments will be ready to measure a variety of factors, including solar radiation intensity, wind velocity, thermometer, flow rate, and so on. Open the non-return valve so that hard water runs totally through copper tubes in the evacuated tube collector. Set and change valve timing based on water flow rate.In practical operation, water is heated inside copper tubes to produce steam.The valve is moved to another location in a copper tube that transports steam through the condenser. The steam stop valve is set to ensure a smooth flow of steam to the surface condenser.After steam condensation, saline/soft water is collected in a jar.The same technique should be performed for varied flow rates and distances between ETC and CPC, resulting in a variety of tests.

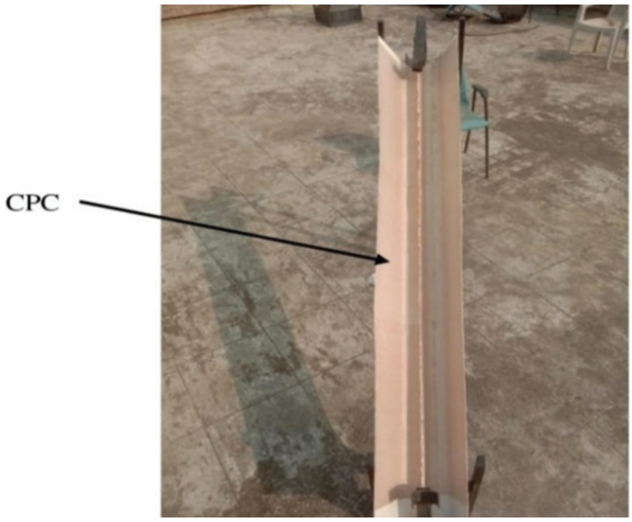

Figure 4. View of Compound Parabolic Concentrator during actual experiment.

Figure 5. Compound Parabolic Concentrator with Mylar.

RESULTS AND DISCUSSION

The results and discussion section mainly include results of the various experiments for the solar desalination system and accordingly discussions are presented in this section. In this investigation only the polymeric materials Mylar and Teflon have been used as reflecting material. There are various advantages of using polymeric materials, as elaborated above.

During the experiment, the hourly change of the measured parameters such as ambient temperature, outside evacuated tube temperature, outlet water temperature, and CPC temperature, as well as the intensity of solar radiation, wind velocity, and the rate of freshwater generation, were

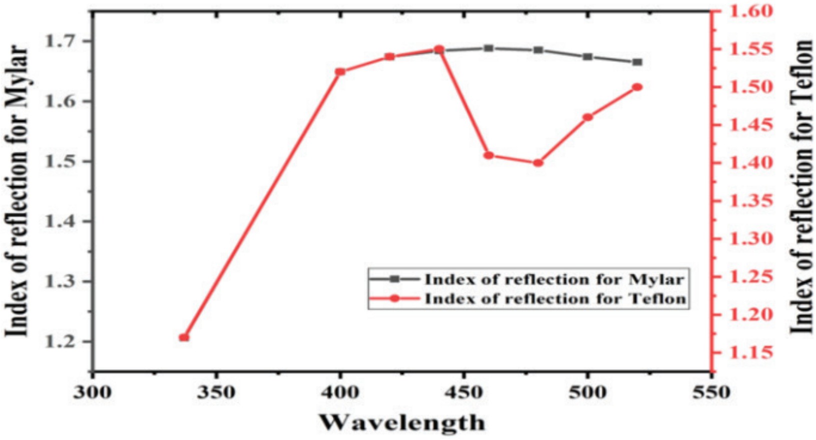

Figure 6. Variation of reflection from Mylar and Teflon with wavelength.

continuously monitored over a one-month period. In this investigation, the materials used for CPC are Mylar and Teflon of 2 mm thickness. Fig. 6 depicts index of reflection for Mylar and Teflon with wavelength. It was observed that with increase in the wavelength, the index of reflection in Mylar is in the range of 1.6 -1.7, whereas in the case of Teflon, with increase in the wavelength there is decrease in the index of reflection. This shows that the index of reflection of Mylar is higher than that of Teflon. It was observed that from Mylar the reflections are more which get transferred to ETC tubes and finally to copper tubes which enhances the formation of steam and thereby leads to higher amount of soft water generation from sea water. Index of refraction in case of Mylar is greater than Teflon for the entire wave length 450 – 525 µm which shows more possibility for generation of drinkable water.

Fig. 7 shows index of absorption for Mylar and Teflon with wavelength. In the case of Mylar it was observed that with increase in the wavelength, in the range of 0.004 to 0.010, there is decrease in the index of absorption whereas it decreases above the wave length of nearly 450 µm in the case of Teflon. During experimentation it was observed that in Teflon the index of absorption is more than that of Mylar, hence less amount of heat is transferred to ETC tubes and then to copper tubes, from the Teflon reflector. This results in relatively less amount of steam formation for the generation of soft water from sea water. There was deviation observed in Teflon as compared to Mylar shows continuously decreasing nature for the index of absorption.

The intensity of solar radiation and production of soft water in litres with Mylar with time is depicted in Fig.8. It was observed that intensity of solar radiation gradually increased from 400 - 930 W/m^2 during the time interval of 12:30 PM to 1:30 PM. In the afternoon time soft water generation rate is very high. At the end of the day 3.5 litres of soft water was collected which clearly explains that higher

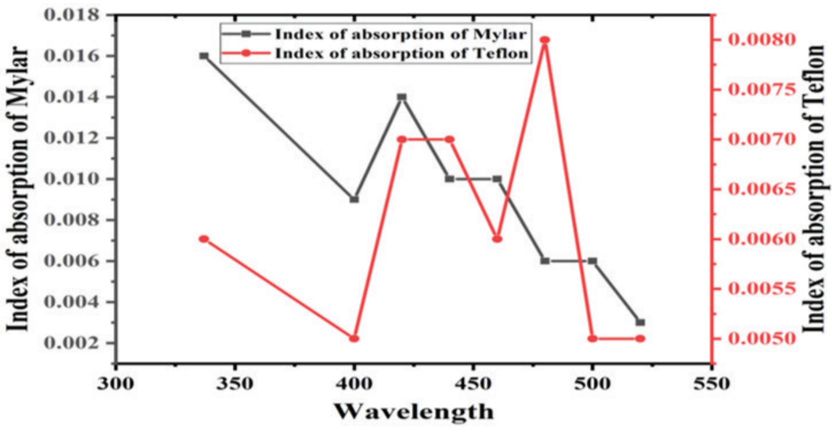

Figure 7. Variation in index of absorption of Mylar and Teflon with wavelength.

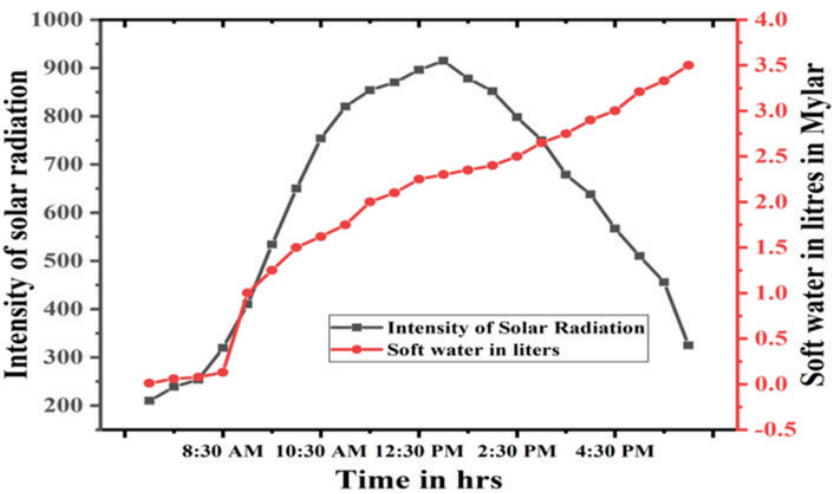

Figure 8. Variation in intensity of solar radiation and output of soft water in litres with time the time of exposure, in case of Mylar reflector.

index of reflection and smaller index of absorption of Mylar lead to higher amount of soft water generated.

The Fig. 9 shows intensity of solar radiation and soft water in litres for Teflon versus time. It is clearly observed that intensity of solar radiation gradually increases from 400 - 930 W/m^2 at the time interval of 12:30 PM to 1:30 PM. In the afternoon generation rate of soft water is very high. At the end of the day 3.2 litres of soft water was collected. The reason behind this is less index of reflection of Teflon and more index of absorption. Thus, on comparing the CPC materials it was noted that there is higher amount of soft water generation in case of Mylar in comparison with Teflon. Initially the formation of soft water rate is very slow in morning session, thereafter in afternoon session the formation rate of soft water is very high due to intensity of solar radiation increases continuously.

Fig. 10 shows soft water production in litres with Mylar and Teflon reflectors with the time of exposure. It may clearly be observed that soft water produced by Mylar reflectors higher in comparison with that from Teflon reflector Throughout the entire day using Mylar as coating material, production of soft water is 3.5 litres per day whereas using Teflon as a coating material there is production of 3.2 litres of soft water. This result clearly indicates that with Mylar the rate of soft water production is more in comparison with Teflon. The reason behind this enhancement from Mylar is its higher index of reflection in comparison with Teflon. Hence, Mylar gives better result in comparison with Teflon.

A table of comparison has been shown for the production of soft water along with reflectivity values for Aluminium foil, Mylar and Teflon in Table 2. It clearly shows that Mylar as a candidate reflecting material with respect to the other two, and it also shows better results for polymeric material as compared to metallic material.

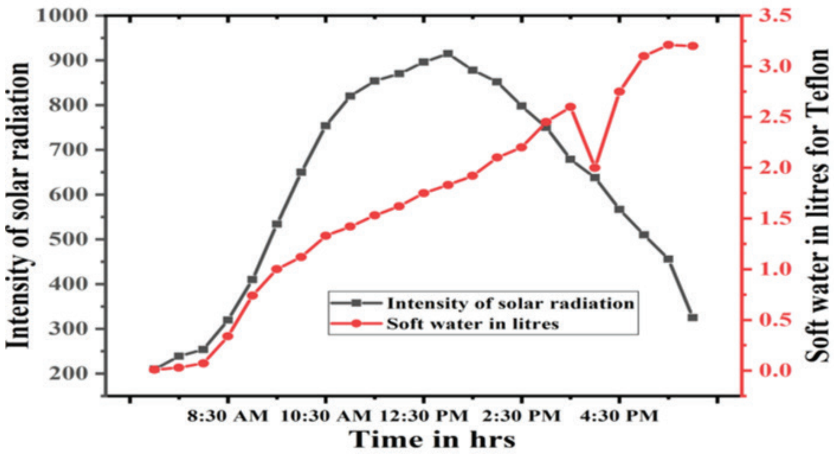

Figure 9. Intensity of solar radiation and soft water in litres for Teflon versus time.

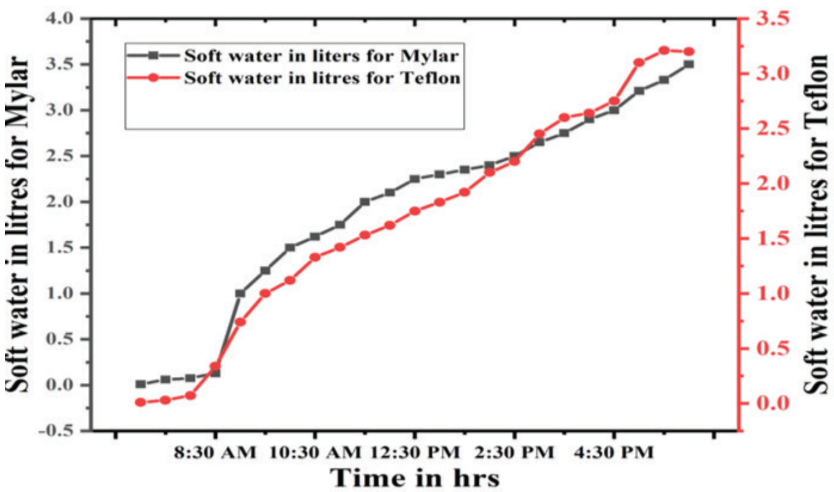

Figure 10. Soft water output in litres with Mylar and Teflon reflectors with time of exposure.

Table 2. Comparison of reflectivity and amount of soft water production for Mylar, Teflon and Aluminium foil as reflecting material used in hybrid ETC and CPC solar desalination system

Sr. No.	Reflector material	Reflectivity	Soft water (in litres)
1	Mylar	98	3.50
2	Teflon	94	3.00
3	Aluminum foil	90	2.15

Table 3. Hybrid Solar system comparison of reflectivity and amount of soft water production

Sr. No.	Hybrid solar system	Soft water (in litres)
1	Solar wind hybrid energy system	0.50
2	Solar still coupled with ETC system	3.28

Based on the comparison between Table 2 and Table 3, it is evident that the materials Mylar, Teflon, and Aluminium foil yield fresh water amounts of 3.5 L, 3.00 L, and 2.15 L per day, respectively. On the other hand, the solar wind hybrid energy system and the solar still coupled with ETC system produce fresh water amounts of 0.50 L and 3.28 L per day, respectively. This comparison demonstrates that the hybrid solar groundwater desalination system is better suited for the production of fresh and drinking water. [11, 32]. Table 3 shows that as per the comparison point of view solar wind hybrid energy system gives 0.50 l soft water per day whereas solar still coupled with ETC system gives 3.28 l soft water per day. This results shows mylar and teflon gives better performance results in hybrid solar desalination system.

Limitation for the entire study

a) Only two materials, Mylar and Teflon, were used during the whole study of the solar desalination system. b) The system is non-functional for the entire heavy rainy season due to insufficient sun radiation on rainy days. c) The entire study exclusively utilizes only groundwater for testing purposes [6].

Environmental Benefit of the Study

The environmental impacts (EIs) of the desalination process vary greatly depending on the characteristics of the feedwater and the specific desalination method being used. This experiment aims to reduce carbon emissions in the desalination process by using Mylar and Teflon as reflector materials. By doing so, the experiment will enable a specific organisation to get advantages under the Clean Development Mechanism (CDM). A society that prioritises a greener environment would benefit from reduced pollution and the implementation of eco-friendly systems [37].

Environmental Impact

It is known that technologies made by humans have significant impact on the environment. Most of the times, these effects lead to unfavorable consequences Although desalination provides a consistent water supply regardless of the natural freshwater ecosystems and delivers relief from water stress and scarcity, many concerns are still expressed due to the potential negative repercussions. This is despite the fact that desalination supports human health and socio-economic welfares. Desalination has had a variety of effects on the environment, each of which is distinct and occurs on a separate level. It is possible to describe desalination that interacts with the world around it through the use of inputs and outputs through as a process straightforward explanation. The terms "geosphere," "hydrosphere," "biosphere," and "atmosphere" are typically used to refer to these interactions, which are inputs from and outputs to nature at various environmental subsystems, such as land, water, living things, and air [38].

Table 4. Specification of Mylar and Teflon

Sr. No.	Property	Mylar	Teflon	Unit
1	Tensile strength	28,000	3,900	PSI
2	Tensile modulus	7,40,000	80,000	PSI
3	Surface roughness	38	30	nm
4	Density	1.39	2.16	g/cm^3

Table 5. Economic analysis of hybrid Solar desalination system (ETC – CPC)

Sr. No.	Quantity of the system	Cost
1	One Single ETC tube	5.83
2	One single CPC for ETC	17.50
3	Stand for the entire setup	7.29
4	Cu tubes for Insides ETC tube	14.58
5	Hard/Soft water tank	11.67
6	Condenser for desalination system	20.42
7	Entire plumbing/ pipe line work	14.58
8	Valves and labor cost	21.88
	Total Cost (USD)	113.75

Economic Analysis of Single Hybrid Solar Desalination System (ETC+CPC)

The economic evaluation of the present work is under-taken for life cost analysis. The entire cost of the current study is primarily made up of fixed costs, production costs, and running costs as is listed in Table 5. The basis of these costs is the real purchase price of the apparatus. The cost basis that we have adopted is for the year 2023 in US dollars.

For the economic analysis shows that the total cost associated with the hybrid energy system is USD 113.75

CONCLUSION

In the current investigation compound parabolic concentrator was employed for desalination purpose and various thermal properties with respect to Mylar and Teflon as coating material have been analysed. During this investigation mylar and teflon material used over CPC and above ETC, single effect boiling approach is suggested for producing drinkable water. The major conclusions from the comparative study are as follows:

a) Mylar and Teflon belong to same class of materials (polymers). The comparison between the two is related to their thermal properties. It shows that Mylar has higher index of reflection and less index of absorption as compared to Teflon
b) For maximum production of soft water the coating thickness for Teflon should be of 3 mm as observed from the experiment.
c) In case of Mylar the coating thickness should be of 2 mm for the maximum production of soft water.
d) Since the index of reflection is higher for Mylar in comparison with Teflon, the production of soft water is higher for Mylar.
e) The overall experimental procedure is cheap, inexhaustible, safe and without power consumption, and is useful from the society point of view.

NOMENCLATURE

Ig	Intensity of solar radiation, W/m^2
t	Time, hrs
T	Temperature, °C
V	Wind velocity, m/sec
n	Refractive index
u	Velocity of the medium, m/sec.
ETC	Evacuated Tube Collector
CPC	Compound Parabolic Concentrator

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AUTHORSHIP CONTRIBUTIONS

Authors equally contributed to this work.

DATA AVAILABILITY STATEMENT

The authors confirm that the data that supports the findings of this study are available within the article. Raw data that support the finding of this study are available from the corresponding author, upon reasonable request.

CONFLICT OF INTEREST

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ETHICS

There are no ethical issues with the publication of this manuscript.

STATEMENT ON THE USE OF ARTIFICIAL INTELLIGENCE

Artificial intelligence was not used in the preparation of the article.

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