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# Single Basin Solar Still with Varying Depth of Water: Optimization by Computational Method

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*ABSTRACT*

Solar still is a device, used to convert brackish water into distill water but the major issue low profitability and it is imperative to outline an ideal device. Computational Fluid Dynamics (CFD) simulation can help designers to improve the execution of a sun oriented still for a given cost. In this study, we examine the capacity of CFD simulation in calculation of heat and mass transfer in a single basin sun powered still. Experiments were performed in month of June in Jaipur, India. In this work, single basin solar still was fabricated and then optimized using CFD based methodology for water depth of 0.01m, 0.02m and 0.03 m. CFD based results help in a designing a solar still with maximum yield productivity of distilled water. It was concluded that maximum yield was achieved when water depth has minimum value i.e. 0.01 m. Total dissolved solid (TDS) value for sample water taken at water basin was in range of 500 PPM but after distillation water at output reaches below 50 PPM. Therefore, solar still was capable of improving the quality of water and brackish water of high TDS value can be reduced and used for drinking purpose.

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## INTRODUCTION

Developing populaces, expanding financial exercises and an adjustment in atmosphere have prompted to genuine shortage of drinking water in numerous nations. Fresh water deficiency and expanding vitality request are among the most significant issues around the world. However restricted and quickly exhausting fossil-based vitality sources, the greenhouse gas discharges that likewise because an abnormal weather change. Water consumption on the planet is utilized for water system (70%), industrial purposes (20%) and household (10%) for drinking and cleaning. The introduced limit of water desalination frameworks by the start of thousand years was around 22 million $m^3$/day and has expanded to 71.7 million $m^3$/day in ten years which requires about 650 million tons of oil every year if just the oil is to be utilized for heating salted water. To increase predominance of drinking water various systems are utilized by individuals yet all methods usages vitality by itself such as RO, heating by electricity. In various parts of Indian towns and residential community where electricity is still not in achieve, better nature of water can likewise be gotten by alternate vitality resources. Among the different accessible strategies solar energy will be a decent source particularly in western and northern parts of India where temperature comes to over 40˚C in summer. The sun discharges vitality at a recurrence of $3.8\times10^{23}$ kW of which around $1.8\times10^{14}$ kW is obstructed by the earth. Around 60% of this total or $1.08\times10^{14}$ kW is consumed by the surface of the earth. The rest is reflected into space and consumed by the environment. In just 1 hour energy consumed by the earth is more than the energy consumed in the whole world for one year. The yearly sun powered imperativeness that accomplishes the world's surface is about 3400,000 EJ [1]. Rain generation is a tremendous use of humidification de-humidification strategy by which drinkable water is delivered from salty water of oceans and seas. Sun, as a warmth source, is utilized to dissipate around 16 million tons of water from land to the climate every second [2].Vapor is conveyed by the winds to where it runs over a low temperature zone and consolidates to shape accelerates as rain, snow. One kg of air can carry around 100 g water vapor at 60 ˚C and it arises to 500 g at 80 ˚C [3]. Solar still (SS) is a device which is utilized to change over saline water into distilled water. They are inexpensive, have low upkeep and they are a perfect decision to meet states of numerous

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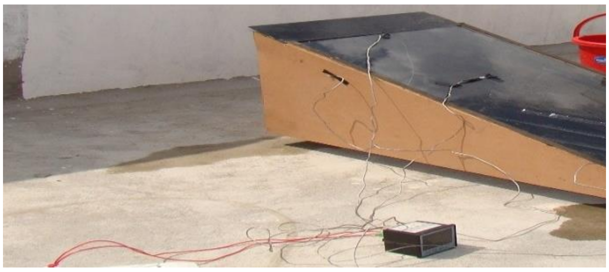
circumstances. Having these incredible points of interest, researchers concerned to investigate such potential sources of energy. There are a few strategies utilized to enhance the efficiency of the still such as latent heat storage with phase change [4-7] for improving distilled water generation, sensible warmth storing materials like rock wicks, solid funnels, stones, charcoal and steel scraps [8-11]. Coupling the thermo-electric [12] and reflectors [13, 14] tools enhances the proficiency of production of water. Panchal et *al.* [15] studied that distilled water output of passive solar still fitted with aluminum plate in water basin was maximum as compared to solar still having galvanized iron plate as well as conventional solar still. Asbik et al. [16] found that quantity of shattered energy was crucial during the sunlight period particularly in the absorber. During night, even if the losses are minute, brackish water and phase changing material makes the maximum and minimum energy destroyed respectively. Energy elimination of the reflexive solar still and the phase changing material medium was extensively affected by the storage mode. Thus, the latent heat generates a significant destroyed energy. Variably latent heat storage increases the water efficiency and reduces the energy efficiency. Generally, the instant energy effectiveness of the solar still was calculated low throughout the day time. Elango et *al.* [17] studied single basin and double basin slope glass stills. In this, still were concentrated under insulated and un-insulated conditions for their generation at different water depth of 1, 2, 3, 4 and 5 cm. A maximum of 4.315 l/0.81 $m^2$ day was acquired at 1 cm water depth by the protected double basin glass still. But the protected single basin still resulted in just 3.565 l/0.81 $m^2$ day. Conversely, investigational measures stay expensive and time intense. Mowla and Karimi [18] demonstrated a single incline sun powered still under climatic state of Iran. They demonstrated that numerical displaying and exploratory outcomes are in a good arrangement. Moreover scientific demonstrating, computational fluid dynamics (CFD) is another apparatus to simulate the stream assembly inside a solar still. CFD has generally minimal effort and rapid. It can likewise recreate a genuine or a perfect condition. In addition, it permits inspecting an extensive number of circumstances and parameters to give an exhaustive arrangement of results. Rheinlander [19] has simulated heat and mass transfer singularities via finite difference technique to explain governing equations of solar still. He observed a close agreement among mathematical and investigational mass transfer information. Omri [20] explained that CFD simulation can be beneficial in optimization of sun based stills. Papanicolaou et al. [21], Papanicolaou and Belessiotis [22] utilized turbulent demonstrating to research the unstable performance of turbulent stream administration in a deviated trapezoidal walled in area. They reported that the quantity of multi-cell stream field relies on upon the Rayleigh number for a settled Lewis number and geometry.

Generally, typical solar tills suffer from their low productivity. In fact, it is very important for an engineer to design an economical device. Therefore, before constructing a solar still, we need some relations to estimate water productivity within an acceptable accuracy. CFD simulation of heat and mass transfer in a solar still is very significant to design an economical device and to enhance its performance for a given cost. To the best of authors' knowledge, there is not enough investigation on the CFD simulation of single basin passive type solar-stills with varying depth of water. For the most part, normal sun based tills experience low profitability problem. Indeed, it is essential for a designer to plan a practical device. In this way, before developing a sun based still, we require a few relations to measure water profitability inside a worthy exactness. CFD simulation of heat and mass transfer in a sun oriented still is very significant to plan an economical device and to improve its execution for a given cost. In this experimental work, our main objective of research work is to:

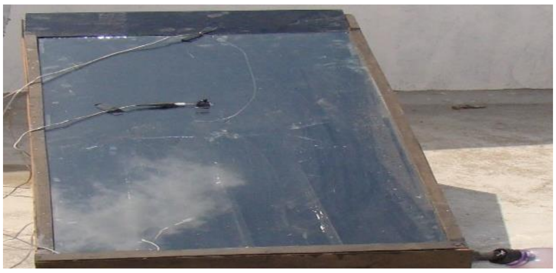
- Determine optimum grid size for optimization of solar still in computational arrangement
- Determine yield production of solar still by applying all parametric equation and boundary condition for CFD based study
- Determine yield productivity of solar still with varying depth of water by applying all boundary condition achieved from CFD
- Determine full day efficiency of solar still
- Compare the TDS level of brackish water at inlet and distilled water at outlet of solar still

## MATERIAL AND METHODS

The experimental image of simple solar still is shown in Figure 1. The experimental set up are installed in Jaipur, India (26.9124˚ N latitude, 75.7873˚E longitude). Solar still (SS) is south facing to receive the maximum solar radiation. The SS having sink space of 1$m^2$ is made-up by using an absorber plate of aluminum sheet 2 mm thickness. The experimentations are carried out in time duration of 7:00 AM–7:00 PM for 1st, 2nd and 3rd June 2017. The temperatures are recorded using K-type thermocouple and Multi point data recorder. The ambient temperature is recorded by using temperature meter (K-type). Various location of thermo couple inside the solar still is shown in Figure 1. A pyranometer is used to screen the solar radiation. The output of both the simple solar still and CFD based solar still are analyzed at the water depths of 0.01, 0.02 and 0.03 m. The interior dividers of sink is layered by dark paint to build absorptivity. The basin is secured with glass front of 4 mm thickness. The crevices between the glass cover the still was covered with silica gel to avert spillage to the environment. Thermocouple $T_1$ shows the temperature of upper side of glass (ºC) while $T_2$ shows the temperature of lower side of glass (ºC), $T_3$ shows the temperature of ambient air (ºC), $T_4$ shows vapor temperature of inside side of SS (ºC) and $T_5$ shows temperature of absorber plate of SS (ºC). Tables 1 and 2 showing specification of instrument used and parameter values applied. In order to measure the hardness of output water from solar still TDS meter of HM Digital manufacturer Inc. within the range of 0-100 ppm and accuracy level ± 2% full scale was used.



(a)



(b)

**Figure 1**. Experimental set up of solar still with Thermo couple

**TABLE 1**. Description of instrument

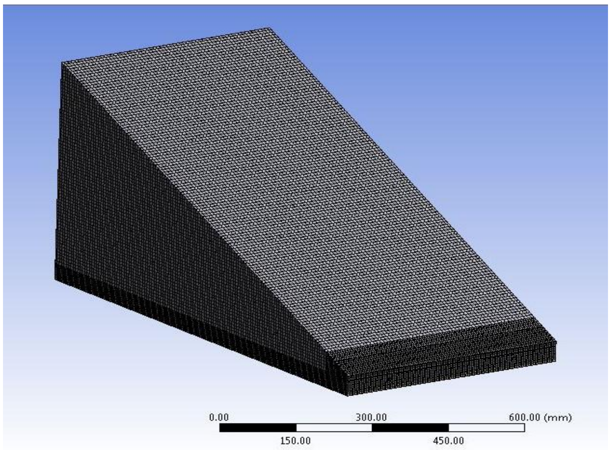
| Instrument | Accuracy | Range | % Error |
|---|---|---|---|
| Thermocouple | ±1 C | 0 – 100 C | 1 |
| Pyranometer | ±25 W/m$^2$ | 0–1850 W/m$^2$ | 3 |
| Digital thermometer | ±1 C | 0 – 100 C | 1 |

Table 2. Thermo physical value of various parameter

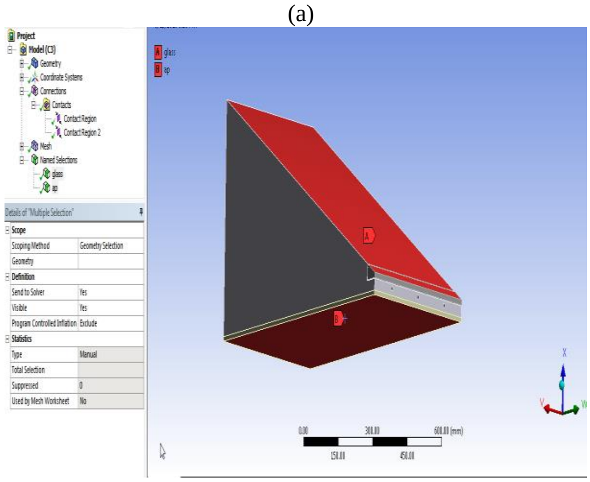
| S. No | Thermo physical values used | |
|---|---|---|
| 1. | Area of basin ($A_{bw}$) | 1 m$^2$ |
| 2. | Specific heat of glass ($C_{pg}$) | 780 J/kg °C |
| 3. | Specific heat of water ($C_{pw}$) | 4187 J/kg °C |
| 4. | Absorptivity of glass ($\alpha_{gw}$) | 0.0469 |
| 5. | Reflectivity of the glass ($\rho_{gw}$) | 0.0732 |
| 6. | Absorptivity of water ($\alpha_w$) | 0.05 |
| 7. | Absorptivity of basin ($\alpha_{wb}$) | 0.93 |

**Geometric modelling and meshing**

Figure 2 shows meshing in which cut cell has been applied to refine the mesh with lowest size of 4 mm and 10 mm as highest size for achieving better results. There are three region such as glass, wood and absorber plate for simple solar still. For meshing geometry, number of node which is 632088 and total element is 553048 number and size of meshing is important factor for achieving optimum result and for this number of meshes has been reduced by cut cell (hex-dominant mesh) method.




(a)



(b)

**Figure 2**. Meshing pattern and Number of body in mesh section of solar still

**Assumptions for evaporation–condensation modelling**

1. Temperature of initial air is considered as morning environment air temperature.
2. Material of the heating plate is aluminium and it is assumed that the plate is fully conductive without any plate thickness.
3. Constant evaporation-condensation frequency is considered. Solar still is assumed perfect leak proof device for this CFD simulation.

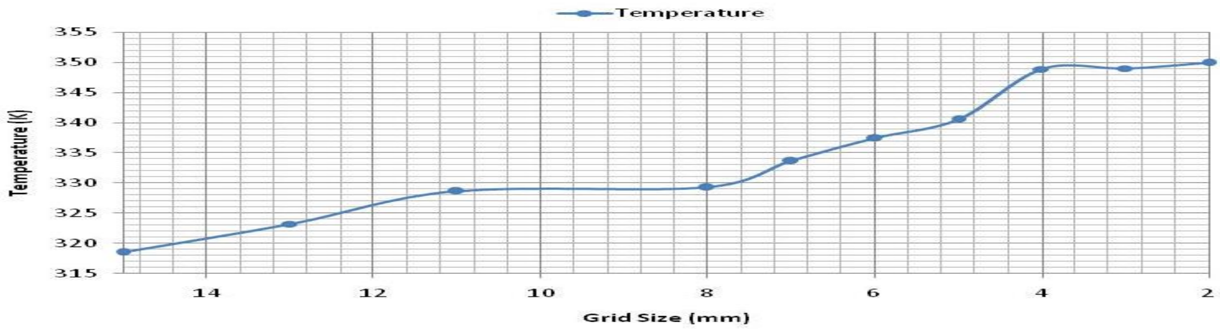



**Figure 3**. Temperature vs. grid size graph

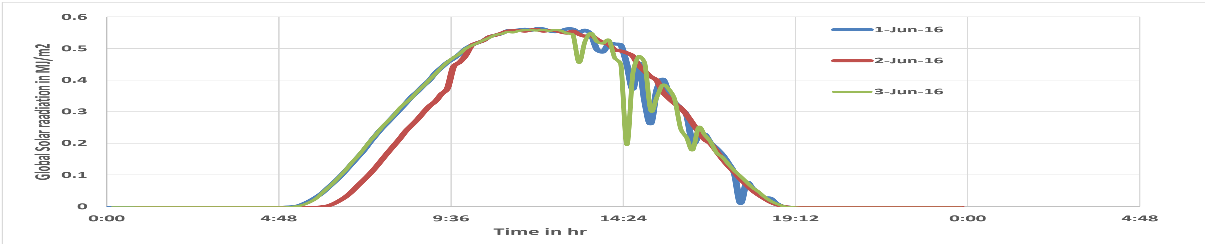



**Figure 4**. Global solar radiation in MJ/m$^2$ vs. time graph

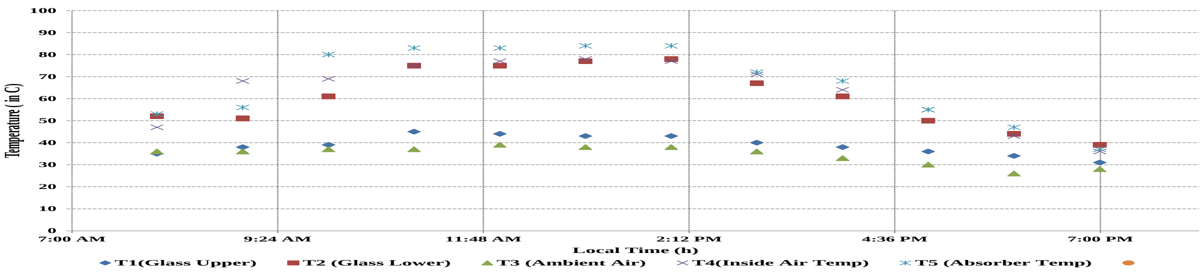



**Figure 5**. Temperature vs. time at 0.01 m water depth on 1/6/2016

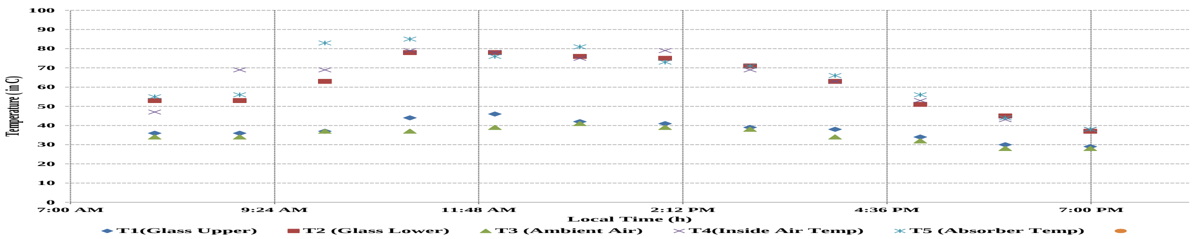



**Figure 6**. Temperature vs. time at 0.02 m water depth on 2/6/2016

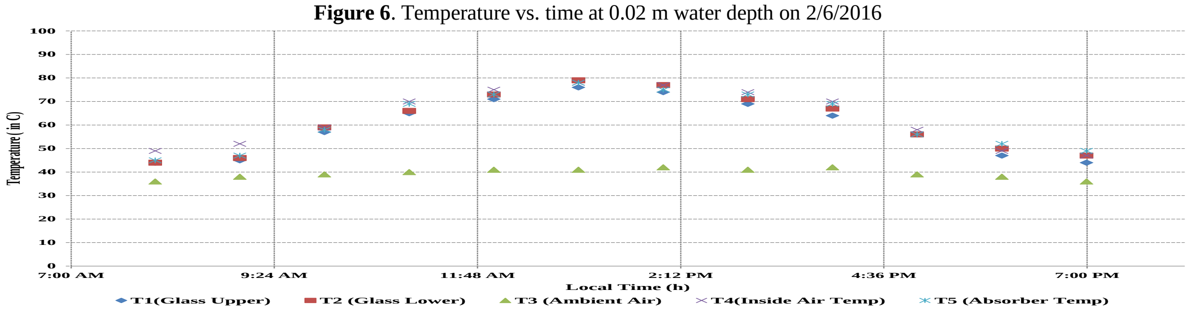



**Figure 7**. Temperature vs. time at 0.03 m water depth on 3/6/2016

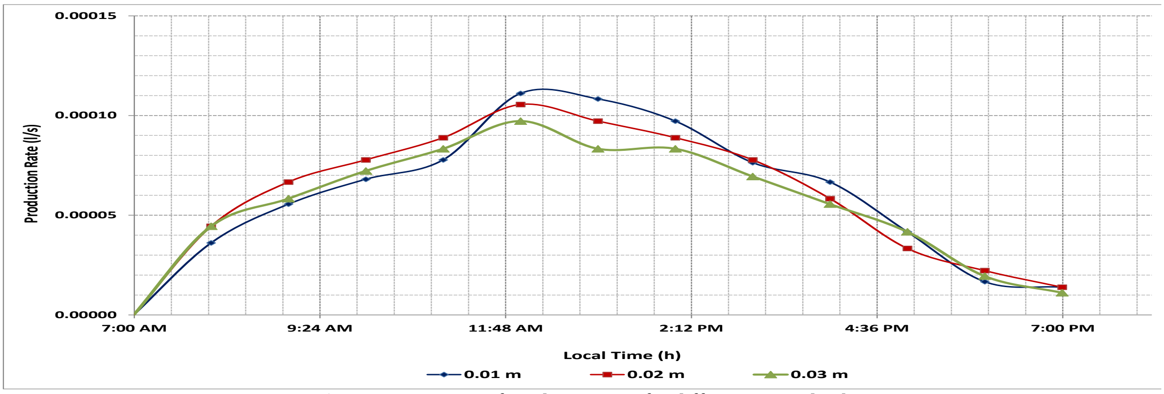



**Figure 8**. Variation of production rate for different water depth

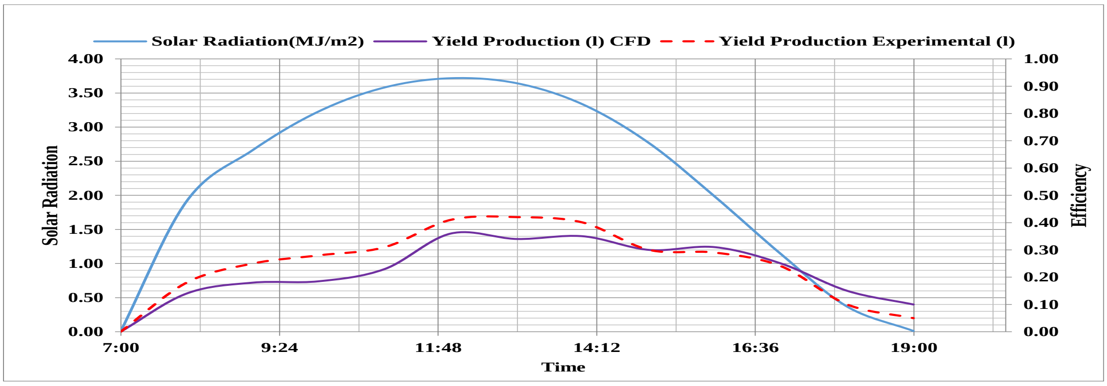



**Figure 9**. Experimental validation for 0.01 m depth

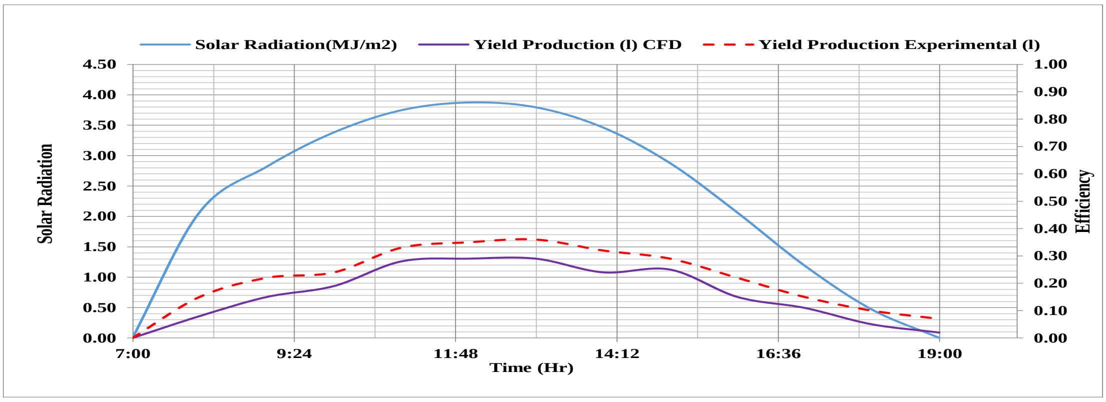



**Figure 10**. Experimental validation for 0.02 m depth

**TABLE 3**. Comparison of Full day productivity and TDS of water for various depth

| S.no | Water Depth | Yield Production (lit) CFD | Yield Production Experimental (lit) | Water hardness in PPM of Dissolved Salts | |
|---|---|---|---|---|---|
| | | | | Sample Water inside basin | Water collected at output of solar still |
| 1. | 0.01 m | 3.90 | 4.48 | 493 | 27 |
| 2. | 0.02 m | 3.30 | 4.00 | 450 | 21 |
| 3. | 0.03 m | 3.20 | 3.76 | 479 | 14 |

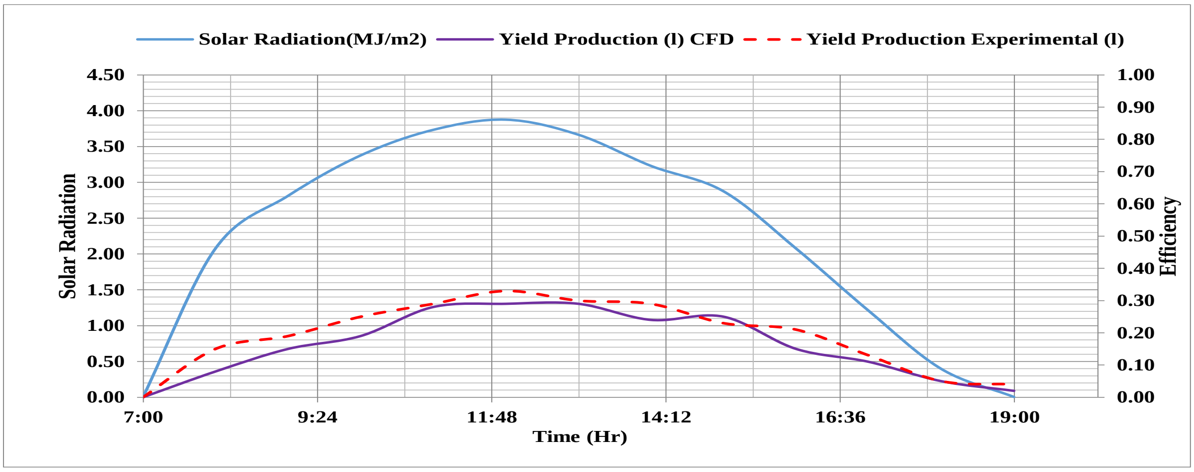



**Figure 11**. Experimental validation for 0.03 m depth

4. No slip condition for velocity is applied at the solar still inner surface.
5. The properties of air are constant, except for the density change with temperature (in general incompressible ideal gas laws) which has been treated using the Boussinesq approximation.
6. Navier-Stokes equation for Mass, momentum and energy has been applied for achieving desired distilled water output.

**Discretization scheme**

| | |
|---|---|
| Variable | Scheme |
| Pressure | PRESTO! |
| Momentum | First order upwind |
| Volume fraction | First order upwind |
| Turbulent kinetic energy | First order upwind |
| Turbulent dissipation rate | First order upwind |
| Energy | First order upwind |
| **Pressure velocity coupling** | |
| Parameter | Value |
| Type | SIMPLEC |
| Skewness Correction | 0.7 |

**Grid independency test**

Figure 3 shows the grid independency test in which temperature and grid size are correlated with each other. This figure shows that below 4 mm size temperature remain stable at 350 k.

**Experimental data**

Figure 4 shows radiation value with respect to time (1$^{st}$ June, 2$^{nd}$ June and 3$^{rd}$ June 2016). Starting radiation valor for 1$^{st}$ and 3$^{rd}$ June are almost identical and due to this both line are superimposing on each other for almost 9 am. Solar radiation has very small value from 12.10 am to 5 am and 7 pm to 12.10 am. Highest value of radiation is between 12 noon to 2 pm. Diffused radiation has lowest and steady value from 7 am to 2 pm and global radiation has highest value especially at 12 noon when it reaches maximum of 0.563 MJ/m$^2$. After 3 pm solar intensities start reducing due to which rapid change in graph is observed after 3 pm and it continues up to 7 pm. A steady path for global and direct radiation value between 12 noon to 2 pm was observed for 2$^{nd}$ June. Global radiation has highest value of 0.560 MJ/m$^2$ at 12 noon and direct radiation has maximum value of 0.423 MJ/m$^2$ at 11.20 am. A greater fluctuation was observed between 2 pm to 5 pm when solar intensity reduces for 3$^{rd}$ June. Diffused radiation value remain steady for 9 am to 1 pm. Highest value of global radiation is 0.559 MJ/m$^2$ at 12.10 pm and direct radiation has maximum value of 0.423 MJ/m$^2$ at 12.30 pm.

## RESULTS AND DISCUSSION

**Thermal analysis of Solar Still**

In this section temperature measurements were conducted at various locations of experimental setup. Figure 5 represents temperature at various point in still and time for 1$^{st}$ June with depth of water 0.01 m. Result shows highest temperature of 84˚C achieved at absorber plate layer at 1 pm. A constant value at time 12 noon to 2 pm is shown for all point in figure with ambient air temperature remained almost constant from 9 am to 4 pm. Figure 6 shows result for 0.02 m depth of water in basin for 2$^{nd}$ June. It shows that absorber plate temperature reaches a value of 85˚Cat time 11 am which is highest for the day. Ambient air temperature is observe to be minimum as compare to all surface temperature. Figure 7 shows temperature value for 3$^{rd}$ June with depth of water 0.03 m. The highest temperature of still at lower glass surface is 79˚C at 1 pm and lowest value is for ambient air. Figure 8 shows the hourly based production of water at various water depth.

Thermal Effectiveness: efficiency of solar still is calculated by following equation:

$$\eta = \frac{M_y\, L \times 3600}{A_{sa} I.\Delta t} \quad (1)$$

where, I = Solar energy on glass shield of solar still in $W/m^2$, L = latent heat of evaporation = 2270000 J / kg, $M_y$ = Full day yield, $A_{sa}$ = Basin area = 1 $m^2$, $\Delta t$ = Time step (Second)

**CFD results used in enhancing experimental results**

Figure 9 show results between yield production achieved by experimental work and CFD work for water depth of 0.1 m. Maximum value of global radiation is 3.72 $MJ/m^2$ at 12 noon. Highest hourly yield of CFD based still is 0.36 litre at 12 noon and after applying the same parameter to experimentally fabricated solar still, experimental solar still is 0.42 litre at 1 pm. CFD result shows the productivity of still for 24 hours is 3.90 litres whereas productivity of experimental solar still for the same time has value of 4.48 litres. Applying all boundary conditions of CFD based still and properly insulation of boundary, after properly executing all collect data, experimental work shows higher yield of productivity. Because of some parametric condition and due to meshing and grid making, little error may exist in computational work, so achieved distilled is lower as compare to experimental data. Figure 10 shows maximum value of global radiation 3.87 $MJ/m^2$ at 12 noon. Maximum hourly water output is 0.36 litre for experimental solar still whereas CFD based still has 0.29 litre water productivity. The 24 hours yield productivity of CFD based solar still is 3.30 litres and experimental solar still is 4 litres. Figure 11 shows highest value of global radiation 3.88 $MJ/m^2$ at 12 noon. Hourly based productivity of CFD based still has maximum value of 0.30 litre at 1 pm and 0.33 litre at 12 noon for experimental solar still. The 24 hours maximum productivity of CFD based still is 3.20 litres whereas experimental based still has maximum value of 3.76 litres. Table 3 shows the productivity comparison of experimental and CFD based solar still and TDS value of distilled water at output. Water for basin of solar still at inlet has been collected from various places in Jaipur.

## CONCLUSION

In this analysis, the profitability of sun oriented still with two techniques in view of CFD simulation and experimental investigation was evaluated. The accompanying are the rundown of fundamental outcomes

- It was found from the experimental analysis that increasing the ambient temperature from 30°C to 45°C will increase the productivity by approx. 10 to 30%, which shows that the system performed more distillation at higher ambient temperatures for simple solar still.
- It was observed that when the water depth increases from 0.01m to 0.03m the productivity decreased by 5%. These results show that the water mass (water depth) has an adverse effect on the distillate output of the solar still system.
- The solar radiation increase from 0 $MJ/m^2/h$ to 5 $MJ/m^2/h$ has increased the productivity of the still by approx. 15 to 35%. However, increase of the solar radiation parameter should increase the solar energy absorbed by the basin liner
- With the help of CFD results and after properly executing all parameters in experimental work, productivity of fabricated solar still increases and it shows that if before experimental work, optimization is computationally conducted then it helps in achieving better results for experimental based study under same parametric conditions.
- Total dissolved solid (TDS) value for distilled water at output reaches below 50 ppm, so solar still is capable of improving the quality of water and brackish water of very high TDS value can be reduced and available for drinking.
- For domestic application of achieving clean water at minimum cost without any external power source, solar still is the best available device under this category.

## REFERENCES


1. Seddegh, S., X. Wang, A.D. Henderson and Z. Xing, 2015. Solar domestic hot water systems using latent heat energy storage medium: a review. Renewable and Sustainable energy reviews, 49: 517-533.
2. Narayan, G.P., M.H. Sharqawy, E.K. Summers, J.H. Lienhard, S.M. Zubair and M. Antar, 2010. The potential of solar-driven humidification–dehumidification desalination for small-scale decentralized water production. Renewable and Sustainable Energy Reviews, 14(4): 1187-1201.
3. Kabeel, A., M.H. Hamed, Z. Omara and S. Sharshir, 2013. Water desalination using a humidification-dehumidification technique—a detailed review. Natural Resources, 4(03): 286.
4. Dashtban, M. and F.F. Tabrizi, 2011. Thermal analysis of a weir-type cascade solar still integrated with PCM storage. Desalination, 279(1): 415-422.
5. Radhwan, A.M., 2005. Transient performance of a stepped solar still withbuilt-in latent heat thermal energy storage. Desalination, 171(1): 61-76.
6. Tabrizi, F.F., M. Dashtban and H. Moghaddam, 2010. Experimental investigation of a weir-type cascade solar still with built-in latent heat thermal energy storage system. Desalination, 260(1): 248-253.
7. Tabrizi, F.F., M. Dashtban, H. Moghaddam and K. Razzaghi, 2010. Effect of water flow rate on internal heat and mass transfer and daily productivity of a weir-type cascade solar still. Desalination, 260(1): 239-247.
8. Murugavel, K.K., K.K. Chockalingam and K. Srithar, 2008. Progresses in improving the effectiveness of the single basin passive solar still. Desalination, 220(1-3): 677-686.
9. Murugavel, K.K., K.K. Chockalingam and K. Srithar, 2008. An experimental study on single basin double slope simulation solar

still with thin layer of water in the basin. Desalination, 220(1-3): 687-693.
10. Murugavel, K.K., S. Sivakumar, J.R. Ahamed, K.K. Chockalingam and K. Srithar, 2010. Single basin double slope solar still with minimum basin depth and energy storing materials. Applied Energy, 87(2): 514-523.
11. Rajaseenivasan, T., T. Elango and K.K. Murugavel, 2013. Comparative study of double basin and single basin solar stills. Desalination, 309: 27-31.
12. Esfahani, J.A., N. Rahbar and M. Lavvaf, 2011. Utilization of thermoelectric cooling in a portable active solar still—an experimental study on winter days. Desalination, 269(1): 198-205.
13. Tanaka, H., 2010. Monthly optimum inclination of glass cover and external reflector of a basin type solar still with internal and external reflector. Solar Energy, 84(11): 1959-1966.
14. Tanaka, H. and Y. Nakatake, 2009. Increase in distillate productivity by inclining the flat plate external reflector of a tilted-wick solar still in winter. Solar Energy, 83(6): 785-789.
15. Panchal, H.N. and P.K. Shah, 2011. Char performance analysis of different energy absorbing plates on solar stills. Iranica Journal of Energy & Environment, 2(4): 297-301.
16. Asbik, M., O. Ansari, A. Bah, N. Zari, A. Mimet and H. El-Ghetany, 2016. Exergy analysis of solar desalination still combined with heat storage system using phase change material (PCM). Desalination, 381: 26-37.
17. Elango, T. and K.K. Murugavel, 2015. The effect of the water depth on the productivity for single and double basin double slope glass solar stills. Desalination, 359: 82-91.
18. Mowla, D. and G. Karimi, 1995. Mathematical modelling of solar stills in Iran. Solar Energy, 55(5): 389-393.
19. Rheinländer, J., 1982. Numerical calculation of heat and mass transfer in solar stills. Solar Energy, 28(2): 173-179.
20. Omri, A., 2007. Numerical investigation on optimization of a solar distiller dimensions. Desalination, 206(1-3): 373-379.
21. Papanicolaou, E., K. Voropoulos and V. Belessiotis, 2002. NATURAL CONVECTIVE HEAT TRANSFER IN AN ASYMMETRIC GREENHOUSE-TYPE SOLAR STILL--EFFECT OF ANGLE OF INCLINATION. Numerical Heat Transfer: Part A: Applications, 42(8): 855-880.
22. Papanicolaou, E. and V. Belessiotis, 2008. Patterns of double-diffusive natural convection with opposing buoyancy forces: comparative study in asymmetric trapezoidal and equivalent rectangular enclosures. Journal of Heat Transfer, 130(9): 092501.

**Persian Abstract**

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**چکیده**

سولار استیل یک دستگاه است که برای تبدیل آب شور به آب مقطر استفاده می شود، اما مسئله مهم سودآوری کم آن است و ضروری است که یک دستگاه ایده آل معرفی شود. شبیه سازی دینامیکی سیالات محاسباتی (CFD) می تواند به طراحان کمک کند تا اجرای این را برای هزینه های خاص بهبود دهند. در این مطالعه، ظرفیت شبیه سازی CFD را در محاسبه انتقال گرما و جرم در یک منبع خورشیدی خورشیدی تنها بررسی می کنیم. آزمایشات انجام شده در ماه ژوئن در جیپور، هند انجام شد. در این کار، تنها حوضه خورشیدی هنوز ساخته شده است و سپس با استفاده از روش CFD مبتنی بر CFD برای عمق آب m۰,۰۱، 0.02m و m۰,۰۳ بهینه سازی شده است. نتایج مبتنی بر CFD در طراحی یک خورشید با حداکثر بهره وری تولید آب مقطر کمک می کند. به این نتیجه رسیدیم که حداکثر عملکرد در زمانی که عمق آب حداقل مقدار ۰,۰۱ میلیمتر داشته باشد به دست آمد. مقدار جامد محلول جامد (TDS) برای آب نمونه گرفته شده در حوضه آب در محدوده ۵۰۰ PPM بود اما پس از تقطیر آب در خروجی کمتر از ۵۰ PPM بود. بنابراین، این دستگاه هنوز قادر به بهبود کیفیت آب بود و آب نمکی از مقدار TDS بالا می تواند کاهش یابد و برای هدف نوشیدن استفاده شود.