ISSN : 2455-9679
SJIF Impact Factor : 6.008

IJRTSM
INTERNATIONAL JOURNAL OF RECENT TECHNOLOGY SCIENCE & MANAGEMENT

"A STUDY ON VARIOUS SOLAR STILL DESIGNS"

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ABSTRACT

Because of rising population, clean, useable water is currently declining daily. Saline and unclean water have a significant negative impact on human health. Because of the equipment and contamination brought on by human activity, developing and developing countries still face a severe water deficit. We must clean the water without affecting the biological composition. Solar energy is one of the best forms of renewable energy on our planet since it uses the sun's warm energy, which is freely and endlessly available. Solar stills are the simplest way to separate pure water from contaminated water. Even if we use cutting-edge technology in every industry in the twenty-first century, some regions are still distant and underdeveloped, where even the most basic necessity of Electric force is either extremely rare or nonexistent at this time. The finest alternative energy source we have for producing clean water and useful water is solar energy. We will raise the condensing water capacity and improve the solar still efficiency in our ongoing study because typically sunlight-based stills have low efficiency and efficacy.

Key Words: *Solar still, single slope, solar still productivity, efficiency, effectiveness.*

I. INTRODUCTION

Almost 1.1 billion people worldwide lack access to clean drinking water. There is not enough water in 26 countries to support agricultural and financial development. There will be a shortage of fresh water due to the depletion of rivers, lakes, and groundwater reservoirs. The majority of illnesses are brought on by brackish water [1]. 79% of the water that is present on the surface of the world is salty and in the form of sea water, according to a survey. Just 1% of the accessible water is fresh and drinkable, and 20% of the available water is brackish [2]. A method to turn brackish or polluted water into fresh and drinkable water is distillation. Some of the traditional distillation methods, include thin film and multi-effect evaporation For significant water requirements, reverse osmosis, distillation, multi-stage flash evaporation, and electrolysis are the most practical methods [3]. A simple method of distilling water using solar energy at a minimal cost is called solar still. To provide potable water, it is frequently employed [4].

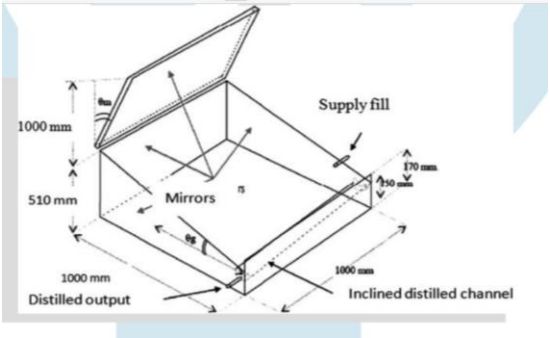

Figure.1 Schematic diagram of the basin-type solar still.

ISSN : 2455-9679
SJIF Impact Factor : 6.008

TYPES OF SOLAR STILLS

Solar still is possibly the oldest method of desalination of water. Its principle of operation is the greenhouse effect; the radiation from the sun evaporates water inside a closed glass covered chamber at a temperature higher than the ambient.

Passive Solar Stills

In a passive still the distillation takes place purely by direct sun light. The Figures bellow depicts various types of passive solar stills. The single slope and double slope solar stills are the conventional low temperature solar stills, operating at a temperature below 60oC. Of the above two, single slope solar still is more versatile and efficient.

Basin type solar still:

These solar stills have been used on farms and public spaces in many countries. It consists of a shallow depth pool of blackened brine, above which is a transparent airtight cover that completely covers the space above the pool. It is in the shape of a roof. Polluted water in a pool or sump is heated and the resulting steam condenses into purified water in a cooler inside the roof. Lids, usually glass, may be plastic slanted towards the collection chute. Solar radiation passes through the coating and is absorbed and converted to heat on the black surface.

Minimal separation work:

From a thermodynamic point of view, desalination is a workflow that eliminates the irreversible mixing of salt and water. This separation process requires minimal work when it can be performed reversibly and uses more work when the separation process generates entropy due to thermal or mechanical irreversibility. Therefore, a guideline for designing or evaluating a desalination process is to determine the minimum or reversible work required to remove a percentage of water from a saltwater source.

II. LITERATURE REVIEW

All paragraphs must be indented. All paragraphs must be justified, i.e. both left-justified and right-justified.

Rahul dev, G N Tiwari (2011) Utilized new way to deal with get trademark condition of a twofold incline uninvolved sunlight based still taking into account exploratory perceptions from composite atmosphere states of New Delhi. He presumed that, non straight trademark bends have more exact for breaking down execution, heat testing and further alteration relying upon different parameters connected with configuration. Atmosphere and operational conditions. [1]

Rahul dev, G N Tiwari (2011) made a transformed safeguard sun based as yet having bended reflector to heat it from top and base with single slant sun based still. He utilized prompt addition and misfortune efficiencies by exploratory information for atmosphere states of Muscat, Oman. He likewise contrasted comparable working and atmosphere conditions and single slant sun oriented still furthermore he discovered every year expense of distillate yield of Inverted safeguard sunlight based still and single incline sun based still were 0.95 and 0.54 Rs. [2]

Abdul Jabbar N Khalifa (2011) Concentrated on writing on connection between spread tilt point and profitability of straightforward sun powered stills in different seasons for connection between ideal tilt edge and scope edge and presumed that, bay tilt edge ought to be bigger in winter and littler in summer, expanding tilt edge would build efficiency and greatest profitability accomplished by utilizing spread tiltangle near the scope of spot.[3]

Salah Abdallah, Mazen M. Abu-Khader, Omar Badran, (2011) made four indistinguishable sun powered stills utilized different engrossing materials utilized as a part of single incline sun oriented still like uncoated and covered permeable medium called metallic wiry wipes and staying two utilized dark volcanic rocks and with no medium in atmosphere states of Jordan. In his analysis, he found that uncoated wipes had the most noticeable water absorption during the day, followed by dark shakes and wire-coated wipes. Humans can survive for several days without food, but cannot live more than a week without water. We've all heard that we should drink at least 8 glasses of water every day. Be that as it may, drinking the basics simply maintains a basic level of well-being. Our body uses at least 8 glasses of water daily

ISSN : 2455-9679
SJIF Impact Factor : 6.008

with normal, moderately latent movement to support basic physical abilities such as assimilation, temperature regulation, joint oil and skin hydration. With every exhalation, every blink of an eye, or every advance made by an effort of imagination, we pass through some of the available water in our frame.[4]

Setoodeh, R. Rahimi, A. Amer (2011) performed multiphase reenactment and tests heat and mass exchange. The water temperatures anticipated by CFD were in concurrence with the trial results. In this paper, we play out a three dimensional re-enactment for common convection stream in a sun oriented still hole and report the outcomes as far as shear push and heat exchange coefficients. Sunlight based vitality is the most impressive vitality source on the planet. Sun, which is 1.495x1011 (m) a long way from the earth and has a breadth of 1.39x109 (m), would transmit around 1353 (W/m^2) on to a surface opposite to beams, if there was no barometrical layer.[5]

M. shakthiwel, S. Shanmugasundaram, T. Alwarsamy (2010): [14] Renewable solar LED probes with and without jute fabric. Jute fabric is a means of creating expansive surfaces that dissipate, return and return accumulated dormant heat. They demonstrated that, aggregate still yield in regenerative sun oriented still with jute material increments roughly 20% and productivity expanded by 8% with minimal effort alteration as the jute fabric is exceptionally shoddy and effortlessly accessible. [6]

Omar Badran (2010) utilized dynamic sunlight based single incline sun powered as yet utilizing diverse operational parameters like distinctive protection thickness, sun powered force, successful absorptive and Transmissibility hypothetically and contrasted with trial information with pick best component improving sun powered still profitability. He demonstrated from study that dynamic sun powered stills can be of the alternatives for improving profitability of still.[7]

K. Kalidasa Murugavel, S Sivakumar, J Riaz Ahmed, Kn K S K Chockalingam, K Srithar, (2010) made a twofold bowl sun oriented still from gentle steel plates and utilized layer of water and also distinctive heat stockpiling materials like quartzite rock, red block pieces, bond solid pieces, washed stones and iron scratches. He found that even three-quarters quartzite was a suitable bowl material for increasing distilled water yields, among other prominent heat-dissipating materials. [8]

Farshad Farshi Tabrizi, Ashkan Zolfaghari Sharak (2010): [17] previously used an embedded sand column reservoir under Iranian atmospheric conditions. He demonstrated that embedded sand heating significantly increases the profitability of solar orientation even in the evening and on dark days, and does not require a pump unit and manager for use at night. [9]

Salah Abdallah, Mazen M. Abu Khader and Omar Badran Salah Abdallah et al. (2009) investigated single incline sun oriented still coordinated with sun based water radiator amid low daylight or shady conditions because of refining process and inferred that water efficiency expanded up to 120% when sunlight based still bowl consolidated with sun powered water heater and night time (amid night) generation contributes up to 14%. led a study on sun powered refining framework by fluffy sets. The study uncovers that wind speed, encompassing temperature, sunlight based power, sprinkler, coupled authority, sun oriented focus, water profundity and so on influence on yield of sun oriented still.[10]

Abdul Jabbar N. Khalifa, Ahmad M. Hamood Abdul Jabbar et.al, (2009) led a study on sun powered refining framework by fluffy sets. The study uncovers that wind speed, encompassing temperature, sunlight based power, sprinkler, coupled authority, sun oriented focus, water profundity and so on influence on yield of sun oriented still.[11]

A.E. Kabeel (2009) created single slant sun based still with considering mirrors altered inside sides was combined with a level plate authority. He found that the everyday efficiency expanded (5310 ml), 36% more than typical still operation (2240 ml) because of coupling with sunlight based gatherer. He additionally watched that expanded in bowl water profundity diminishes the profitability and still efficiency was relative to the sun powered radiation force.[12]

A.A. ElSebaii, Yaghmour S.J, F.S. AlHazmi, Adel S. Faidah, F.M. AlMarzouki and A.A. AlGhamdi (2009): Today, in light of technological progress, agricultural intensification, changing living standards and world population growth, interest in freshwater continues to grow. Only 3% of total water is consumed, but this amount is also not transported by

ISSN : 2455-9679
SJIF Impact Factor : 6.008

road. Freshwater scarcity is a major factor inhibiting local/moderate improvement. Often the water source is salty or contains unsafe microorganisms and is not particularly drinkable. The ocean provides an endless source of water, but it is unfit for human use because its salt content ranges from 3% to 5%. There are also many coastal areas where seawater is plentiful but potable water is unavailable. Hence, this is a much-needed need for many people to enjoy the pure and impeccable water. [13]

Hiroshi Tanaka, (2009) utilized heat retaining materials as a part of four indistinguishable sun based stills. The initial three stills contained uncoated metallic wiry wipe, covered metallic: wiry wipe and dark volcanic rocks. The fourth one utilized as reference still does not contain any engrossing materials (dark painted). The results showed that uncoated wipes had the highest water accumulation during the day, followed by black stone and coated metal wire wipes. Again, the overall increase in water collection was 28%, 43% and 60% for coated and uncoated metal wire wipes and dark shakes, respectively.[14]

G N Tiwari, A K Tiwari(2008) Sun-oriented ones still operate on the basic criteria of scattering and accumulating. Contaminated brine enters the solar energy source, and sunlight strikes the glass surface, creating water that is heated by the impact of the nursery and then disappears. The moment the water disappears inside the solar powered still, it leaves all impurities and microbes behind the bowl. Disappeared and already purified water accumulates on the bottom of the glass and continues to flow into the accumulation and then into the coaster contained within it. In this method, the salts and microorganisms available in the first still-based solar makeup are lost. The extra water contained in the solar-powered distillation unit flushes concentrated waste from the solar-powered distillation vessel, maintaining a strategic distance from unwanted salts in the vessel. [15]

S. Shanmugan, P. Rajamohan and D. Mutharasu (2008) joined supporter mirror (acrylic) simply over the glass front of still bowl of range 1m2. The outcomes appeared with mirror sponsor the unit yield was 4.2 $l/m^2/d$ at 890 W/m^2 and upgrade was 20 to 26%.

V. Velmurugan and K. Srithar, (2007) The heat execution of a solitary slant sun based still combined with sun based gatherer utilizing diverse protection thickness (1, 2.5, and 5 cm), sunlight based power, general heat misfortune coefficient, absorptive, transmissibility, wind speed, temperature contrast amongst spread and water were concentrated on and presumed that general framework productivity as far as day by day distillate yield would increment by expanding the bowl water temperature utilizing circled boiling point water from the sun based authority.[17]

A. Omri, M. Najjari, S. Nasrallah,talked (2007) about the heat profiles at various Grashof numbers and slant of top cover and found that dividers were not at consistent temperature. The study demonstrated that common smooth movement inside the sun based still is dictated by the top spread slant. The same creators numerically examined the regular convective stream in a triangular pit of a sunlight based still.[18]

III. Conclusion

In this review, numerous solar stills have been thoroughly examined in regard to all design requirements. Also, the impact of design and operational characteristics on the productivity of different stills' distillate has been discussed. Write about solar panel design such that the next inferences are possible. By employing the least amount of water, the maximum yield was produced. As opposed to higher thickness glass covers, lower thickness glass covers are favoured. Output may be impacted by the temperature and quality of the feed water. Using multi-effect and active principles, solar still performance is improved to the utmost extent. Solar energy collection for evaporation and heat dissipation for condensation are the two main production constraints.

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ISSN : 2455-9679
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