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Solar Water Distillation by Hybrid Technology

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Abstract— *presents with the rapid development of social economy, the worldwide shortage of water resources is becoming increasingly prominent, especially in the coastal countries and regions of high population density areas. Market demand is driving the development of seawater desalination technology to the direction of large scale, high efficiency, low energy consumption and low cost. The paper uses solar radiation heat - photovoltaic integrated energy, a seawater desalination device was designed based on the two stage heating and cooling system, the water is heated by two stages, by the solar collector and the photovoltaic electric heater respectively, then the condensing heat exchanger is used to process the saturated vapor condensation obtained by two stage heating to obtain fresh water. With the method of thermodynamic energy balance and energy -level balance analysis, the energy efficiency and related parameter variation characteristics are respectively analysis based on energy saving and energy level matching. By calculating the heat loss (heat transfer, heat convection and heat radiation) of seawater.*

Keywords— Solar energy, Renewable energy, solar collector, Water heating, Hybrid, sterilization. Joint water distillation equipment.

I. INTRODUCTION

Level and The Water is the most vital resource for life. In our planet earth, approximately 97.2% water lies in oceans as salt water, while 2.15% in frozen ice form and the remaining 0.65% remains as fresh water. The ultimatum for fresh water has increased day by day and will grow with the rapid growth of population, agriculture and industry. As a result, the fresh water reserve depletes day by day. The requirement of clean water per person is about 2.7 meter cube per day, thus the global requirement is about 16.5 billion meter cube per day only for drinking purpose. In India over 3 trillion meter cube of water is received from rainfall, which is among the highest in the world. Fourteen major river systems share 83% of the drainage. Basin account for 85 % of the surface flow and serve 80% of the total population of the country. There are also 44 mediums and 55 minor rivers which mostly originate in the coastal mountains and 80% of their discharge occurs during the monsoon months. With respect to ground water reserves in India, the estimated availability of ground water is to be over 210 billion meter cube. In spite of fairly high amount of available fresh water, India has a very low per capita availability of drinking water, about 2.43 thousand meter cube per year. Many organizations like United Nations (UN), World Health Organization (WHO) and the World Bank are actively involved in encouraging the projects related to supply of fresh healthy water. There were a large number of swamps and wetlands in India, which are essential for a balanced ecosystem

II. OBJECTIVES AND TECHNICAL CHANLLENGES

2.1 OBJECTIVES

1. The main objective of the offer work is to design a prototype solar still for domestic application.
2. To explore and use new materials or condensing cover/Nano-condensing covers for better efficiency of solar still.
3. TECHNICAL CHALLENGES

a. Inadequacies in grid infrastructure
b. Communication issues

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III. BLOCK DIAGRAM

The Solar energy, in the form of electromagnetic radiation from the infrared (long) to the ultraviolet (short) wavelengths, is radiant light and heat from the Sun that is strap using a range of ever-evolving technologies such as photovoltaic (PV), solar thermal energy (STE) and artificial photosynthesis, etc. PV is a term which encrust the conversion of light into electricity using semiconducting materials that exhibit the photovoltaic effect. STE is a form of energy and a technology for strapping solar energy to generate thermal energy or electrical energy for application The design principle of hybrid thermal-photovoltaic water distillation equipment is to use the non-polluting solar energy at the most extent, as the driving force during the seawater distillation process of evaporation and condensation. The principle diagram is shown in Fig.1

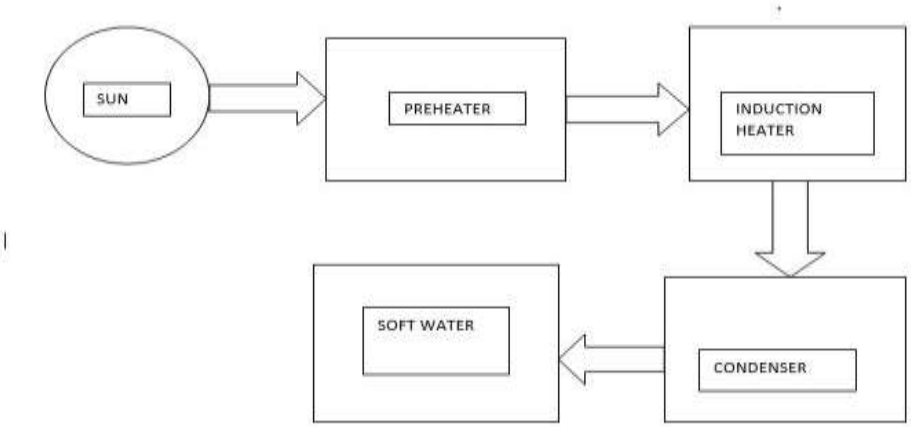
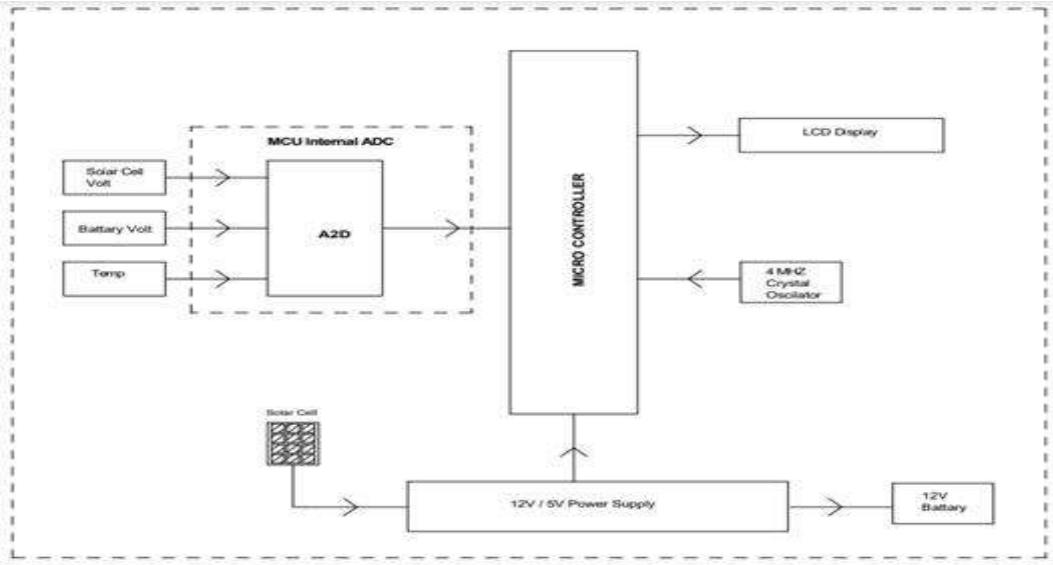


Figure 1: Block Diagram of Sea Water Distillation

IV Circuit Diagram



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V. WORKING

1. Solar energy, in the form of electromagnetic radiation from the infrared (long) to the ultraviolet (short) wavelengths, is radiant light and heat from the Sun that is harnessed using a range of ever-evolving mechanics such as photovoltaic (PV), solar thermal energy (STE) and artificial photosynthesis, etc. PV is a term, which covers the transformation of light into electricity using semiconducting materials that exhibit the photovoltaic effect. STE is a0000 form of energy and a mechanics for strapping solar energy to generate thermal energy or electrical energy for application.
2. The design principle of hybrid thermal-photovoltaic water distillation equipment is to utilize the non-polluting solar energy at the most extent, as the driving force during the seawater distillation process of evaporation and condensation. The principle diagram is shown in Fig.1. Especially, solar collector without concentrated panels in the first level applies the second level PV electrical heating method to solve the problem of boiling evaporation under the non -vacuum condition, when only the solar thermal energy is used efficiency. In order to obtain the highest energy

VI. COMPONENTS DESCRIPTION

6.1 Induction heater

Induction heating is the operation of heating an electric powered conducting object (usually a metal) by electromagnetic induction, through heat lead to in the object by eddy currents. An induction heater comprise of an electromagnet, and an electronic oscillator that passes a high-frequency alternating current (AC) through the electromagnet. The rapidly alternating magnetic field penetrates the object.

6.2 Solar panel

Solar Cell panels (Power plants) convert the sun's energy into solar electricity. The Apollo is the largest source of energy in the form of heat and light energy. Solar Power has a huge probable to make a major impact on the electricity requirement in homes and industries. That the sun requisite as much energy onto the earth in a single day that equals the annual energy requirement is enough to judge the amount of solar energy that goes untapped

6.3 LCD Display

LCD (Liquid Crystal Display) is the technology used for displays in notebook, TV & other appliances. Like LED and gas - plasma technologies, LCDs allow displays to be much lean than cathode ray tube (CRT) technology. It displays the Energy Meter reading units and balance. A 16X2 LCD is connected with microcontroller at 7,8,9,10,11 and 12 pins to display the reading of various sensors

6.4 Relay

Single pole dabble throw (SPDT) relay is connected to port RB0 of the micro controller through a driver transistor (Q1). The relay requires 12 V at a current of around 100 milliamps, which cannot provided by the micro controller. So the driver transistor is added. A relay is an electrical switch that uses an electromagnet to shift the switch from the off to on position instead of a moving the switch. It takes relatively a small amount of power to turn on a relay but the relay can control something that draws much more power. The relay is used to operate external electronic lock, safety switch or any other electrical device ETC.

6.5 DC to AC converter

A DC-AC power inverter is a circuit, which modifies an input varying or non-varying direct current (DC) to an alternating current (AC) of a specified voltage and frequency, and a regulated DC voltage. In the case of this project, the input DC voltage source will be a battery, which is being supplied by piezo electric Plate. As such, the DC voltage will likely be incompatible, and considerations will need to be made in order to produce the desired output. This desired AC output is a 220V, 50Hz pure sine wave. The desired DC output is a 12V regulated. This will allow the scheme to output power, which is usable by any load.

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6.5 Battery

Solar batteries are used to fount solar power (solar electricity) and discharge power as and when needed. Rechargeable Solar batteries are used in off-grid PV systems to stock up excess electricity. Several solar battery banks use wet cells, while others use sealed or gel cell batteries. Every of these batteries have different hotness, rising, and exposure to air requirements. NiMH batteries are chosen and most common when it comes to solar energy because they are better than standard NiCad batteries in terms of charging and release cycles.

VII. CONCLUSION

The design development of both active and passive solar stills step up more and more solar energy exploitation for desalination of water in a cost effective manner. For rural people in remote areas, passive solar still specially the wick or capillary type seems to be an attractive choice to get water for drinking and other domestic purposes. From this exhaustive literature review, it is found that different method are developed for distillation of water. These methods are subject to the order of fresh water, class of water source and the involved expense. Conventional Reverse Osmosis systems are currently prevalent domestically but at the cost of plenty of ravage water. Non-conventional water purifiers like solar stills have limitless potential but their usage is inadequate due to lesser output rate. Humidification dehumidification method is the most appropriate option for fresh water production and combined system for all together hot water production. The multi-effect distillation technique can be used for mass production of fresh water. The detailed review reveals that there is a need to develop a fusion system of water purification, which can overcome the limitations of all existing water purification systems.

VIII. RESULT

It is found that various methods are developed for distillation of water. These methods are subject to the demand of fresh water, quality of water source and the involved expense. Conventional Reverse Osmosis system are currently prevalent domestically but at the cost of plenty of waste water. Non-conventional water purifiers like solar stills have unlimited potential but their usage is inadequate due to lesser output rate. Humidification dehumidification process is the most appropriate option for fresh water production and combined system for simultaneously hot water production.

Alternatives such as use of solar energy can be solution as it sustainable in nature. India, being a tropical country, is blessed with plenty of sun shine. The average daily solar radiation varies between 4 and 7 kWh per square meter for different part of the country. There are averages 300 clear sunny days a year. Thus, it receives about 5000 trillion kWh of solar energy in a year. The highest annual global radiation is received in Rajasthan and northern Gujarat, which promises huge potential for solar desalination plant in these areas.

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