DISTILATION OF WATER USING RENEWABLE ENERGY SOURCES

Maram Sumanth PG research scholar, Refrigeration and Air-Conditioning, Dept of Mechanical Engineering, JNTUA College of Engineering, Ananthapuramu, A.P, India
Dr. D.R Srinivasan Asst. Professor, Dept of Mechanical Engineering,
JNTUA College of Engineering, Ananthapuramu, A.P, India

ABSTRACT

The project aims to design a hydel, tidal and solar based power-based water purification system using thermal method.The project makes a use of generators which converts mechanical energy into electrical energy. hydel, tidal and solar energy is obtained stored into the battery through charging circuits. We can measure the generated voltage in multi meters.

The battery supply is fed to the heaters through switch. When the user switches ON the heater, due to heat effect water get evaporate from water chamber and also solar heat is uses to evaporate water from the water chamber and condenses on the inside of the covered glass and also the evaporate water will fall into the water chamber of the purifier. By this way we can distillate the water in two methods.

The purpose of this project is to develop new versions of solar and heater-based water distillation system by using tidal and hydel power generation.

Keywords
Hydel setup, Tidal setup, Generators, Charging circuits, Rechargeable battery, Solar panel Multi meters, Purifier water chamber, Inverter.

INTRODUCTION

Water is the most important substance on earth. Humans are fully dependent on water to survive and to live healthily. This makes water a very scarce resource since it is used daily. Water purification is the process of removing undesirable chemicals, biological contaminants, suspended solids as well as gases from water. Most of the existing water purification systems are based on the distillation method, chemical purifying method and the condensation method with boilers to accelerate purification.

The solar water distillation method is illustrated in Figure 2 (Kumar & Bai, 2008). A similar layout was adopted while developing the design concepts described in this paper.

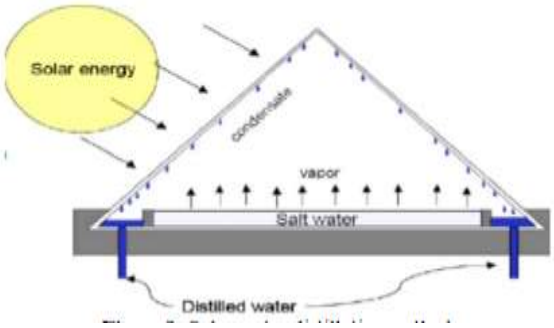


Fig: solar water distillation method

Disadvantages of the existing design:

- It is static or immovable.
- The purification process is slow as no boiler or heating coils are installed.

The proposed project "**Solar water purification by thermal method with tidal and hydel power**" is an exclusive project which can be uses to purifiers the water in thermal method. By using this project we can purifier the water in two methods. The project makes a use of generators which converts mechanical energy into electrical energy. hydel ,tidal and solar energy is obtained stored into the battery through charging circuits and this battery DC voltage is converts into AC voltage using inverter which

is connected to the heater which can be used for water boiling. We can measure the generated voltage in multimeters.

LITERATURE SURVEY

1. **Department of Science & Technology (DST)**
   DST has supported KG Design Services (KGDS), Coimbatore and National Institute of Ocean Technology (NIOT) to develop and demonstrate a solar thermal desalination plant which harnesses solar energy, concentrates it and produces steam which in turn is used for desalination of sea water through the Linear Fresnel Reflector (LFR) systems.
2. **Developing Indigenous Resources (DIR)**
   DIR has a small scale water purification pilot project concerning around 270 households in Punjab. The aim of their pilot project is to determine which method of water purification is accepted best by the people living in the 'bustee'. Their three methods involve solar, chemical and filtration.

Solar Water Disinfection (SODIS)

Solar water disinfection is a low technology, simple process of purifying water using solar energy and solar radiation. SODIS as a technology was first introduced in 1980 by AftimAcraetal from the American University of Beirut. The process involves contaminated water being filled in transparent PET or glass bottles which are then exposed to the sun for approximately 6 hours. The UV rays of sun eliminate the diarrhea -causing pathogens, thereby making the water fit for consumption.

Solar Water Distillation

Solar water distillation uses a solar still to condense pure water vapour and settle out harmful substances to make clean, pure drinking water. This process is used when the water is brackish containing harmful bacteria, or for settling out heavy metals and also for desalination of sea water.

Implementation

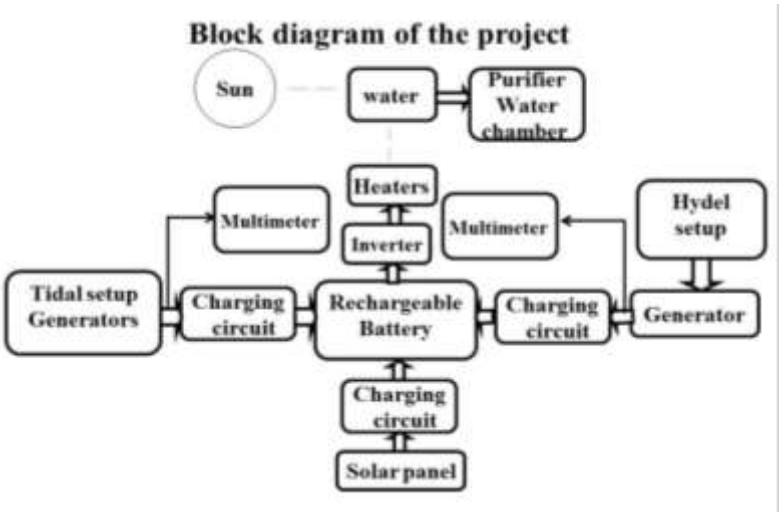


Fig: Solar water purification by thermal method with tidal power

The project "**Solar water purification by thermal method with tidal power**" was designed a solar water purification by thermal method system.

In this project we are using solar, hydel and tidal power-based water purification system. This hybrid power is used to store the battery and converts this DC battery power into AC current with the help of inverter which can be used to switches ON the water heater to heat up the water for water purification. When we place this setup under the sun, due to solar radiation the water was evaporated

from water chamber. By this way we are heating the water in two methods. The evaporated water from the water will be attached to the opposite surface of the glass and fall down into the water collector of the purifier.

Related Work

The brief introduction of different modules used in this project is discussed below:

SOLAR PANEL

Fig: SOLAR PANEL

A solar cell or photovoltaic cell is a device that converts solar energy into electricity by the photovoltaic effect. Sometimes the term solar cell is reserved for devices intended specifically to capture energy from sunlight, while the term photovoltaic cell is used when the source is unspecified. Assemblies of cells are used to make solar panel, solar modules, or photovoltaicarrays.

Solar cell efficiencies vary from 6% for amorphous silicon-based solar cells to 40.7% with multiple-junction research lab cells and 42.8% with multiple dies assembled into a hybrid package. Solar cell energy conversion efficiencies for commercially available multi crystalline Si solar cells are around 14-19%.Solar cells can also be applied to other electronics devices to make it self-power sustainable in the sun. There are solar cell phone chargers, solar bike light and solar camping lanterns that people can adopt for daily use.

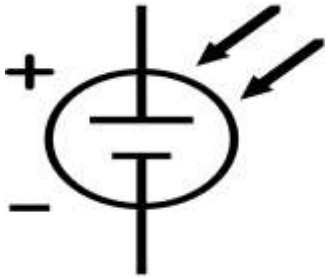


Fig: The schematic symbol of a solar cell

1. Photons in sunlight hit the solar panel and are absorbed by semi conducting materials, such as silicon.
2. Electrons (negatively charged) are knocked loose from their atoms, allowing them to flow through the material to produce electricity. Due to the special composition of solar cells, only allow the electrons to move in a single direction. The complementary positive charges that are also created (like bubbles) are called holes and flow in the direction opposite of the electrons in a silicon solar panel.
3. An array of solar panels converts solar energy into a usable amount of direct current (DC) electricity.

Tidal power

The tidal phenomenon can be simply shown as the periodic motion of the waters of the sea, caused by celestial bodies, principally the moon and the sun, upon different parts of the rotating earth. In its rise and fall, a periodic horizontal movement of the water called tidal current accompanies the tide.

Tidal turbines are **similar to wind turbines in that they have blades that turn a rotor to power a generator**. They can be placed on the sea floor where there is strong tidal flow. Because water is about 800 times denser than air, tidal turbines have to be much sturdier and heavier than wind turbines.

ISSN: 2278-4632
Vol-13, Issue-4, No.01, April : 2023

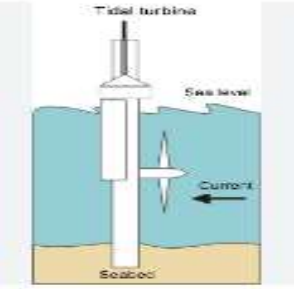


Fig: Tidal power

D.C Generators

Generator principle: An electrical generator is a machine which converts mechanical energy (or power) into electrical energy (or power).

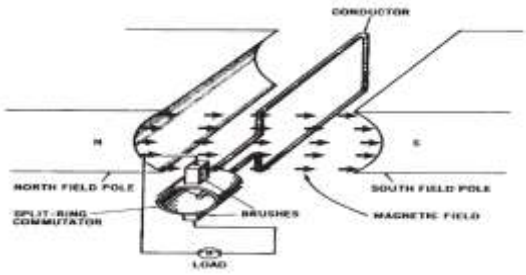


Fig: DC generator

The principle of operation of a DC generator is similar to that of the AC generator, which was discussed previously. A rotating armature coil passes through a magnetic field that develops between the north and south polarities of permanent magnets or electromagnets. As the coil rotates, electromagnetic induction causes current to be induced into the coil. The current produced is an alternating current. However, it is possible to convert the alternating current that is induced into the armature into a form of direct current. This conversion of AC into DC is accomplished through the use of a commutator. The conductors of the armature of a DC generator are connected to commutator segments.

The commutator has two segments, which are insulated from one an other and from the shaft of the machine on which it rotates. An end of each armature conductor is connected to each commutator segment. The purpose of the commutator is to reverse the armature coil connection to the external load circuit at the same time that the current induced in the armature coil reverses. This causes DC at the correct polarity to be applied to the load at all times.

Hydel Power

Hydel setup is used to generate the flapper in to the water which can be uses to generate the power to charge the battery.

Charging Circuit

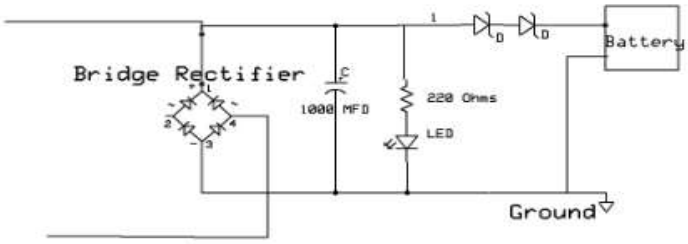


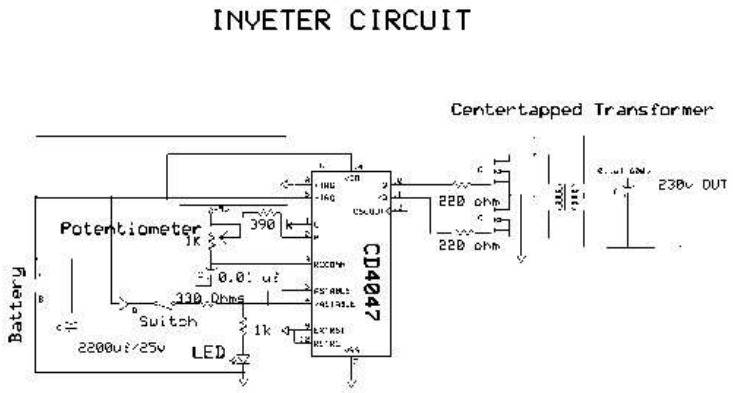
Fig: Charging circuit

ISSN: 2278-4632
Vol-13, Issue-4, No.01, April : 2023

Working of charging circuit

From the above circuit is use to charge the battery which is coming from solar, hydel and tidal energy.These output are given to the rectifier.These spikes are removed with the help of capacitor is used. We can get 12V Steady DC at the output terminal which can be indicated if the LED glows and which can be stored into the rechargeable battery.

Inverter



In the circuit diagram we can observe that 12V battery is connecter to the diode LED and also connected to the pin8 of the IC 4047 which is VCC or power supply pin and also to pin 4 and 5 which are astable and complement astable of the IC. Diode in the circuit will help not give any reverse current, LED will work as a indicator to the battery is working or not. IC CD4047 will work in the astable multivibrator mode. To work it in astable multivibrator mode we need an external capacitor which should be connected between the pin1 and pin3. Pin2 is connected by the resistor and a variable resistor to change the change the output frequency of the IC. Remaining pins are grounded .The pins 10 and 11 are connected to the gate of the mosfets IRF540.

The pin 10 and 11 are Q and ~Q from these pins the output frequencies is generated with 50% duty cycle. The output frequency is connected to the mosfets through resistor which will help to prevent to the loading of the mosfets. The main AC current is generated by the two mosfets which will act as a two electronic switches. The battery current is made to flow upper half or positive half of the primary coil of transformer through Q1 this is done when the pin 10 becomes high and lower half or negative half is done by opposite current flow through the primary coil of transformer, this is done when pin 11 is high. By switching the two mosfets current is generated.

This AC is given to the step up transformer of the secondary coil from this coil only we will get the increased AC voltage , this AC voltage is so high; from step up transformer we will get the max voltage. This AC output was connected to the heater to boil the water.

ACKNOWLEDGEMENT

We would like to thank all the authors of different research papers referred during writing this paper. It was very knowledge gaining and helpful for the further research to be done in future.

CONCLUSION

This design also fulfills the requirement of low budget product considering the most of the places don't provide potable water to their citizens. Water purification through solar power is one of the best inventions to save energy and to have uncontaminated water. An electric purifier system requires more power and costs a lot more too. As solar energy is being used for the purification of water, which is cheap and abundant, it can be used everywhere where electricity is not available. This project has only

capital cost and almost no running cost. Hence, it will prove to be useful in the near future.Tidal currents with sufficient energy for harvesting occur when water passes through a constriction, causing the water to move faster. This system will able to use the hybrid power to purifier the water which is economically free available in nature. This system able to converts the DC power into AC power using inverter which can be used to heat the water for purification. future work will provide clarity about the materials used, the size of all components/modules, and the maintenance of the proposed systems. furthermore, the performance of each system could be analysed to improve water purification and minimise design complexity. Based on the concept selection and evaluation, a single system, representing the most promising concept, will be built.

REFERENCES

[1] Jervin Paul Dhas "solar aqua purifier and its water quality management", International Journal of Industrial Electronics and Electrical Engineering, ISSN: 2347-6982, Volume-3, Issue-5, 2015.
[2] Kaipia, T., Salonen, P., Lassila, J., Partanen, J., "Application of Low Voltage DC-Distribution System – A Techno-Economical Study", Proceedings CIRED 2007 Conference, part 1, pp 1-4,2007.
[3] Greg Sachs, PE, "Solar Pv Basics" in Solar Pv For Architects & Engineers. Empower CES, LLC, Clean Energy, Island Park,New York..
[4] Paajanen, P., Kaipia, T., Partanen, J., "DC supply of low-voltage electrical appliances in residential buildings", Proceedings CIRED 2009 Conference, part 1, pp.1-4, 2009.
[5] Kaipia, T., Lassila, J., Salonen, P., Voutilainen, V., Partanen, J., "A planning methodology for combined AC and DC electricity distribution networks," Proceedings NORDAC 2008 conference.
[6] Mr.Shaikh S.K.: Assistant Professor, Electrical Department of Annasaheb Dange College of Engineering and Technology,Ashta, Maharashtra, India. M.E.(Electrical), Area of Specialization-Machine.
[7]. Mr.Bhagavati P.B.: Assistant Professor, Civil Department of Annasaheb Dange College of Engineering and Technology,Ashta, Maharashtra, India. M.E.(Civil), Area of Specialization-Environment
[8]. Ms.Mali Rutuja S.: Appeared B.E at Electrical Department of Annasaheb Dange College of Engineering and Technology,Ashta, Maharashtra, India.
[9]. Ms.Gaikwad Siddhi C.: Appeared B.E at Electrical Department of Annasaheb Dange College of Engineering and Technology, Ashta, Maharashtra, India.
[10]. Ms. Jadhav Priyanka B.: Appeared B.E at Electrical Department of Annasaheb Dange College of Engineering andTechnology, Ashta, Maharashtra, India.
[11]Ms. Bongarde Sneha J.:Appeared B.E at Electrical Department of Annasaheb Dange College of Engineering and Technology ,Ashta, Maharashtra, India.

