

Solar Powered Automated Atmospheric Water Generator Using Peltier Device

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ABSTRACT

There is a saying, "water has only two aspects; when mixed with anything it's NEED, and when not it's LIFE". Sometimes the terrible water scarcity in tropical countries like Bangladesh reminds us this quote immensely. Despite the fact that water covers more than two third (around 70%) of the Earth's surface yet at the same time fresh water which can be utilized for drinking and doing regular errands stays rare. Drinking water accessibility is a note worthy issue in some country region in Bangladesh during the summer because of absence of precipitation. For that reason, people need to go a couple of kilometers far from home to get the water. This project aims to solve this problem. In the coastal areas of Bangladesh the percentage of relative humidity is quite high. Along these regions, the humid air can be utilized to meet the water needs of individual by utilizing a dehumidifier unit. The Atmospheric Water Generator is one of the option answer for new water recuperation from environment which is straight forwardly consolidated the dampness substance of water vapor from the air. This paper introduces the strategy to build up a model of an AWG in light of Thermo-electric cooler (TEC) that utilized 12volt DC, consequently its appropriates for utilizing sustainable power sources asset.

Keywords— Bidirectional DC/DC Converter, Solar PV, Arduino UNO microcontroller

I. INTRODUCTION

It is difficult to get water resources for irrigation or other purposes in the many countries like India, especially in arid regions. Because of the pure water scarcity in the many regions worldwide, mainly in Arabic Gulf countries, finding different methods for the pure water generation becomes more useful to

motivate many researchers to work on related topics. In all aspects of life water is needed. It is difficult to purify, costly to transport and it is not possible to substitute, water is an essential element of life nearly 45 crores of people in 129 countries are staying in water-deficit regions.

For irrigation of the Agricultural fields nearly 70% of fresh water is used which has raised water conflict

between the urban and rural areas if all this continues, then very soon i.e. by 2032, nearly half of the world's population will be facing the shortage of water problem. It is predicted that within the 21st century there'll be water wars. Due to lack of rainfall it is observed that the problem of water scarcity is there in other places of world. However, in highly humid areas such as places close to the sea, condensing the water vapour present in air we can places close to sea. Here, the paper presents the method to develop a water condensation system based on thermoelectric cooler. The system consists of cooling elements, heat exchange unit and air circulation unit.

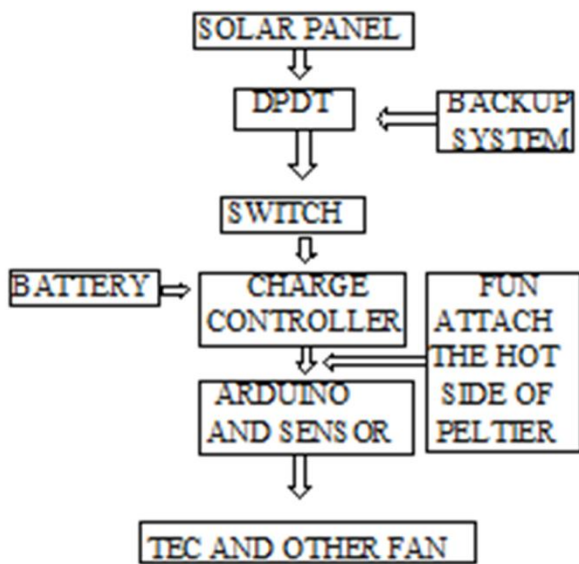


Fig 1 : Block Diagram

The Atmosphere is contains large amount of water in the form of moisture, vapour etc. Within those amounts almost 30% of water is wasted. This amount of water can be used if we are able to extract the water that present in the air in the form of moisture. This Atmospheric moisture converts directly into usable and even drinkable water this is called Atmospheric Water Generator. This project will helps to extend the applications of such devices further in the future. From previous knowledge, we got to know that the temperature require to condense water is understand as temperature .In this project we are using a of a thermoelectric Peltier (TEC) couple, which is

employed to make the environment of water condensing temperature or dew point or otherwise we can also use conventional compressor and evaporator system could to condense water by simply exchanging the heat of transformation of coolant inside the evaporator. After condensing ,the condensed water will be collected to used for drinking, irrigation and various other applications.

II. HARDWARE REQUIREMENTS

The construction setup of the AWG is as follows,

- Solar Panel
- Heat Pipe & Exhaust Fan
- Peltier Module (TEC1-12706)
- Battery
- Arduino
- Stainless steel cone

Solar Panel: - In the construction solar cell is located at the top of the model which direct converts solar energy into electrical energy by conversion of light or other electro-magnetic radiation into electricity.

Battery: - The direct supply of solar cell is to the battery for charging an main purpose of the battery is to provide electric supply for peltier plate and heat pipe exhaust fan.

Heat Pipe & Exhaust Fan: - Exhaust fan is attached to heat pipe and it is used for transfer the heat from hot side of peltier plate to the atmosphere and it located on the hot side of peltier module.

Peltier Module: - In construction we have used TEC1-12706 solid state peltier module and it is located below the heat pipe in which hot plate is at upper side and cold plate is at bottom side.

Arduino:-The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits.

Stainless Steel Cone: - The main purpose of stainless steel cone is to collect the moisture, droplets of water in the container and it's located below the cold side of peltier plate

III. HARDWARE COMPONENTS

3.1 Solar Panel

Solar panels are those devices which are used to absorb the sun's rays and convert them into electricity or heat. A Solar panel is actually a collection of solar (or photovoltaic) cells, which can be used to generate electricity through photovoltaic effect.



Fig 2 :Solar Panel

3.2 Relay

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations.



Fig 3 : Relay

3.3 Solar Exhaust fan

A solar fan is a mechanical fan powered by solar panels. The solar panels are either mounted on the device or are installed independently.

Solar fans mostly do not require secondary power sources other than solar power, as most of them are used for cooling purposes during day time.



Fig 4 :Solar Exhaust

3.4 Solar Charger Controller

A charge controller or charge regulator is basically a voltage and/or current regulator to keep batteries from overcharging.

It regulates the voltage and current coming from the solar panels going to the battery. Most batteries need around 14 to 14.5 volts to get fully charged.



Fig 5: Solar Charger Controller

3.5 Peltier device

A peltier cooler, heater, or thermoelectric heat pump is a solid-state active heat pump which transfers heat from one side of the device to the other, with consumption of electrical energy, depending on the direction of the current.

It can also be used as a temperature controller that either heats.



Fig 6 Peltier Device

3.6 Arduino Uno

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits.



Fig 7:Arduino Uno

3.7 Solar Battery

A device that reserves energy for later consumption that is charged by a connected solar system. The stored electricity is consumed after sundown, during energy demand peaks, or during a power outage . Most common on residential or commercial buildings.



Fig 8: Solar Battery

IV. SOFTWARE COMPONENTS

The Arduino integrated development environment (IDE) may be a cross-platform application (for Windows, macOS, Linux) that's written within the programming language Java. It's wont to write and upload programs to Arduino board. The Arduino IDE supports the languages C and C++ using special rules of

code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. We are using embedded C to program the device.

V. EMBEDDED C PROGRAMING

Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software. Embedded C programming plays a key role in performing specific function by the processor. In day- to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embeddedC.

VI. CONCLUSION

The design is more convenient for water collection. The design is so simple such that the device can be carried to anywhere .The equipment is very helpful for explorers, mountaineers, fishermen etc. The concept of this system can also be used as a better alternative in refrigeration against conventional systems. At the current climatic conditions as global warming increases and the water resources over the world diminishes, so this equipment is extremely helpful to mankind.

VII. FUTURE SCOPE

- 1) The atmosphere is a potentially limitless alternative water source that has gained increasing industrial interest.
- 2) Atmospheric water generation technology's entrance into the commercial market is mainly to offer a solution to the worsening global water crisis.
- 3) May be in next 5 to 10 years atmospheric water generators can be used instead of water purifiers.

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