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Design And Development Of Salt Water To Fresh Water Converter.

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Abstract: Seawater desalination is an important method for meeting the growing need for fresh water; nevertheless, it is quite energy expensive due to the high salt of the source. Studies on using solar energy to drive seawater desalination are intensively pursued. Solar energy is a potentially ideal green energy source for water desalination, particularly in non-residential areas where the grid is unavailable. Photovoltaic (PV) cells powered by solar energy are a realistic and cost-effective method for supplying electricity for low-emission water desalination systems in regions such as deserts and offshore stations. The PV energy must be treated using power electronic power conditioning equipment. In this project, a prototype model for turning salt water to fresh water using the solar (PV Cells) desalination process was built and tested for performance. The results demonstrate consistency in acquiring fresh water.

Index Terms – Salt water, Fresh water, PV cells

I INTRODUCTION:

Desalination is a procedure that removes dissolved mineral salts from water. Currently, this procedure, when applied to seawater, is one of the most common ways to obtain fresh water for human use or agriculture.
A desalination process effectively separates saline water into two parts - one with a low percentage of salt (treated water or product water) and the other with a significantly higher concentration than the original feed water, which is usually referred to as brine concentrate or simply as "concentrate. Water is one of the most abundant resources on Earth, accounting for three-fourths of its surface. According to geography science, 97% of the world's water is saltwater in the oceans, with only 3% freshwater found in the poles (in the form of ice), ground water, lakes, and rivers. Unfortunately, glaciers and constant snow cover make 70% of the meager 3% inaccessible. Desalination techniques require energy to separate salt from brackish water or seawater. The rapid expansion of desalination systems requires a lot of energy, resulting in environmental damage owing to the use of fossil fuels. Renewable systems are an attractive alternative to fossil fuel-based energy systems for reducing hazardous effluent and environmental issues. Renewable energy currently powers fewer than 1% of all desalination systems in operation.

Fresh water production utilizing desalination technology powered by renewable energy systems is a viable solution to water shortage in distant places with a lack of potable water and traditional energy resources such as heat and electricity. Desalination systems are split into two types of processes: membrane and non-

membrane. The primary methods of membrane processing are reverse osmosis (RO) and electro dialysis (ED). The two most common non-membrane procedures are capacitive deionization (CDI) and distillation.

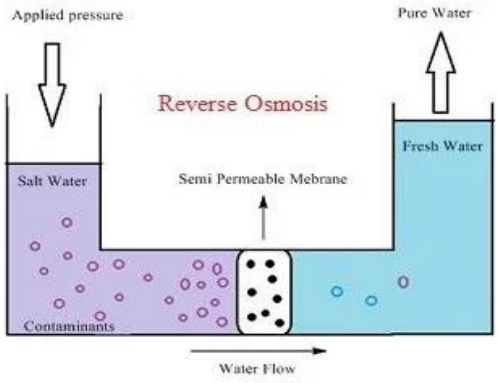

Fig:1 Reverse Osmosis

II.LITERATURE REVIEW

This is primarily due to the high capital and maintenance expenses associated with renewable energy. Solar desalination plants coupled to conventional desalination systems have been erected in a variety of sites throughout the world. The vast majority of these desalination facilities serve as pilot systems for technological research and demonstration. Fresh water production utilizing desalination technology powered by renewable energy systems is a viable solution to water shortage in distant places with a lack of potable water and traditional energy resources such as heat and electricity. The principle of indirect solar water desalination systems can be divided into two subsystems: the solar energy collection system solar collector and photovoltaic cell and the plant for converting the collected energy into fresh water. The plant subsystem encompasses a variety of processes that are divided into membrane and non-membrane processes, as described in the introduction. Popular distillation technologies include multi-stage flash, multiple-effect boiling, and vapor compression. An MEB process consists of a number of elements known as effects. It is an apparatus for efficiently employing steam heat to evaporate water, as shown. The feed water is boiled in a series of steps, each held at a lower pressure than the previous one. Because the boiling temperature of water falls as pressure decreases, the vapor boiled off in one effect can be used to heat the next, with the exception of the first (at the maximum pressure), which requires an external heat source. In this technique, the vapor is generated by flashing and boiling, but the majority of the distillate is created by boiling.

III. PROBLEM DEFINATION

Projected demands for essential water resources due to global population expansion would outstrip available conventional water supplies, resulting in a global crisis affecting local, national, and global economies as well as public health. More than one billion people throughout the world still lack access to clean drinking water. The expanding need for freshwater sources, as well as the environmental challenges caused by droughts around the world, have shifted attention away from water conservation and toward industrial operations such as technological advances in water reuse and desalination. However, desalination requires a lot of energy, and using non-renewable energy can be expensive and damaging to the environment.

Objectives of the proposed work

The primary goals of converting saltwater to freshwater, or desalination, are to address water scarcity, improve public health by providing safe drinking water, and promote economic growth by enabling agriculture and industrial development.

COMPONENTS USED

Battery with invertor

An inverter battery system offers backup power during outages by storing energy in direct current (DC) and converting it to alternating current (AC) via an inverter, which subsequently powers household appliances.

Relay module

A relay module is a circuit board that houses one or more relays, which are electromechanical switches that allow a low-power signal to operate a high-power circuit, allowing devices such as lights, motors, and solenoids to be turned on and off remotely.

Fig 2: Relay

Arduino Uno R3 Pin Diagram

The Arduino Uno R3 pin diagram is shown below. It comprises 14-digit I/O pins. From these pins, 6-pins can be utilized like PWM outputs. This board includes 14 digital input/output pins, Analog inputs-6, a USB connection, quartz crystal-16 MHz, a power jack,a USB connection, resonator-16Mhz, a power jack, an ICSP header an RST button.

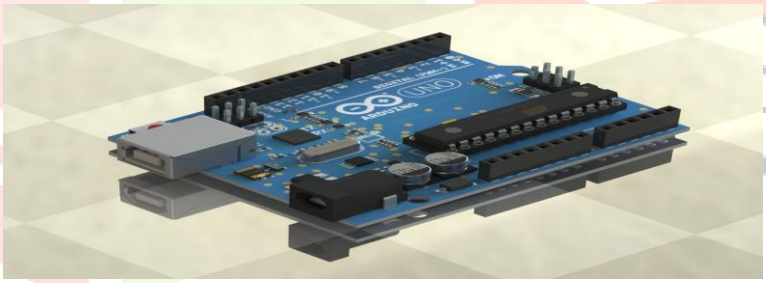

Fig 3: Arduino

Water Motor Pump

the Make block water pump motor - DC 12V/370-04PM. It includes a 12V motor and a robust thermoplastic body, making it ideal for water priming, automobile pump experimentation, bonsai rockery, and DIY projects, among other things.

Fig 4: Water motor pump

LCD display

A liquid crystal display (LCD) can be readily interfaced with an Arduino to provide a user interface. Liquid crystal displays (LCDs) are widely used to display data in calculators, microwave ovens, and other electronic equipment.

Working Principle of DHT11 Sensor

The electrolysis technique is used to transport salt ions from one solution to another using ion-exchange membranes and an applied electric potential difference. The technique removes salt ions from brackish water by applying a DC voltage or current. Saline feed water contains dissolved salts that are divided into positively charged sodium and negatively charged chlorine ions. These ions move toward a reversely charged electrode immersed in the solution, with positive ions (cations) moving to the negative electrode (cathode) and negative ions (anions) to the positive electrode (anode). During heating and vaporization, the water will begin to boil; when it reaches its optimal temperature, it will be recognized by a temperature sensor and shown on an LCD display, which will be monitored by an Arduino Uno. Desalinated water is heated at low pressure, resulting in quick and irreversible evaporation. This process is repeated in subsequent stages, with the pressure decreasing depending on the conditions. It is appropriate for high-salinity waters as well as those with higher temperatures and higher pollution levels. When heated, water evaporates. The molecules move and vibrate so swiftly that they escape into the atmosphere as water vapor. Evaporation is an extremely important component of the water cycle.

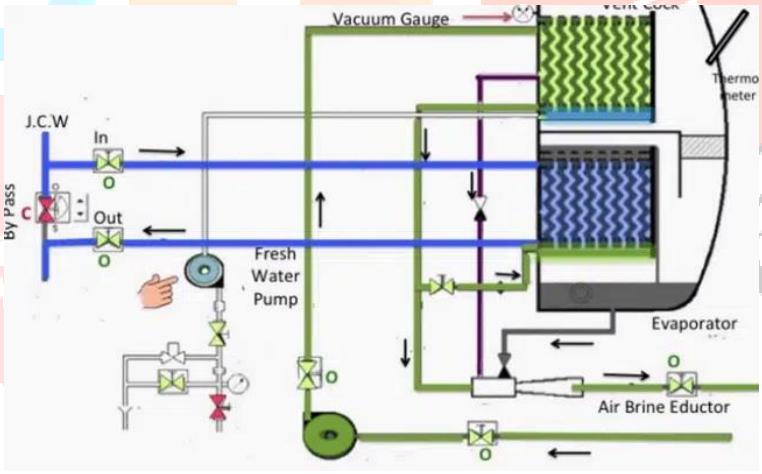

Fig: 5 Working Circuit

IV. RESULT AND DISCUSSION:

After condensation, fresh water (distilled water) flows from the capillary tube into the fresh water tank. The remaining water (brine water) is then drained from the heating tank. In rare cases, brine can be dumped into surface water bodies including rivers, lakes, and reservoirs. This project helps farmers to test soil independently without long waits and requirement of authorities to do it for them. Reverse osmosis is one of the ways utilized on board to produce fresh water. This is typically utilized on passenger vessels with a high need for fresh water production. However, on commerce ships, evaporation is employed since reverse osmosis is expensive and requires extensive membrane care.

V. CONCLUSION:

Desalination, which converts saltwater to freshwater, is an important answer to worldwide water scarcity, but it is not without obstacles. While technological developments are making desalination more efficient and cost-effective, environmental consequences and energy usage are still major challenges that must be addressed.

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