



# “Design & Implementation of Solar Powered Dual Way Working Portable Water Purifier.”

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**Abstract** In this paper, we are making a water purifier which works on solar energy. The basic principle behind this project is reverse osmosis. The solar radiations are collected by solar panel. This energy is then stored in a battery. The battery is connected to the purification unit through an electromagnetic relay. The purification unit consists of high-pressure motor, reverse osmosis system and the water tank. The high pressure creates the necessary pressure required to carry out reverse osmosis. The microcontroller Arduino Uno keeps a watch to the level of water in the water tank and prevents it from over flow. Through this process we obtain the purified water in the water tank.

## I. INTRODUCTION

Pure drinking water is essential to ensure good health. Contaminated water hampers health by causing several water-borne diseases such as Diarrhea, Cholera, Guinea worm disease, Typhoid and Dysentery. In developing countries like Bangladesh, scarcity of pure drinking water is a big issue till now. Diarrheal disease is the country's biggest killer, taking the lives of 62 in 1000 under-fives. Besides, dependency on limited energy resources indicate future problem for these countries. During flood and other calamities, intensive public service campaigns alert people to boil their drinking water, but fuel is limited and costly. Leaning towards renewable energy might solve the energy crisis. A water resource should be safe and reliable but also affordable to people. In order to provide a safe and affordable water supply, or impure. Salinity is a major problem in the coastal areas of Kutch and Gujarat. In our country pure drinking water is a major problem in tribal/rural area. There are many processes available for purification of drinking water like Chlorine tablets, Pot chlorination of wells, Slow and rapid sand filters, Fluoride removal, Reverse osmosis plants, etc. In this project, we are making a water purifier which works on solar energy. The basic principle behind this project is reverse osmosis. We are using solar energy which is a renewable source, abundant and cheap. In case of power failures, this purifier will continue to work as solar energy can be stored. Here, we use Arduino Uno which prevents the water from over flowing. This purifier can be used in remote and rural areas where there is no electricity. It can also be used in places affected by natural disasters. It also reduces the salt content in sea water. It provides pollution free operation.

## II. LITERATURE SURVEY

Every year, around one lac people die in India because of water-borne diseases. It has been noted that so much groundwater is now unsuitable for drinking purposes due to the excessive concentrations of fluoride and ions, and the water in the environment is also unfitted to drink due to the prevalence of several kinds of bacteria and chemicals since many companies decompose wastewater or industrial waste in rivers and stream reservoirs. The scarcity of water supply has become more apparent as the population grows. The project is motivated by the scarcity of freshwater resources as well as the abundant supply of unclean water available for prospective conversion into potable water. Our project's goal is to convert solar energy into clean, drinkable water as efficiently as possible. Distillation is among the methods that can be used to purify water. This necessitates an energy input, which can be provided by heat, electricity, or solar radiation. Solar water distillation is a process of using solar energy for this reason. Solar distillation is an appealing method for producing portable water that uses free solar energy. The proposed solar RO water purifier model can be allowed potential, expanding its application area. The use of solar PV cells in conjunction with appropriate control system circuits for RO water purification. The control system circuit consists of a charge controller that increases solar efficiency and has numerous protections. This equipment is powered by renewable energy. Solar energy is a clean renewable energy system that can help to reduce pollution while also providing a reliable source of potable water. In the absence of external energy, we rely on electricity supplied by the utility company. The renewable energy. Solar energy is a clean renewable energy system that can help to reduce pollution while also providing a reliable source of potable water.

### 3.1 Block Diagram

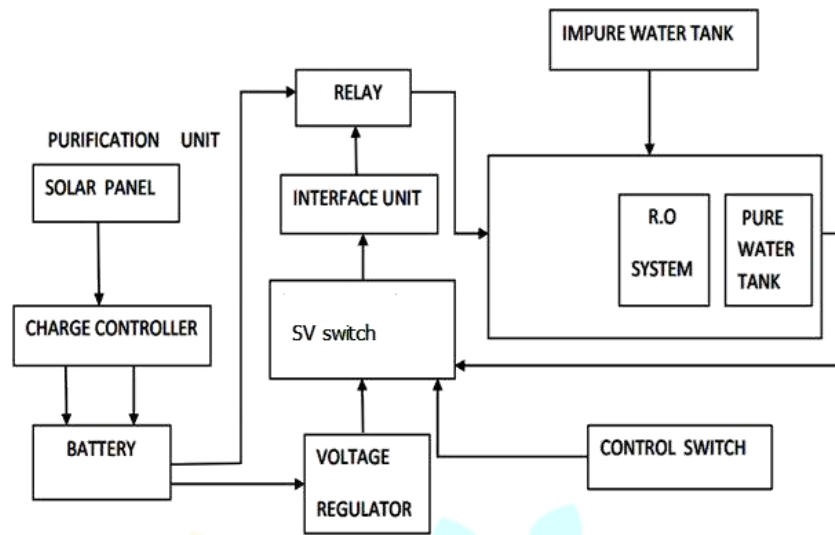


Figure 1: Block Diagram

The solar radiations are collected by solar panel. This energy is then stored in a battery through a charge controller. The charge controller prevents the battery from getting overcharged. The battery is connected to the purification unit through an electromagnetic relay. The battery is also connected to a voltage regulator. The voltage regulator converts 24V to +5V, which is required by the microcontroller. The purification unit consists of high-pressure motor, reverse osmosis system and the water tank. The high pressure creates the necessary pressure required to carry out reverse osmosis. The microcontroller Arduino uno keeps watch to the level of water in the water tank and prevents it from over flow. Through this process we obtain the purified water in the water tank.

### 3.2 Circuit Diagram

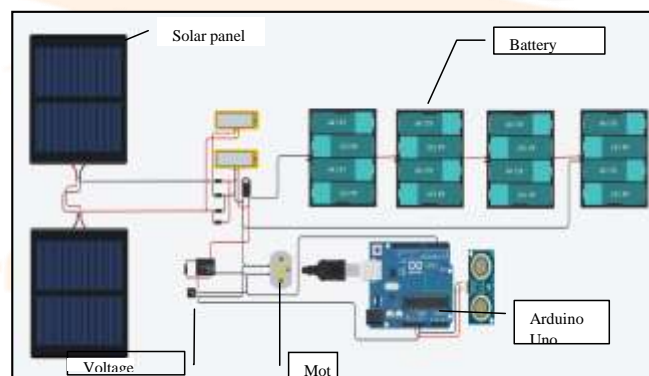


Figure 2: Simulation of System

### 3.3 Operation of Simulation

Solar energy can be a major source of power. Its potential is 178 billion MW which is about 20,000 times the world's demand. But it cannot be developed on large scale. Sun's energy can be utilized as thermal and photovoltaic. The solar power where sun hits atmosphere is 1017 watts, whereas the solar power on earth's surface is 1016 watts. The total world – wide power demand of all needs of civilization is 1013 watts. Therefore, the sun gives us 1000 times more power than we need. The energy radiated by the sun on a bright sunny day is approximately 1kw/m<sup>2</sup>, which may be used in driving the prime movers for the purpose of generation of electrical energy. Some applications of solar energy are solar water heater, solar cookers, Solar furnaces, Solar ponds, Solar energy collectors, Solar energy storage etc. In this paper, solar energy is being collected by using a solar panel. The collected solar energy is being stored in the battery. In case of rural and remote areas and the areas affected but natural disasters where electricity is a big problem, this stored energy can be used for the purification of water. The charge controller used here controls the required amount of solar energy to be stored in the battery.

#### IV. SIMULATION RESULTS

##### 4.1 Case 1: Virtual Solar Generation:

In this case we will use 24v, 2A solar panel for run this project. Solar will charge 24v, 2A battery. Charging current will be 4A. so, our battery will be charges in 2 hours. In simulation we will show how our solar are connected. Its charging voltage and current also will be presented. Simulation will show bellow.

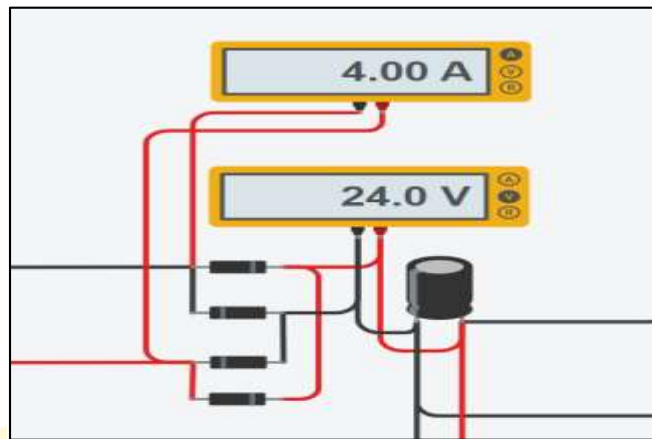


Figure 3: Simulation Diagram

##### 4.2 Case 2: Solar Powered Water Purifier Pump:

In this case we will connect 24v 3A dc water pump for pumping water to membrane with high pressure. Also, this motor will start and stop automatically. Because we want to stop motor when water empty in tank. Also stop the motor when tank will full. Simulation will show bellow. Ultrasonic sense water surface in high then motor will stop in simulation it will show you 0 rpm. When water level goes down then motor will start and it will show you 5555 rpm.

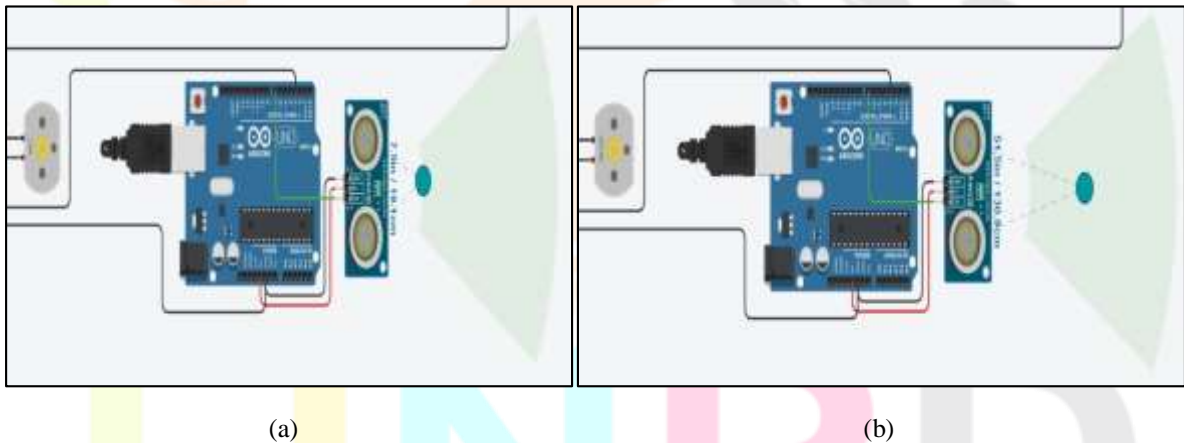


Figure 4 (a) and (b): Ultrasonic Sensor Diagram

##### 4.3 Simulation Results

Table 1: Observation table

| Sr. No | Date       | Voltage at 9.00AM | Voltage at 1.00AM | Voltage at 5.00AM |
|--------|------------|-------------------|-------------------|-------------------|
| 1.     | 10/12/2022 | 24v               | 24v               | 24v               |
| 2.     | 11/12/2022 | 24v               | 24v               | 24v               |
| 3.     | 13/12/2022 | 24v               | 25v               | 24v               |
| 4.     | 14/12/2022 | 24v               | 24v               | 25v               |

Table 2: Operation result table

| Sr. No | Case                                       | Results                        |
|--------|--|--------------------------------|
| 1.     | Ultrasonic sense water level<br>below 15cm | Pressure pump will turn<br>ON  |
| 2.     | Ultrasonic sense water level<br>above 15cm | Pressure pump will turn<br>OFF |

## V. CONCLUSION

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. Here, the microcontroller which is used also prevents the water from overflowing. Moreover, reverse osmosis is a good disinfectant process. This project has only capital cost and almost no running cost. Hence, it will prove to be useful in the near future.

## VI. ACKNOWLEDGEMENT

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## VII. REFERENCES

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