Visvesvaraya Technological University
Belgaum, Karnataka-590 018

A Project Report on

"DESIGNING OF A SOLAR WATER PURIFIER"

Project Report submitted in partial fulfillment of the requirement for the award of the degree of

Bachelor of Engineering
In
Electrical & Electronics Engineering

Submitted by

VIVEK NAIK R   1CR17EE418

Under the Guidance of
Dr. ARIJIT DATTA
Asst Professor, Department of Electrical & Electronics Engineering
CMR Institute of Technology

CMR Institute of Technology, Bengaluru-560 037

Department of Electrical & Electronics Engineering

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CMR INSTITUTE OF TECHNOLOGY
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
AECS Layout, Bengaluru-560 037

Certificate

Certified that the project work entitled **"Designing of a Solar Water Purifier"** carried out by Mr. Vivek Naik R, 1CR17EE418 is bonafide student of CMR Institute of Technology, Bengaluru, in partial fulfillment for the award of Bachelor of Engineering in Electrical & Electronics Engineering of the Visvesvaraya Technological University, Belgaum, during the year 2020-2021. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library.

The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

Signature of the Guide   *Signature of the HOD*   *Signature of the Principal*

Dr. Arijit Datta
Asst Professor
EEE Department
CMRIT, Bengaluru

Dr. K. Chitra
Professor & HOD
EEE Department
CMRIT, Bengaluru

Dr. Sanjay Jain
Principal,
CMRIT, Bengaluru

External Viva

Name of the Examiners   Signature & Date

1.

2.

DECLARATION

I, [**Mr. Vivek Naik R (1CR17EE418)],** hereby declare that the report entitled **"Designing of a Solar Water Purifier"** has been carried out by me under the guidance of **Dr. Arijit Datta**, Asst. Professor, Department of Electrical & Electronics Engineering, CMR Institute of Technology, Bengaluru, in partial fulfillment of the requirement for the degree of **BACHELOR OF ENGINEERING in ELECTRICAL & ELECTRONICS ENGINEERING**, of Visveswaraya Technological University, Belgaum during the academic year 2020-21. The work done in this report is original and it has not been submitted for any other degree in any university.

Place: Bengaluru

Vivek Naik R (1CR17EE418)

Date: 09.08.2021

Abstract

This system has designed a water purification system to augment the water distribution system. The system utilizes sediment filtration supplemented with ultraviolet light to effectively filter and sterilize contaminatedwater. The goal of the project was to meet the needs of the long term water treatment solution. The purpose of this report is to present an overview of the entire project including: the design solution, project cost, construction, and maintenance information, testing and evaluation results and future field testing plans.

Acknowledgement

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mention of people, who are responsible for the completion of the project and who made it possible, because success is outcome of hard work and perseverance, but stead fast of all is encouraging guidance. So with gratitude, I acknowledge all those whose guidance and encouragement served us to motivate towards the success of the project work.

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CHAPTER 1

INTRODUCTION

1.1 BRIEF BACKGROUND OF RESEARCH

The decreasing availability of water has necessitated in the search for fresh sources of drinking water. The available water in many areas in the country is brackish, saline 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, I am making a water purifier which works on solar energy. The basic principle behind this project is reverse osmosis.

I am 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, I use microcontroller 8051 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.
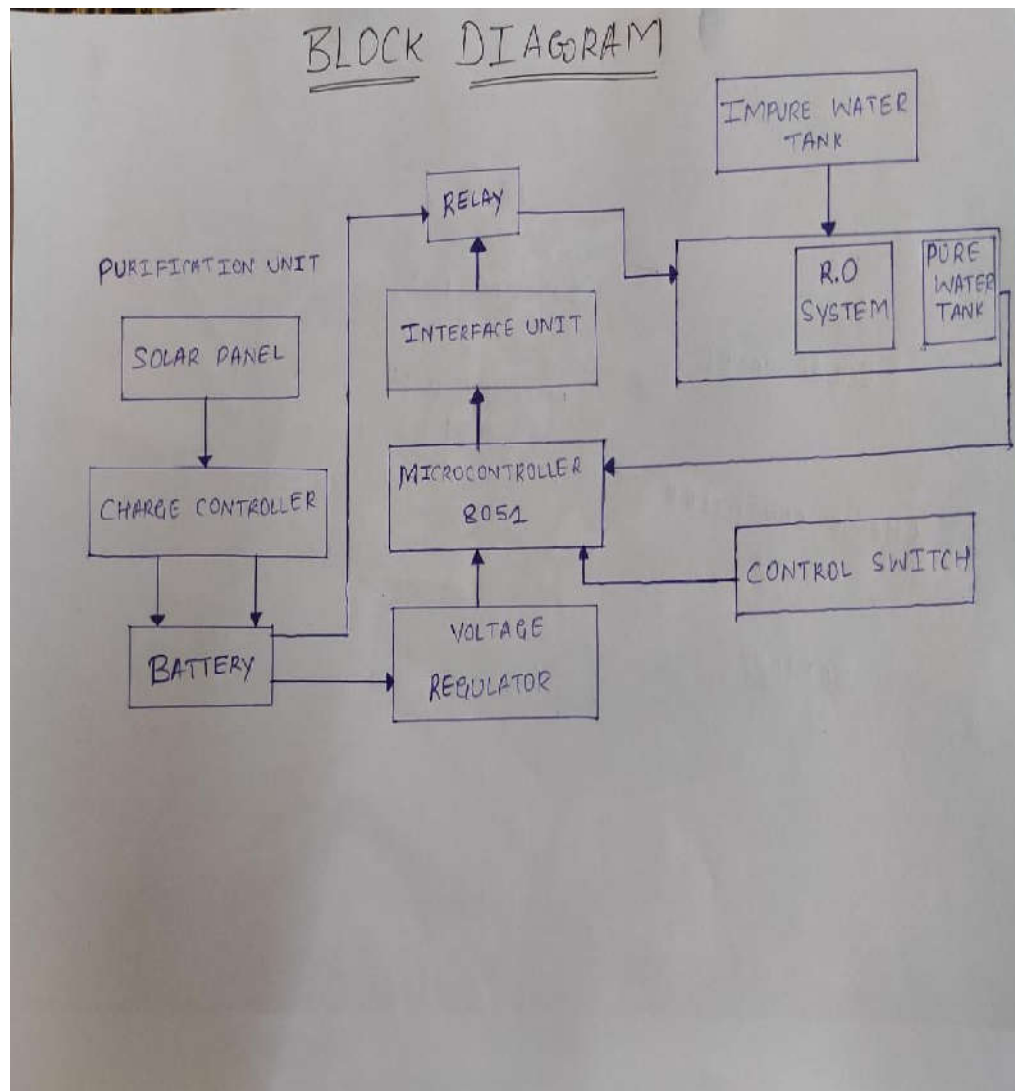
1.2 BLOCK DIAGRAM

Fig 1.1 BLOCK DIAGRAM OF THE PROJECT

1.3 WORKING PRINCIPLE

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 8051 keeps impure water tank control switch microcontroller 8051 interface unit relay battery charge controller high pressure motor solar panel pure water tank r.o system. Voltage regulator issue a watch to the level of water in the water tank and prevents it from over flow. Through this process I obtain the purified water in the water tank.

CHAPTER 2

METHODOLOGY

2.1 SOLAR ENERGY

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 $1kw/m^2$, 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, solarcookers, Solarfurnaces, Solar ponds, solar energy collectors, solar energy storage etc.

2.2 SOLAR PANEL

In this project, 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. International Journal of Pure and Applied Mathematics Special Issue .

2.3 REVERSE OSMOSIS

When two solutions of different concentrations are separated by a semi-permeable membrane, solvent (water) flows from a region of lower concentration to higher concentration. This process is called osmosis. This driving force in this called osmotic pressure. If a hydrostatic pressure in excess of osmotic pressure is applied on the higher concentration side, the solvent flow is reversed i.e., solvent flows from higher concentration to lower concentration. This process is called

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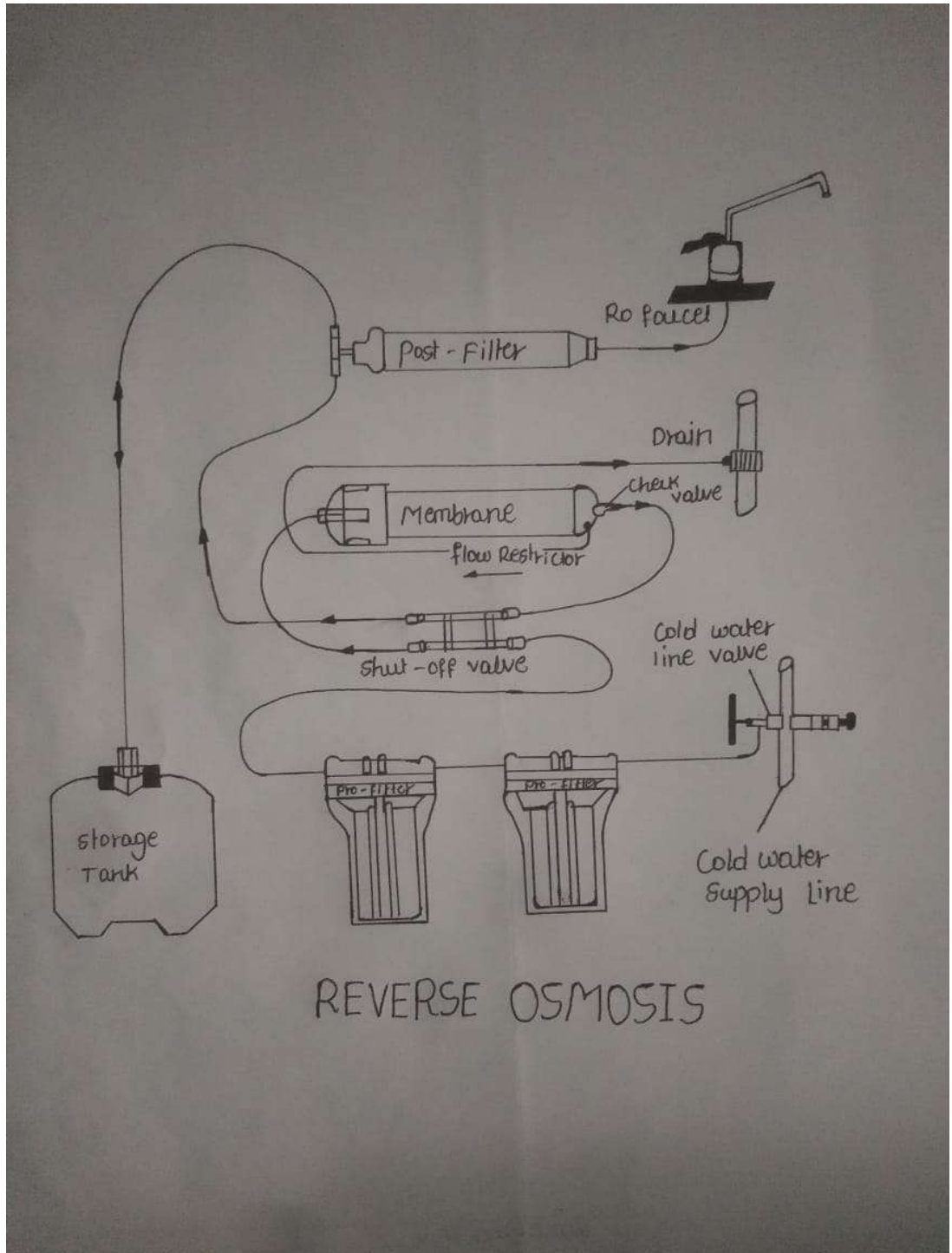reverse osmosis. Thus, in the process of reverse osmosis pure water is separated from salt water.

Fig 2.3. REVERSE OSMOSIS

2.4 HARDWARE DESCRIPTIONS

2.4.1 POWER SUPPLY CIRCUIT

Power supply circuit Figure 5 Circuit diagram of power supply circuit In this project I am using 24V, 40W solar panel and a 24V, 7.5A battery. The battery is being charged by the solar panel through a charge control relay. The maximum charge holding capacity of the battery is27.6V.A charge controller has been connected across the battery to prevent it from getting overcharged i.e.

Above 27.6V.A diode has been used in this circuit to maintain the current in one direction. The voltage regulator circuit has been used which converts 24V to +5V,as the microcontroller accepts a constant +5V.The regulated DC supply is used for the microcontroller and the unregulated DC supply is used for the motor and relay.
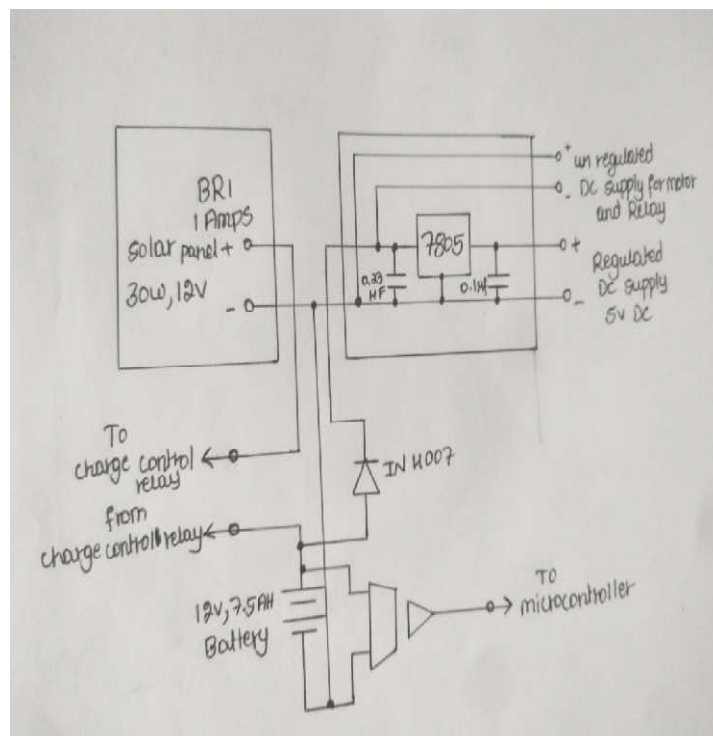

Fig. 2.4.1. POWER SUPPLY CIRCUIT.

2.4.2 CONTROL CIRCUIT

The control circuit mainly consists of the microcontroller P89V51RD2BN and an LCD display. The microcontroller accepts three inputs at the following situations :- i)When the battery is overcharged ii)When the water tank overflows iii)When the water tank is empty The microcontroller gives three output signals to the relay control circuit. A 16*2 LCD display has been used here.[14-18]The ON/OFF switch is manually operated. Whenever the tank is empty, the ON switch is operated and whenever it is filled, the OFF switch is operated. The RESET switch is automatically operated.

CHAPTER 3

NECESSITY OF WATER PURIFICATION

3.1 NEED OF PURIFYING THE WATER

- Helps To Keep The Environment Safe And Clean.

- Helps To Prevent The Various Cancer Causing Risks.

- You Can Ensure To Have Great Water Quality. It Deeply Removes The Chlorine From The Water And Makes It Healthy For A Drink. Once You Have The Water Purifiers At Your Home You Can Save Money On Water Expenses. Filter Water Also Contributes The Air Quality.

CHAPTER 4

APPLICATIONS

4.1 APPLICATIONS

There are no moving parts, it is therefore reliable and almost maintenance free. Water taste is claimed to be better since the device act as a solar water vaporizer and it doesn't boil the water. Neutral pH is claimed (like rain water).

CHAPTER 5

CONCLUSIONS

5.1 CONCLUSION OF THE PROJECT

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**.**

CHAPTER 6

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