

SOLAR POWER OPERATED WATER PURIFIER PLANT

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ABSTRACT

The first domestic filter to be made was by Greek scientist Hippocrates called the Hippocratic sleeve. The lack of clean water is a major problem of plagues many area of the world in today. There are various technology available in the market such as RO membrane, UV radiation UF filtration. But these technologies are very expensive and consume too much power to be effective in rural area. Most of the rural area there is no availability of electricity. So we decide to use the solar power. Water purification is the process to remove the contaminated water from the surface water. Due to contaminated water can cause the various diseases like as Kidney Stone, Malaria, Stomach Pain, untold misery and brain damage. Hence we can use the RO membrane technology to purify the water using solar power.

KEYWORDS: RO (Reverse Osmosis), TDS (Total Dissolved Solids), UV (Ultra Violet), UF (Ultra Filtration), DC Booster Pump, Arduino Kit, Filters, Solar Panels, Battery, Solar Charge Controller

INTRODUCTION

Water purification is the process to remove the contaminants from the ground water for the specific purposes. The contaminants like as particulate matter, dissolved minerals. This are various technologies are available in the market to purify the water such as distillation, ion exchange, filtration, RO membrane filtration , ultraviolet(UV) radiation or a combination of more than one and more technology. The mostly used technology is membrane filtration and UV radiation.

Due to poor quality of water and also the various chemicals are present in the surface water. Because of these water many borne diseases are spared, which cause the untold misery. In these water the various types of bacteria also present. Lead metal can cause the brain damage and it is very dangerous to human health. The RO membrane removes the particles as small as 0.0001 microns from the contaminated water or ground water.

In our project we can use the solar power for the operation of purifier. In the most of ruralarea their lack of availability of electricity. Without electricity we cannot operate the purifier plant. Hence we can use the solar power for the processing of purifier. It is clean source of electricity and also it will be environment friendly.

SYSTEM DESCRIPTION

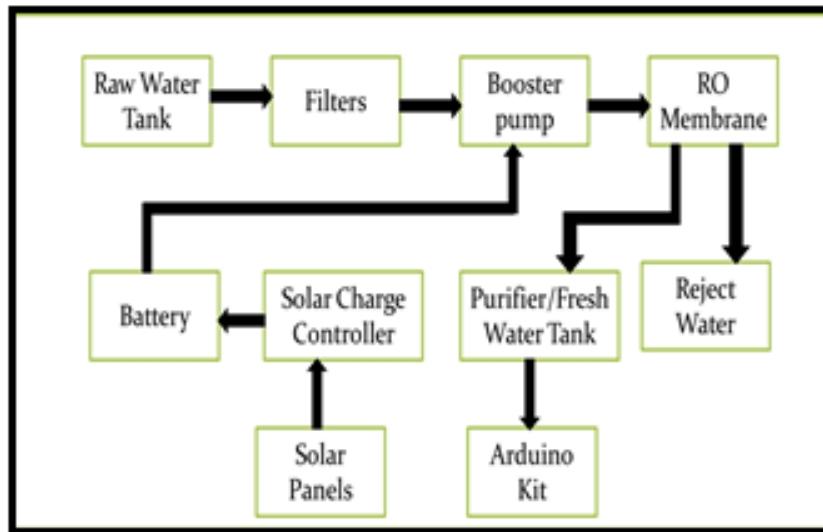


Figure no1: Block Diagram of Solar Power Operated Water Purifier

Our project we can use various components such as filters, booster pump, Ro membrane, battery, solar charge controller, solar panel, Arduino kit etc. The description of these components are as follows:

- 1. Raw water tank:**In the tank the huge amount of raw water is available which use for the process.
- 2. filters:**There are 3 types of filters are use in our project. Which is use to filter the water. These filters are the primary stage of purifier which will remove the waste material and bacteria. Filter will also remove the various chemicals from water.
- 3. Booster pump:**The purpose of the reverse osmosis booster pump is to increase water pressure going into the RO unit. Reverse osmosis is a pressure driven process. If inlet water pressures are low that so that time output of RO membrane is low and rejected water is more. so booster pump is essential in this system..
- 4.RO Membrane:**It is process in which dissolved solids are removed from impure water is called as reverse osmosis. By using the semi permeable membrane we can removes ions, molecules and larger particles from water. Reverse osmosis can remove many type of dissolved and suspended species from water.
- 5. Battery:** A battery is supplying electric power, its positive terminal is cathode and its negative terminal is anode. An electric battery is a device consisting of one or more electrochemical cells with external connection provided to power electrical devices. We are used for this RO plant battery is 12v two batteries.
- 6. Solar Panels:**The solar panels are made up of photovoltaic cells, which convert sunlight into direct current Electricity throughout the day. The amount of power produced depend on the intensity of light.

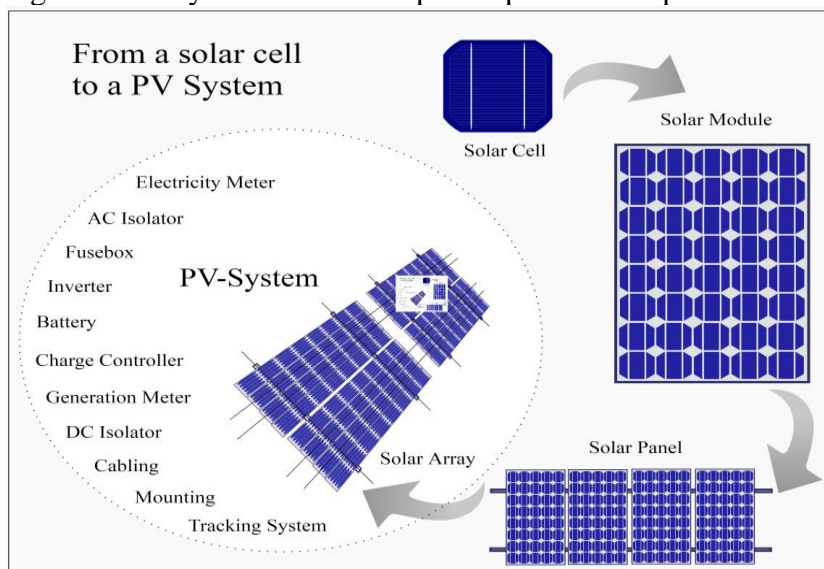


Figure no.2: solar cell &PV system

SOLAR IV CHARACTERISTICS

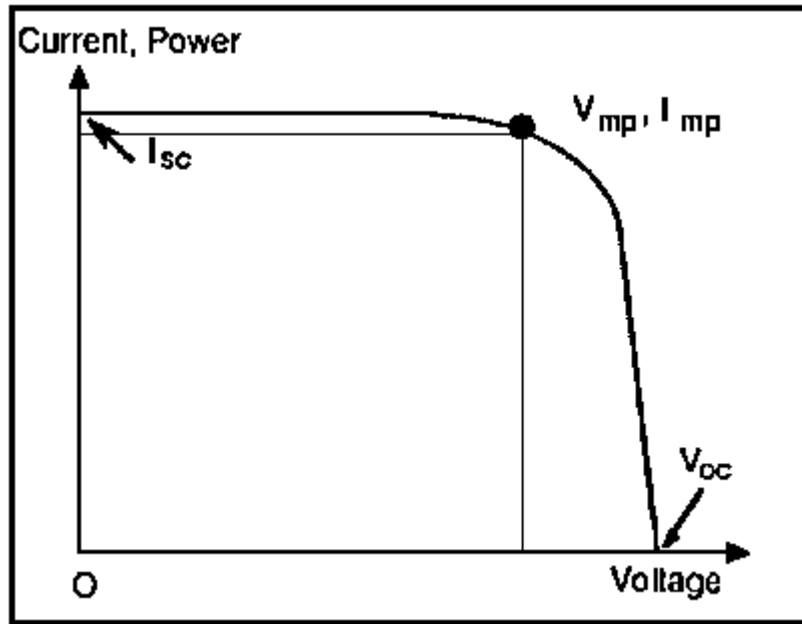


Figure no.3: Solar IV characteristics

SOLAR PV CHARACTERISTICS

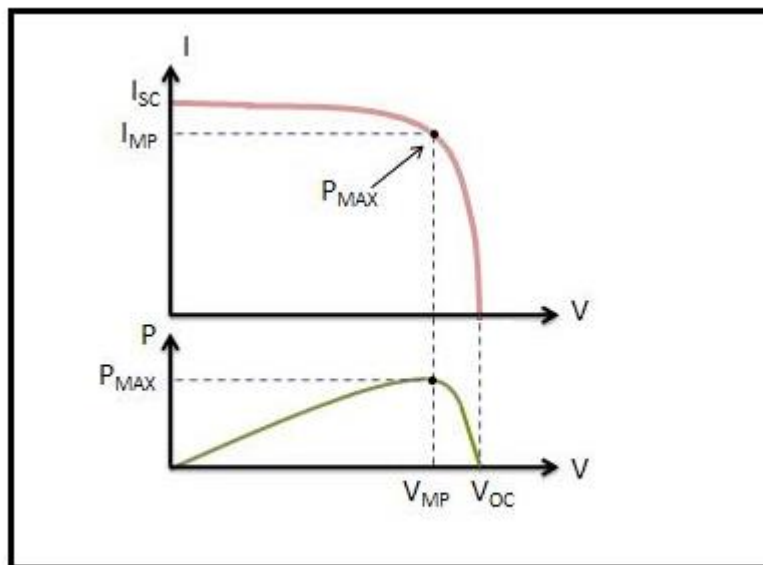


Figure no.4: Solar PV characteristics

7.Arduino:It is an electronic device which is easy to use in the form of hardware as well as programming. This board is designed with set of input and output pins which are interface with various expansion boards.Arduino is used for the controlling purpose. If raw water tank is empty that time booster pump will be off this provision is made through the arduino. Water level indicator indicate the storage status of the water store in tank.We are providing the control on fresh water output through arduino by creating 3 switches.

8.Purifier/ Fresh Water Tank:

After the water is passing through membrane only pure water is store in this tank

9. Maximum Power Point Tracking(MPPT):

It is charge controllers used for extracting maximum available power from PV module under certain conditions. The voltage at which PV module can produce maximum power is called maximum power point.

List of methods-

1. P and O algorithm
2. Incremental conductance
3. Open Circuit Voltage Technique
4. Short Circuit Current Technique

1. P and O algorithm- P&O method is designed and one of the most commonly used MPPT methods. In this method, reference signal is changed and the effect of this variation on power is monitored, according the rate of change in power, new reference signal is generated. This algorithm perturbs the operating voltage to ensure maximum power. While there are several advanced and more optimized variants of this algorithm, a basic P&O MPPT algorithm is shown below.

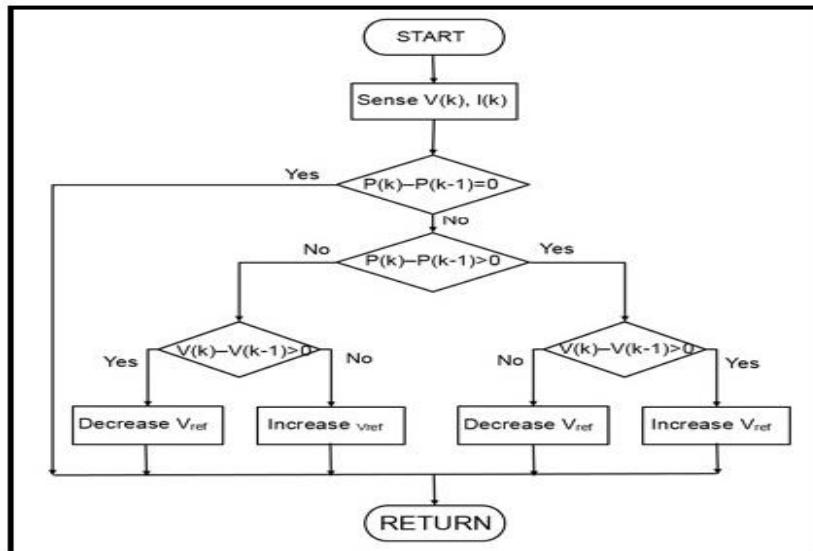


Figure no.5: Perturbation and observation (P&O) algorithm

2. Incremental conductance- Incremental conductance is one of the important technique in this system and because of its higher steady-state accuracy and environmental adaptability it is widely implemented tracked control strategy. This algorithm, shown below, compares the incremental conductance to the instantaneous conductance in a PV system. Depending on the result, it increases or decreases the voltage until the maximum power point (MPP) is reached. Unlike with the P&O algorithm, the voltage remains constant once MPP is reached.

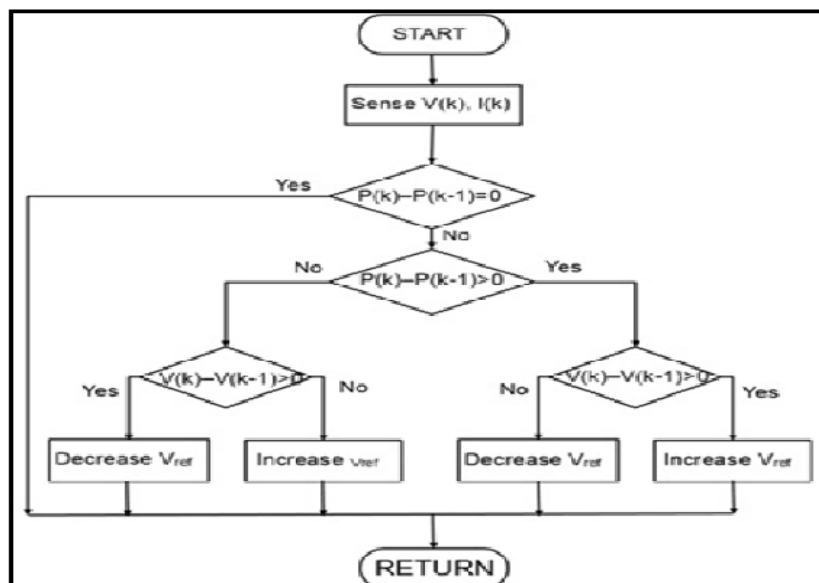


Figure. no6: Incremental conductance algorithm

C. Specification of Components

Table No.01

| Sr. No. | Components | Specification |
|---------|--------------|---------------|
| 1. | Solar Panel | 20W |
| 2. | Battery | 12v 7.2Ah |
| 3. | Booster pump | 24v,1.5A |
| 4. | Relay | 12v |
| 5. | ARDUINO | UNO board |

CONCLUSION

Safe drinking water is the basic need of human beings. Microbial contamination of drinking water is a major health hazard, to overcome these we can use RO purifier for the clean and fresh water but the main problem in some village areas is that there is no availability of electricity for adequate time, because of which we cannot operate RO water purifier plant. Hence it will be end over with smart approach to get pure drinking water with the optimum use of renewable energy sources with our project.

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