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"Spatika Jala-Dhara" A Portable Water Management System

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Abstract: **-- The human body contains majority of fluids like water and minerals. Water also termed as the 'Elixir of life' and most important source of living of a human being along with food and air. More than Seventy percent of the brain is made of water, while blood contains of 80 percent water. Water is vital for nearly every bodily function, Water transports the nutrients from foods into the bloodstream, then on to the each cells in the body. A well-hydrated body has good levels of oxygen. Water with a molecular structure consisting two atoms of hydrogen and one atom of oxygen. The body can't properly burn or stores of energy without oxygen. And Lack of fluid (water) weakens the immune system, and makes a person more vulnerable to get affected from disease.**
Water purification is the process of removing undesirable pro-chemicals, biological matters, and suspended solids from contaminated water. Our proposed water purification system is aimed for remote areas and focus on providing a pure drinking water at more economical cost with high reliability to the families in remote village. This involves the research, design and manufacture of water purification system using only renewable energy. It consist of a combination of solar energy, reverse osmosis (RO) and ultraviolet (UV) lamp sterilizer system with power supplied by photovoltaic (PV) panels. It is an effective method to eliminate bacteria, viruses and protozoan in contaminated water .This method is made portable, cost effective, user friendly and energy efficient enough to meet the needs of drinking water.
The main objective of this research is to use the available energy with high efficiency, hence Direct current (DC) source is used to power the RO purification system

***Keywords*—Reverse osmosis system; Solar energy powered; Raw water storage tank; TDS adjuster.**

I. INTRODUCTION

Growth must be restricted. An average person must consume 4 litres of water to survive and lead a healthy life.

The Objectives Of This Research Are:-

a) To provide water purification system working on renewable energy and reduce the use of fossil fuels.
b) To provide pure and safe drinking water at affordable cost to the rural areas.
c) c) To make the system energy efficient. Hence DC source generated from Photovoltaic panels are used to power the RO water purification system. d) To make the system portable and user friendly.

Concepts

Some of the concepts of that are related to the research are:-

Solar Panel

Sun explores abundant of light energy in terms of photon packets, solar panel is a collection of silicon cells of an array of photo-voltaic cells that produce DC power when sun light is incident on it. The amount of power produced depends on the level of light intensity. A solar panel has a life span of 25 years, construction includes 36 solar cells mounted on solar panel with generation capacity of 24 volts and 150 watts per hour in our model.

***Solar photovoltaic panel consist of*:-**

1. Tempered glass with low iron content and high transparent efficiency
2. Solar cells categorized in two types, they are:-
   - ♣ Polysilicon cells
   - ♣ Monocrystalline cells
3. Ethylene-vinyl acetate (EVA)
4. PV Back sheet

Are the components required to manufacture a solar photovoltaic panel.

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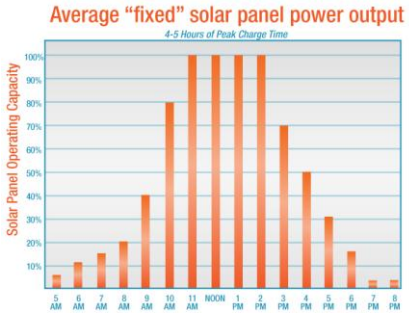


Power generation vs Time Graph

Water Purifier

It consists of a high pressure diaphragm water pump (low rpm) to transfer the water into the RO module. The RO module consists of a semi-permeable membrane to retain the unwanted minerals thereby removing the sediments and total dissolved .solids. The UV system has a UV lamp that emits Ultra Violet rays within the wavelength range of 200-300 nm. Water when exposed to this, becomes free from micro-organisms.

Reverse osmosis (RO) membrane:

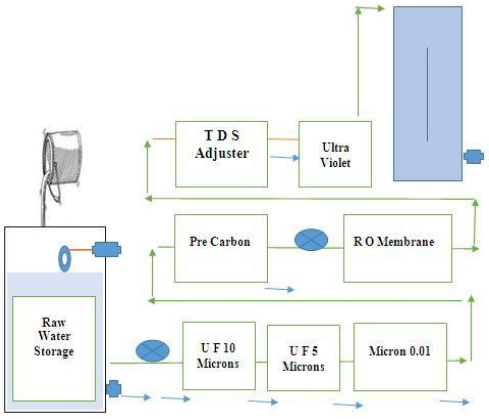
Reverse osmosis (RO) is a water purification technology that uses a semipermeable membrane (small pores) to remove ions, dissolved solid molecules, as small as 0.0001 microns from drinking water. In reverse osmosis, an applied pressure is used to overcome osmotic pressure, a colligative, that is driven by chemical potential differences of the solvent, thermodynamic parameter. Reverse osmosis can remove many types of dissolved and suspended species from water .The result is that the solute is retained on the pressurized side of the membrane and the pure solvent is allowed to pass to the other side producing portable water.

When purification of water is done on a large scale, the purity gradually decreases because of the long term use of filters in the RO module. Hence monitoring of the system is very necessary in order to maintain the water quality as per the required standards set by the WHO. This monitoring can be performed by a manually operated TDS adjusting switch.

In this project we use the Reverse osmosis (RO) technology research and developed by "Bhabha Atomic Research Centre (BARC)" government of India.

II. PROTOTYPE MODEL OF PROPOSED PROJECT

Block diagram



Procedure

The setup is placed on a flat surface. Photovoltaic panel is exposed to Sun Light which intern generates the Direct current (DC) energy of 24 volts, 150 watts per hour from solar panel and connected to water purifier system through charge controller Raw water tank is filled with water to be purified using manually or by connecting to a water tap (Dual arrangement). Raw water is pumped by a diaphragm pump to the purifier

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system Purifier system consists of 6 stages of purification, they are as listed below.

1. Ultra-filtration (removes particle greater than 10 microns)
2. Ultra-filtration (removes particle greater than 5 microns)
3. Micron Filter (removes particle greater than 0.01 microns)
4. Pre carbon wash (eliminates the odour and colour of solvent)
5. Reverse Osmosis membrane (removes the particle greater than 0.0001 microns)
6. Ultra violet chamber (neutralises the bacteria present in solvent)
7. Drinkable form of water is stored in a food grade plastic container along with water level controller

Advantages

- ♣ No need of overhead storage tank
- ♣ Easy to maintenance
- ♣ Water purifier system is portable
- ♣ This purifier unit is not dependent on any of external source of energy

***Social Relevance*:**

- ♣ We take responsibility to build a better Nation by educating the people about the usage of Renewable energy source.
- ♣ No pollution, No fumes, Completely Zero emission of greenhouse gases, Since we use Only natural resources
- ♣ Creating awareness in rural school students gives strong impact in Society.

Methodology

- ♣ The project is implemented using various that are organized in a specific way so that the device is small and portable.
- ♣ Each component has a specific function to perform. Our project is basically divided into three parts: mechanical, electronics and display unit.
- ♣ This part consists of various components, which are as follows:

1) Photo-Diode
2) Voltage regulator (7805)
3) Microcontroller (AT89s52)
4) Oscillator
5) LED
6) Capacitor
7) Resistor
8) LCD
9) Water-pump
10) Power MOSFETs
11) Switch
12) Connecting wires

AT98s52
Pin Description
VCC: Supply voltage.
GND: Ground

Port 0: Port 0 is an 8-bit open drain bidirectional I/O port. As an output port, each pin can sink eight TTL inputs. When 1s are written to port 0 pins, the pins can be used as high-impedance inputs. Port 0 can also be configured to be the multiplexed low-order address/data bus during accesses to external program and data memory. In this mode, P0 has internal pull-ups. Port 0 also receives the code bytes during Flash programming and outputs the code bytes during program verification.

Port 1: Port 1 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 1 output buffers can sink/source four TTL inputs. When 1s are written to Port 1 pins, they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 1 pins that are externally being pulled low will source current (IIL) because of the internal pull-ups.

In addition, P1.0 and P1.1 can be configured to be the timer/counter 2 external count input (P1.0/T2) and the timer/counter 2 trigger input (P1.1/T2EX), respectively, as shown in the following table.

Port Pin	Alternate Functions
P1.0	T2 (external count input to Timer/Counter 2), clock-out
P1.1	T2EX (Timer/Counter 2 capture/reload trigger and direction control)
P1.5	MOSI (used for In-System Programming)
P1.6	MISO (used for In-System Programming)
P1.7	SCK (used for In-System Programming)

Table: 2.1 Port 1 alternate functions

Port 1 also receives the low-order address bytes during Flash programming and verification.

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Port 2: Port 2 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 2 output buffers can sink/source four TTL inputs. When 1s are written to Port 2 pins, they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 2 pins that are externally being pulled low will source current (IIL) because of the internal pull-ups.
Port 2 emits the high-order address byte during fetches from external program memory and during accesses to external data memory that uses 16-bit addresses (MOVX @ DPTR). In this application, Port 2 uses strong internal pull-ups when emitting 1s. During accesses to external data memory that uses 8-bit addresses (MOVX @ RI), Port 2 emits the contents of the P2 Special Function Register. Port 2 also receives the high-order address bits and some control signals during Flash programming and verification.

Port 3: Port 3 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 3 output buffers can sink/source four TTL inputs. When 1s are written to Port 3 pins, they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 3 pins that are externally being pulled low will source current (IIL) because of the pull-ups. Port 3 receives some control signals for Flash programming and verification. Port 3 also serves the functions of various special features of the AT89S52, as shown in the following table.

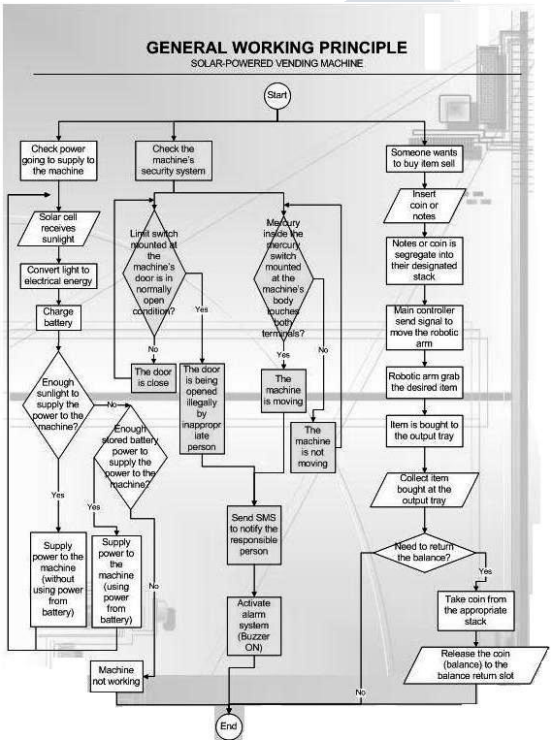
RST: Reset input. A high on this pin for two machine cycles while the oscillator is running resets the device. This pin drives high for 98 oscillator periods after the Watchdog times out. The DISRTO bit in SFR AUXR (address 8EH) can be used to disable this feature. In the default state of bit DISRTO, the RESET HIGH out feature is enabled.

PSEN: Program Store Enable (PSEN) is the read strobe to external program memory.When the AT89S52 is executing code from external program memory, PSEN is activated twice each machine cycle, except that two PSEN activations are skipped during each access to external data memory.

EA/VPP: External Access Enable. EA must be strapped to GND in order to enable the device to fetch code from external program memory locations starting at 0000H up to FFFFH. Note, however, that if lock bit 1 is programmed, EA will be internally latched on reset. EA should be strapped to VCC for internal program executions. This pin also receives the 12-volt programming enable voltage (VPP) during Flash programming.

Photodiode:

Photodiodes are semiconductor light sensors that generate a current or voltage when the P-N junction in the semiconductor is illuminated by light. The term photodiode can be broadly defined to include even solar batteries, but it usually refers to sensors used to detect the intensity of light. Photodiodes can be classified by function and construction as follows:



III. CONCLUSION

Water and electricity are two basic and essential parameters for all living organisms. But, both these resources are scarcely available at future days. This paper focuses on solving this problem by proposing a solar based water purification system. The intention of this work is to provide consumable safe and hygiene drinking water by utilizing the rich source of renewable energy that can be obtained from the sun. The system is also continuously monitored to ensure that there is no decrease in the quality of the water that is being purified.

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