

Design And Implementation Of A Biomedical Solar Autoclave

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Introduction

Microscopic organisms, including bacteria, viruses, fungi and animal parasites penetrate the body's natural barriers and multiply to create symptoms.

The benefits of implanted, external communicated and surface contacting devices are often limited by the occurrence of infections associated with the devices, even when the best aseptic techniques are practiced.

Sterilization is defined as a validated process used to render a product free from viable microorganisms. The presence of microorganisms on the individual items is expressed in terms of probability. While the probability may be reduced to a very low number, it can never be reduced to zero.

In this paper the proposed technique is to design an autoclave operating by using PV cells depending on Sun as alternative source of energy instead of electricity. The goal is to utilize solar energy for solar thermal conversion. The produced heat can be used for different purposes such as operating medical devices and many electrical devices using electricity.

Project Objectives:

1. Use alternative energy source which is solar energy in operating biomedical autoclave.
2. Reduce pollution and reduce electricity consumption.
3. Apply this design in medical field by designing biomedical autoclave.

Results:

1. The PV cell placed at the roof exposed to the sun used to charge the batteries and the batteries used to operate the heater of the chamber.
2. The required temp. 120° C and pressure 2 bar by obtaining DC current from PV cell.

Proposed project

To protect the environment from pollution the solar energy used as alternative source of energy. Solar energy is considered clean, economic and sustainable source of energy. In this paper a biomedical solar autoclave was designed and built. The autoclave was provided with a photo-voltaic (PV) cell, charger controller and batteries to supply the system with the required power to accomplish the sterilization process under 2 bar steam pressure at temperature of 120° C within a period of time – 15 minutes. The output of the PV-cell is a constant current, this current will be used to charge a two series 12Vdc batteries.

Charger-controller is utilized to control the charging and discharging cycles of the series batteries. Autoclave is important device used to sterilize medical tools to prevent infection.

$$Q_{tot} = Q_1 + Q_2 + Q_3$$

$$P_{array} = \frac{TotalPV}{t_{array}}$$



Project Block Diagram:

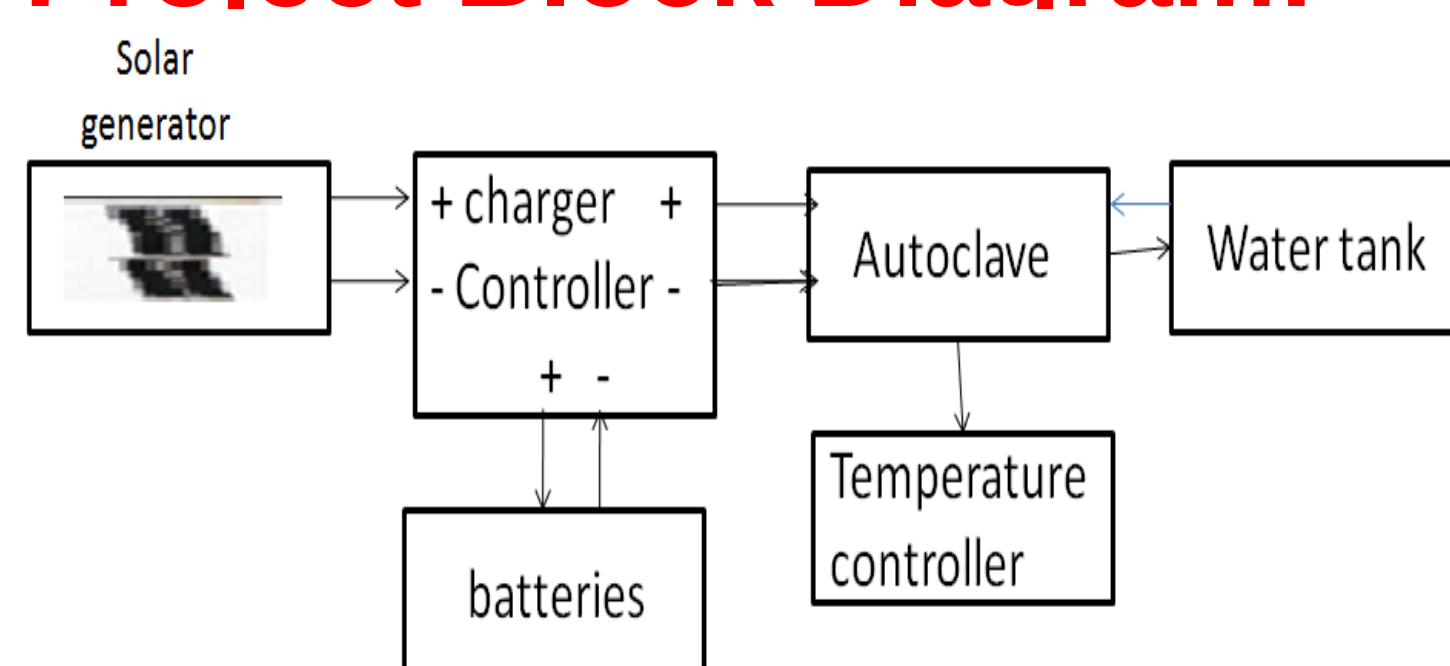
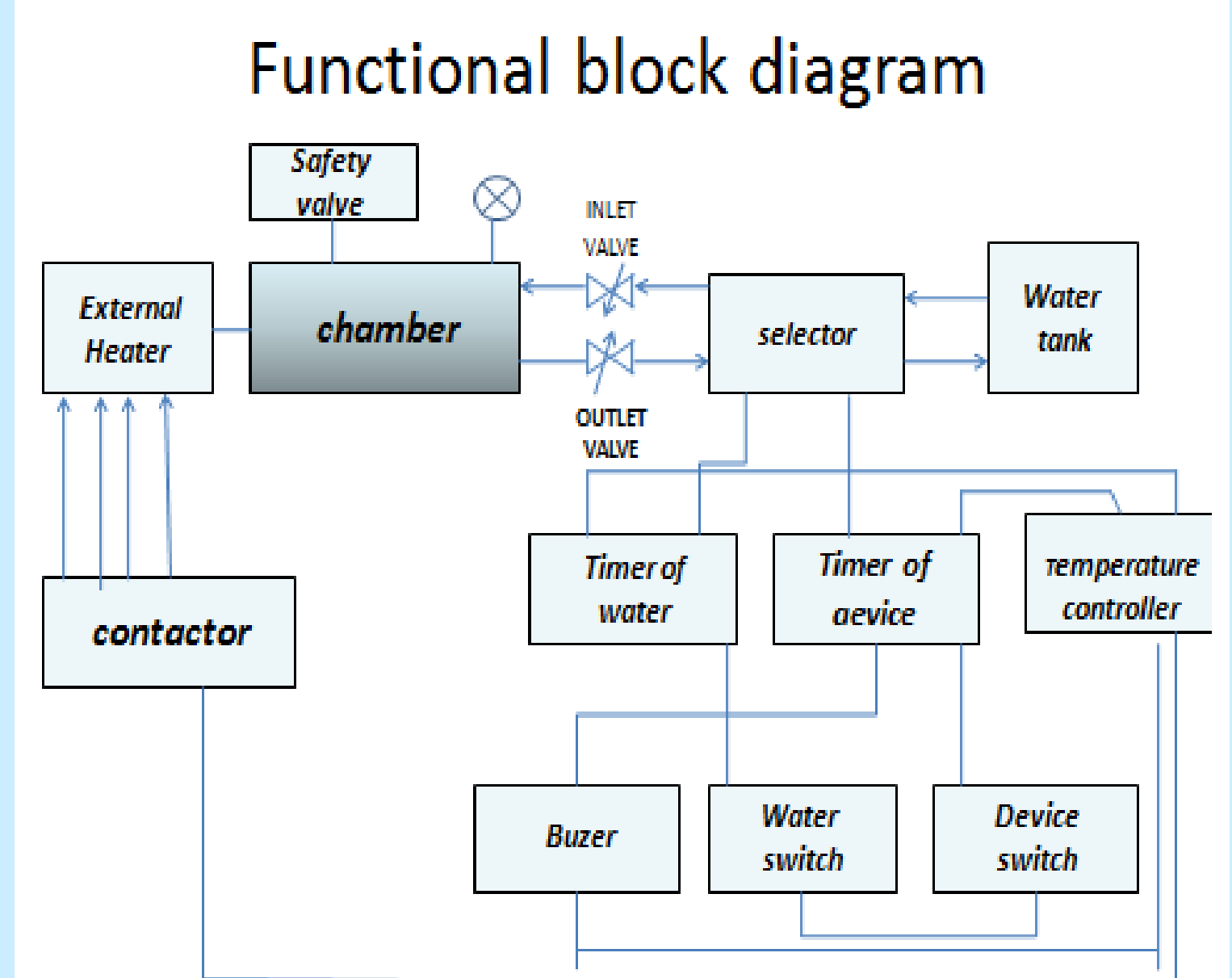


Figure 1: General Block Diagram.

The solar panel will provide 4.5 A and 110 watt which will be stored in the battery and the battery will provide the autoclave the desired energy to operate the device.

The charger controller will organize the charging and discharging. The following block diagram explains the internal design of the autoclave.



System Design and Implementation:

Mechanical system implementation

The mechanical system implementation includes combining the chamber with water tank, safety valve, solenoid valves, pressure gauge, temperature controller, timer, switch, buzzer, selector, contactor. The heater is placed outside the chamber. The following picture shows mechanical system implementation.



Testing:

The system tested several times and the results was near the desired one . the first reading is 1.8 bar and 115 . The second reading is 1.8 bar and 115 .

