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Solarizer

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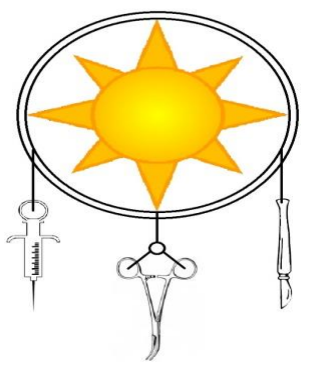
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SOLARIZER

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Problem Statement

In developing countries and following natural disasters, there is a need for a portable solar powered autoclave to properly sterilize surgical equipment because there is often no access to electricity or natural gas. Without proper sterilization of surgical equipment, infectious diseases may spread throughout a population.

Product Benefits

- Self-powered with use of solar power
- Durable and portable components
- Straightforward and easy to operate after basic training
- Safety features to prevent injury to user and device

Design Overview

| Part | Reason Chosen |
|--|--|
| All-American 1925X Sterilizer | Durable Aluminum, Machinable |
| 2 x 1kWh Lithium Ion Chevy Volt Battery | Light Weight, Rechargeable, Large Capacity |
| 120-Watt Powerenz Solar Panel | Light Weight, Foldable |
| Genasun MPPT Boost Charge Controller | Light Weight, Custom-made for Product |
| 24 V 600 Watt DC Submersible Heating Element | Low Power Consumption, No Need for AC/DC Converter |
| DC/DC Step Down Converter | Ensures 600 Watts to Element at All Times |

Safety Features

| Safety Element | Protects Against |
|---------------------------|--|
| 40 Amp Fuse | Overcurrent |
| Flyback Diode | Residual Current Backflow from Element |
| Genasun Charge Controller | Current Backflow, Battery Overcharge |
| Mineral Wool Wrap | Burns from Contact with Autoclave |
| Pressure Plug | Too Much Pressure in Vessel |

Figure 1. Example of typical instruments placed in autoclaves worldwide

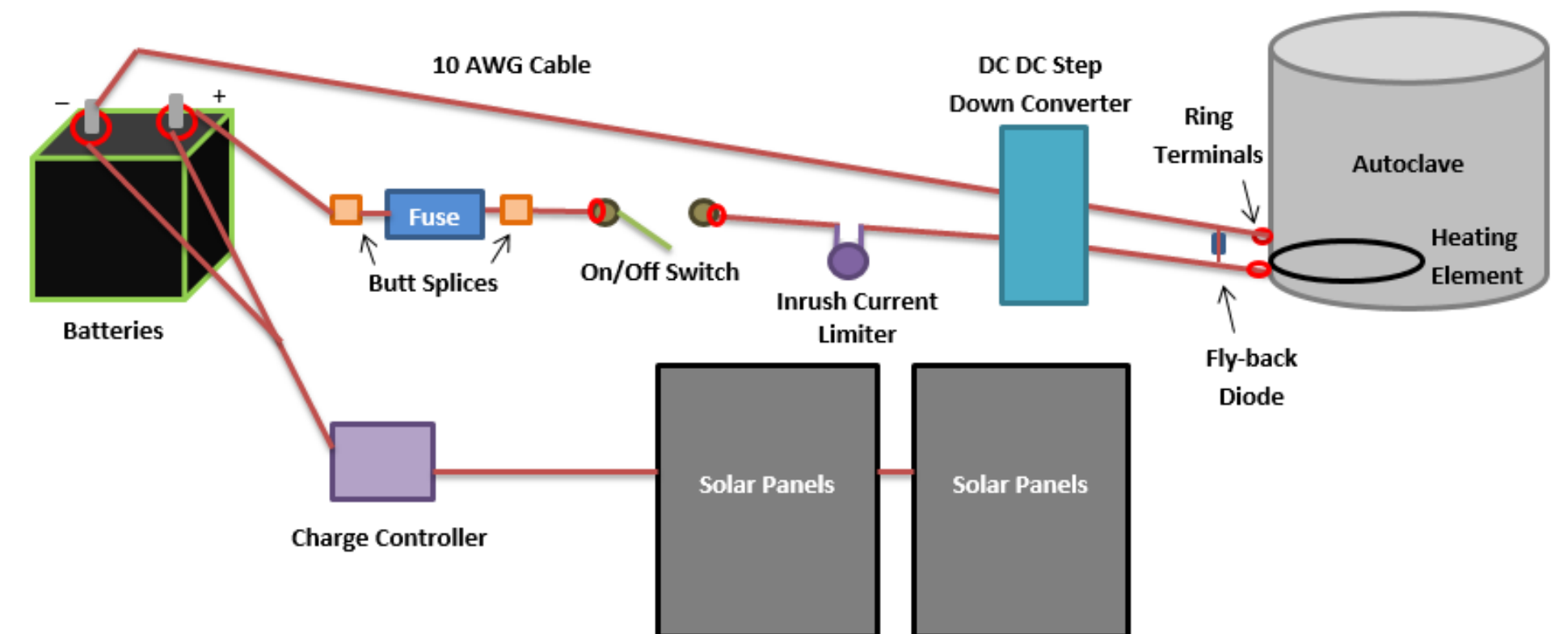


Figure 2. Final schematic of design layout

Calculations

| Parameter | Result |
|--------------------------------|---------------------------|
| Time to Reach 121° C | 29.2 minutes |
| Total Sterilization Cycle Time | 84.2 minutes |
| Battery Bank Capacity | 1.83 sterilization cycles |
| Time to Charge Battery Bank | 19.2 hours |

Data and Analysis

In order to validate the autoclave, tests will be run to ensure that the device will reach the sterilization temperature of 121° Celcius for at least 35 minutes. In addition, the voltage loss in the batteries during the cycles will be tracked to create a graph of voltage loss vs. time. A graph of battery voltage vs. time while charging with the solar panel will also be created.

Future Improvements

- Use of bacteria spore strips for improved sterility testing
- Polymer insulator for improved durability over mineral wool
- Plug-in connections for easier assembly and convenience
- Additional solar panels for quicker charging times

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NORTHROP GRUMMAN

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