Solar Powered Aeroponics System in Bangalore, India

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Abstract

The ETHOS program sent a team of two students to Bangalore, India to work with The SELCO Foundation which is an energy access company that creates financial and engineering innovations for underserved communities. The team worked on various projects including a solar powered aeroponics system. At the completion of the program the team had designed, constructed, and tested a functioning prototype.

Figure 1: ETHOS Team

Introduction

- 40% of India's population lives without proper access to electricity, a statistic SELCO is attempting to change
- Many parts of India are currently undergoing severe drought
- Solar powered aeroponics can combat both issues as a water efficient form of farming
- Plants grown via aeroponics have higher yields and can be harvest more frequently.

Project Description

Solar Powered Aeroponics System

- Research was conducted to learn what aeroponics is as well as its potential benefits and drawbacks

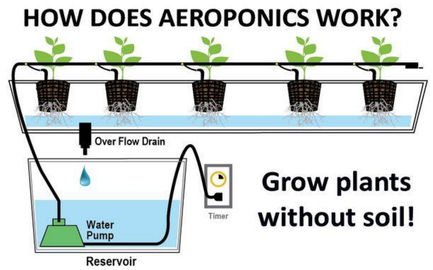

Figure 2: Diagram of aeroponics system

- Calculations were conducted to size the solar panels, size the system pump, ensure necessary pressure at the nozzles and determine the maximum size of the entire aeroponics system
- The team consulted with an Electrical Engineer to design a microcontroller powered system to control the solenoid valves and pump
- Materials were procured at a market and were used construct a prototype
- A prototype was built and the design was evaluated for functionality and performance

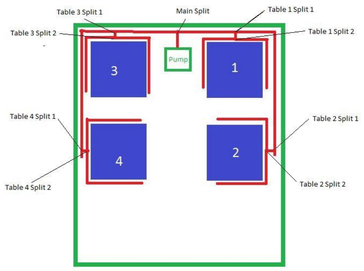

Figure 3: Diagram of system

Results & Discussion

- 160 PSI pump providing 5 L/min can service up to 14 tables, team constructed prototype for 4 tables
- Three 100W solar panels with a 12V 400AH battery bank
- Used raspberry pi microcontroller with the option of web based monitoring in the future
- System pressure was tested using analog pressure gauge

Table 1: System Performance in psi

	SV 1	SV 2	SV 3	SV 4
At Valve	150	160	160	150
At Table	145	150	145	145

- System was tested for functionality by observation. The system was successful at providing water at regular intervals with the exception of occasional valve failure

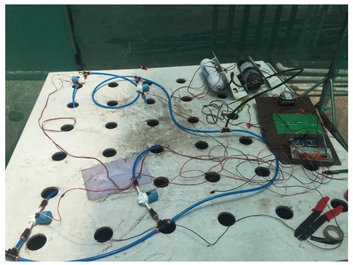

Figure 4: Test Set-up

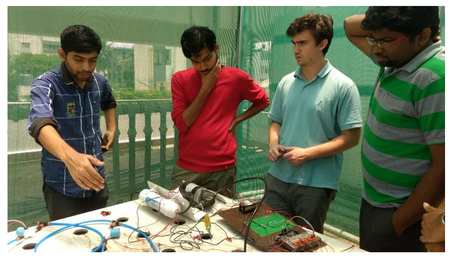

Figure 5: System Demonstration

Recommendations

- Resolve solenoid valve issues:
  - Test larger valves with a higher voltage system
  - Test system with a smaller pump, or increase overall size in order to minimize excessively high pressures
- Integrate web based monitoring for water level, temperature, and humidity.
- Conduct growth test using a variety of plants
- Ensure entire system is sufficiently secured and anchored to prevent the system being damaged by high winds

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