Transforming Algae To Biofuel

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1. Introduction

Problem Statement

The challenge of achieving economically viable microalgae production persists due to high costs and inadequate yields, hindering its widespread adoption for various applications.

Constraints

Photo Inhibition
Weather
Scalability

Growth rate

Desired output rate: 30 - 35 g/$(m^2 day)$
Growth rate: 0.3 - 0.4 day^{-1}
Algae concentration: 1.5 g/L - 2 g/L

2. System Design

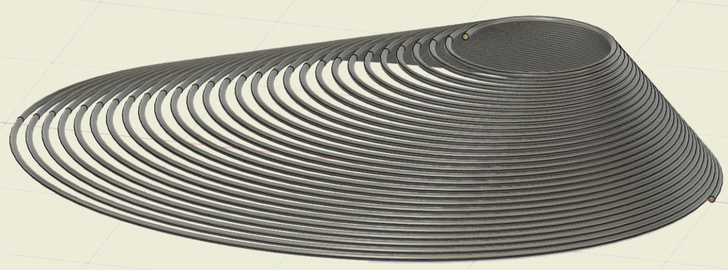
Reactor Sizing:

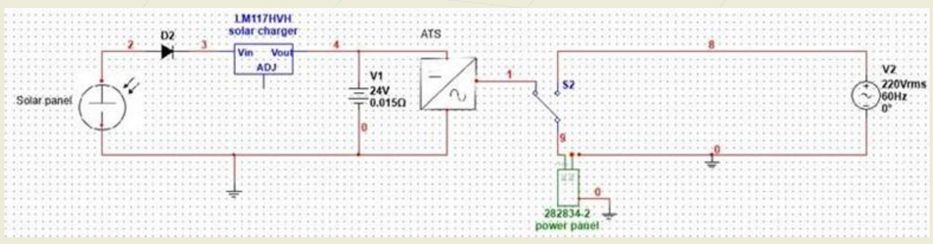
The Desired Volume: 18 L

$$V = \frac{Q}{\mu \times X}$$

The Total Tube Length: 20 m

$$L = \frac{V_{tube}}{\pi \times \frac{D^2}{4}}$$





Dual Power System:

The Solar Power
The Grid Power

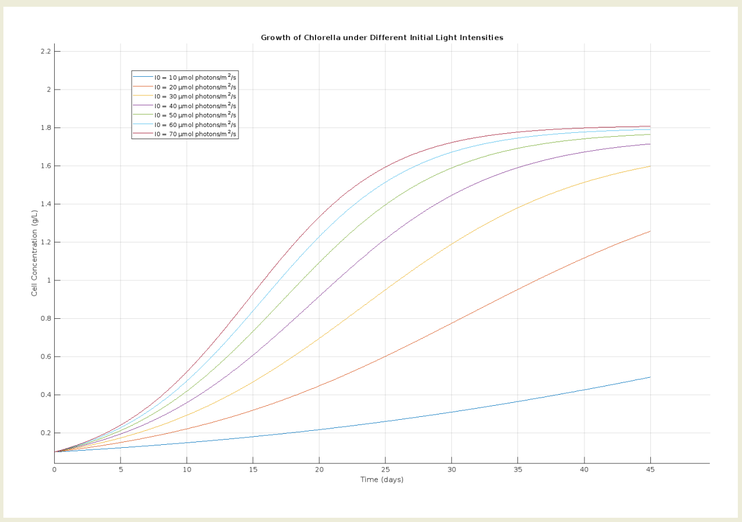
$$Solar\ Size = \frac{P}{T \times eff}$$

Solar System Sizing:

The Solar System Size : 1.1 kW/h
The Number of Solar Panels: 6 Solar Panels (0.2 kW/h)

3. Testing & Validation

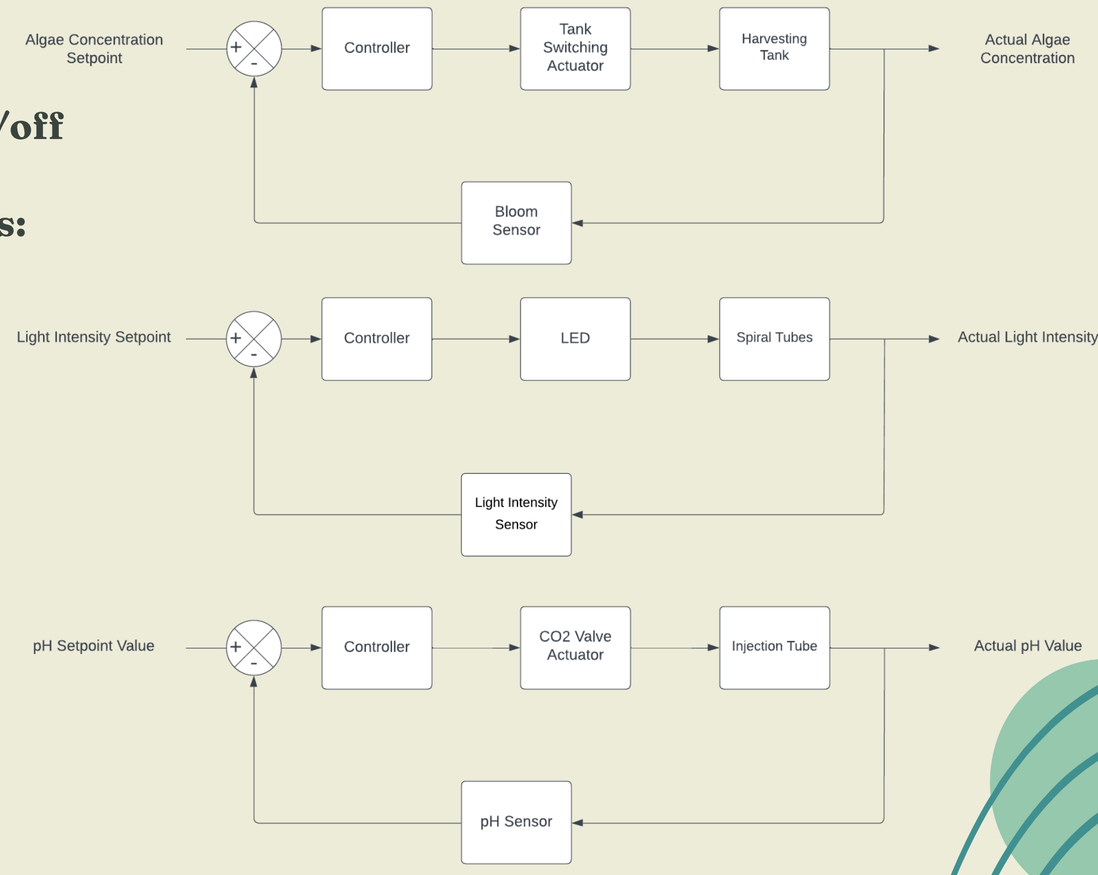
The system's theoretical validity and simulated performance have been confirmed. Furthermore, our prototype is operational and currently facilitating data collection.



Control Design:

The system utilizes on/off control.

Three control variables:
- Concentration
- Light Intensity
- pH value



4. Conclusion

The prototype has proved that our design of photobioreactor is able cultivate algae. However, due to time constraints of waiting algae to grow we cannot validate our targets.