Microalgae Growth for Wastewater Remediation and Biofuel Production

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Introduction

Microalgae biomass can be used to produce

- Biocrude
- Bioplastics
- Fertilizers
- Culture Media

Microalgae cultivation can be expensive. Growth on wastewater could reduce this cost.

This project aims to quantify wastewater treatment by microalgae grown on Rotating Algae Bioreactors (RABRs)

Figure 1: RABRs after a month of growth in pressate.

Figure 2: Side profile of the harvested microalgae biofilm.

Materials and Methods

Before treatment could begin, several RABRs were needed. These were constructed from acrylic and PVC.

Microalgae and pressate (partially treated water) were collected from the Central Valley Water Reclamation Facility in Salt Lake City.

Hach kits were used to measure nitrogen and phosphorus concentration in the wastewater.

Periodically, microalgae was harvested using solid plastic scrapers.

Results

In less than a month, dissolved nitrogen concentrations were reduced from 400 mg/L to 10 mg/L.

Dissolved phosphorus concentrations were reduced from 85 mg/L to 5.5 mg/L.

RABRs produced an average of 5.5g dry microalgae per liter of wastewater or 20 g/m2/day.

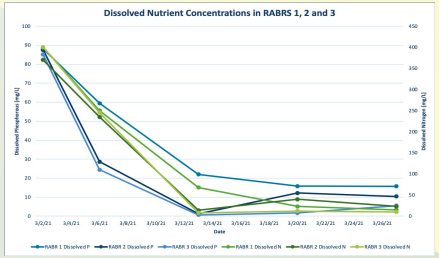

Figure 3: Dissolved nutrient concentrations over time. Green: Dissolved nitrogen. Blue: Dissolved phosphorus.

Due to biomass production, suspended nitrogen and phosphorous increased from approximately 0 mg/L to 20 mg/L P and 14 mg/L N.

Conclusions

- RABRs can be used to cultivate microalgae and treat wastewater
- Nutrient removal rates may compete with traditional methods

Future Work

- Energy optimization and economic analysis are still needed
- Hydrothermal liquefaction and bomb calorimetry will be used to estimate microalgae biofuel yields

References

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