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Improving Wastewater Treatment Using Algal Biofilms and Bioenergy

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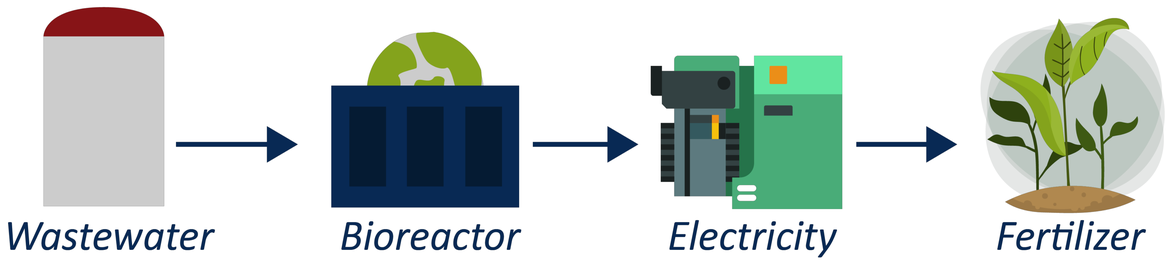
Introduction

This project represents a collaboration between Utah State University, Central Valley Water Reclamation Facility (CVWRF), and WesTech Engineering, Inc. The goal of the project is to help water treatment plants meet state nutrient standards and reduce operating costs. This is being accomplished in three major sections:

1. **Wastewater treatment –** microalgae is grown to remove nitrogen and phosphorus from water.
2. **Biogas generation –** the microalgae is harvested and processed to produce methane gas used to generate power.
3. **Fertilizer production –** nutrients are also collected from the wastewater and turned into high-value fertilizer.

By creating systems that remove nutrients from water and create value added products at the same time the environmental impact and cost of water treatment are reduced.

Figure 1-



Methods

Algae is grown on rotating discs using wastewater from CVWRF. The algae is then harvested and placed in digesters to create biogas. The biogas is used to power generators. Additional harvested algae and nutrients are used to create fertilizer pellets.

Results

Nutrient removal from the wastewater has been successfully demonstrated over the past year. A combination of algae and food waste has also generated significant biogas. Nitrogen and phosphorus rich fertilizer pellets are currently being created.

Figure 2 – Pilot scale setup at Central Valley

A side and aerial view of the current pilot scale reactor at CVWRF for treating wastewater and growing microalgae to harvest.

Figure 3 – Lettuce grown on microalgae fertilizer

A sample of lettuce grown on fertilizer enhanced with microalgae.

Conclusions

The primary benefits of the project are:

1. Nutrient removal from wastewater using more efficient biological methods. This will aid in reducing the environmental impact and cost of water treatment.
2. Increased biogas production in the form of methane using microalgae and food waste. The gas is then used for local power generation at CVWRF.
3. Fertilizer pellets produced in the project can be used to increase plant growth.

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