

**Abstract for Public Release**  
**Utah State University**  
**Synergistic Municipal Wastewater Treatment Using a Rotating Algae Biofilm Reactor**  
Control No. 2203-1712

Utah State University's (USU) Sustainable Waste to Bioproducts Engineering Center (SWBEC) is partnering with the Pacific Northwest National Laboratory (PNNL), the wastewater treatment industry leader, WesTech-Inc., the Central Valley Water Reclamation Facility (CVWRF), the largest in Utah, and ALGIX, Inc., to propose and test a novel microalgae cultivation system for cultivating algae for treatment of wastewater and transformation into biofuel (renewable diesel) and bioplastic, while simultaneously remediating wastewater. Utilizing an agricultural based approach, this technology cultivates algae on a substratum that rotates vertically through wastewater where algae uptake nutrients from the wastewater and the greenhouse gas, carbon dioxide, using natural sunlight to form a cohesive biofilm that is easily harvested as a cohesive mat. The algae can be dried on the flat disk before harvesting by simply slowing the rotation of the risk to allow greater time in the dry air compared with time in the wastewater.

The Rotating Algae Biofilm Reactor (RABR) is unique and innovative in the following ways: (1) requires low power; (2) provides one technology for both algae cultivation, separation from the wastewater, and mechanical harvesting by scraping; and (3) eliminates the need for chemical addition to aggregate cells for settling and separation from wastewater that can add cost and negatively impact downstream processing into biofuels and bioproducts.

With the collaboration of our industrial partner, WesTech-Inc. an international wastewater processing and treatment equipment company, we have designed and manufactured a portable test RABR system to process 1,200 gallons of wastewater in 3-6 hours. The function of our proposal partner, PNNL, will be to lead the transformation to renewable diesel, to understand the interactions in the algal-bacterial community that affect system performance, and to conduct a techno-economic analysis and an environmental impact analysis of the RABR system. The role of USU is in the evaluation and identification of different support materials to be placed on the plastic disks for algae cultivation that maximizes algae production and is cost-effective, to work with PNNL to understand the interactions among the algae and bacteria, and to evaluate algae biofilm growth and harvesting cycles through seasonal changes in weather and sunlight. The field scale test RABR system will be hosted by the CVWRF that treats 50 million gallons per day and is located in Salt Lake City, Utah, with an additional role in conducting testing on the chemistry of the algal biofilm that is harvested.

This project integrates algae cultivation with wastewater treatment to significantly reduce environmental impacts of harmful algal blooms on lakes and stream, and simultaneously provides renewable diesel to provide energy independence and energy security to the U.S. The RABR technology has potential to provide both urban and rural areas with workforce development opportunities.