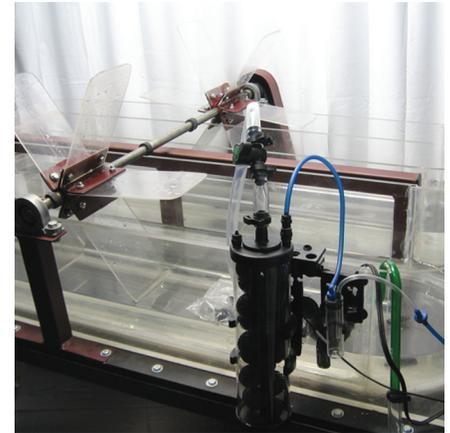


Optimization of Environmental Conditions for Microalgae Growth and Oil Production

The goal of this project is to develop the process model and control parameters to optimize the growth and lipid production of microalgae species. Key parameters include atmospheric conditions, water quality factors, mixing, and light characteristics. Because the final commercial scale is projected to be much larger than the bench, pilot, or demonstration scales, a clear understanding of the bioreactors, the process variables, and the control parameters is critical. The proposed industrial-scale project is for a two-stage process in which the first stage will create an environment for microalgae growth, while the second stage will provide an environment for oil production.

The Process

- Open, race-track, test-bed systems with a working volume of 10 gallons each have been designed and fabricated to control the environmental variables and measure the production of biomass and oil by microalgae. Each test bed is independently controlled and monitored, allowing replicated experiments with comparisons between control and experimental parameters.
- A 100-gallon pilot-scale race-track bioreactor has been installed to evaluate scale-up parameters.
- Each bioreactor can be operated as either a turbidostat or a chemostat, so the controlling parameters can be varied, responses measured, and biomass and lipid production optimized.



Paddlewheels and pump

Research Objectives

- Develop a fundamental understanding of the operating parameters of the race-track bioreactors with an emphasis on maximum biomass and lipid productivity.
- Develop operating and process control algorithms to optimize biomass production and that can be evaluated at larger demonstration and production scales.
- Develop guidelines on the scale-up of race-track bioreactors.
- Develop the basis for an engineering economic analysis of the microalgae biomass and oil production process.

Outcomes

- Provide engineering-based understanding of the design and control of open race-track style bioreactors for production of microalgae and oil leading to the production of microalgae-based biodiesel.
- Provide the basis for engineering scale-up of microalgae production and an engineering economic analysis of the process.

For more information, contact

Bob Avant, Bioenergy Program Director, Texas AgriLife Research
100 Centeq Bldg. A | 1500 Research Parkway
College Station TX 77843-2583
Ph: 512.365.6591 | E-mail: bavant@tamu.edu