9th European Chemistry Congress

June 17-18, 2019 | Berlin, Germany

Direct microalgae harvesting to prevent harmful algal blooms and produce renewable biofuel

Kevin Shurtleff, Phillip Rich, Tyler Johnson, Austin Bettridge, Blake Allred, Anastasiia Matkovska, Jeffrey Keller, Jacob King and **Spencer Jacobsen**
Utah Valley University, Utah

Harmful algal blooms (HABs) are a serious environmental issue worldwide. HABs occur when water conditions (temperature, solar insolation, and nutrients) foster rapid growth of microalgae (cyanobacteria). When microalgae reach high concentrations, the sunlight is blocked, preventing photosynthesis. This results in microalgae death, which releases endotoxins that contaminate the water. The purpose of the microalgae harvesting project at Utah Valley University is to design, build and test a direct microalgae harvesting barge that can be deployed on the water to target problem areas. The harvesting barge will extract the microalgae from the water, preventing an HAB and reducing the nutrient content of the water. Ultimately, the harvested algae will be used as a carbon neutral biofuel. We have designed, built and tested seven, lab-scale, microalgae harvesting technologies. We tested the effectiveness of each technology at removing low concentrations of microalgae from water over time. Of the seven technologies tested, only two of the technologies were deemed effective as a continuously-swept cellulose filter they designed and a conventional plate and frame filter press with body addition of cellulose. We determined the cost and time required to scale-up our continuously-swept filter made it less favorable to using a conventional plate and frame filter press. We have designed a full-scale, 10 foot wide x 30 foot long, algae harvesting barge. It will filter 1.73 million gallons of water during each 16 hour day, removing 590 kilograms of algae (at an average algae concentration 0.1 gram per liter). The barge can filter 1 square mile of water every 20 days. We envision a fleet of barges operating globally to prevent algae blooms. We will use the harvested algae/cellulose filter cake as a carbon-neutral biofuel to produce electricity. We hope to deploy the prototype microalgae harvester on Utah Lake in the spring of 2019.

kshurtleff@uvu.edu