

Operation SWAT

Summary

Microalgae has been researched and cultivated commercially for human and animal nutrition, for cosmetics and pharmaceutical applications, for biofuels and biomass production, for wastewater treatment and to some extent for greenhouse gas abatement. The most critical challenge faced by all algae growers is harvesting. Harvesting is expensive and energy intensive. A group of European SMEs (Salsnes, Asio and Inwatec) have decided to work together to capture a part of the global algae harvesting equipment market. The objective is to develop a universal algae harvesting technology by building on their experiences gained from removing particles from wastewater and by modifying wastewater treatment technologies to harvest algae. **Salsnes Water to Algae Treatment (SWAT) technology** will use a flocculator followed by a Salsnes Filter to harvest algae. Two RTDs (Aquateam and HERI) will carry out research and development to achieve the objective. Two test sites have been chosen (IGV in Germany and Aqualia in Spain) to test the SWAT technology.

The goal of the SWAT technology is 95% algae recovery, 40% lower costs than the best state of the art technologies (Centrifuge and Dissolved Air Flotation) and energy consumption $< 0.08 \text{ kWh/m}^3$ of algae. The consortium will explore the SWAT technology in the growing biofuel market (which has a projection of 1.6 billion US\$ or 1.2 billion Euros by 2015) and then in other algae markets. The EU is home to 30% of the world's algae markets.

To date the project has identified algae species of commercial interest for biofuel production, animal feed, food, cosmetics and pharmaceuticals. Seven selected algae species have been grown in the lab and tested for harvesting using bench and pilot scale flocculator and bench scale Salsnes Filter (SF). The data obtained was used for design of SF prototype (SF500) and pilot scale Asio flocculator (PSAF).

Two test sites were chosen and investigated for algae harvesting using the prototypes designed. Test site 1 at IGV, Germany produces algae using pure cultures for commercial applications and Test Site 2, Aqualia, Spain produces algae using wastewater for biofuel applications. At both these test sites, particle and floc size analysis, direct filtration, screening of polymers and G values for flocculation, bench scale flocculation followed by SF using fine mesh sieves were investigated. The preliminary data collected was used for SWAT database and also for further pilot testing.

The SF500 over the period of several months of testing underwent 7 different versions. The integration of the flocculator and the SF500 have been highlighted in several deliverables. The SWAT technology after extensive testing at the two sites, yielded a result of $\geq 95\%$ algae recovery while using $\leq 0.08 \text{ kWh/m}^3$ of algae for energy consumption.

The results were disseminated at the International Water Association Leading Edge Technology platform at Bordeaux, France and the SWAT prototype presentations were made at the World Resource Forum at Davos in Switzerland.

Several key milestones noted in the Operation SWAT project were all met during this Reporting Period 2 and results have been documented in respective Deliverables.