



## **Technology Commercialization Opportunity**

### Renewable Biomass, Biofuel and Bioproducts Production from Industrial and Agricultural Wastewater

UGARF Case: 1453

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School: College of Agriculture. BioAg Engineering

Intellectual Property Status: Patent Pending

#### **Introduction**

Most wastewater produced worldwide is rich in macro- and micronutrients necessary for algal and bacterial growth. This poses a serious environmental problem; as such wastewaters will eventually lead to a population explosion of algae and other organisms in lakes and rivers, severely (and often irreversibly) disturbing those ecosystems. On the other hand, contained growth of algae and micro-organisms are key components of the biotechnology, biofuels and other industries. Consequently, any technology that allows for the efficient capture and utilization of hydro-contaminants as part of a process for the production of materials of economic interest will be addressing two major socio-economic concerns of the modern age: environmental remediation and production of alternative fuels.

#### **Technology Summary**

Using *both* treated and untreated wastewater generated by a US carpet company as models, UGA scientists have developed a method for growth, harvesting and utilization of native algae consortium for environmental remediation and concomitant production of bio-oils, biodiesel and other chemicals. The method, which also comprised forced bubbling of air (or neat CO<sub>2</sub>) through the algal growth environment leading to accelerated consumption of CO<sub>2</sub>, led to nearly quantitative removal of nitrate (99.7% removed), ammonia (100%) and phosphate (98.8%) from wastewater. The harvested algae was processed to yield ca 7% of lipids. The crude oil extracted from the algae displayed an energy content of 40.2MJ/kg (10Mcal/kg). Fatty acids (including branched) from C<sub>14</sub> to C<sub>22</sub> were isolated. Inexpensive esterification of fat acids led to successful conversion of the bio-oil into bio-diesel, which in turn exceeds ASTM D6584 specifications. Using this method, the potential biomass growth in an effluent reservoir is estimated at ca. 49 tons/acre/year.

#### **Advantages**

- No need for added nutrients
- Environmentally benign and carbon-negative
- Allows for fast growth of algae and consequent production of bio-oils, bio-diesel and other chemicals
- Scalable for use directly in connection with effluent reservoirs
- Compatible with UGARF technologies described in cases 1443 (Production of Higher Quality Bio-oils by In-line Esterification of Pyrolysis Vapor) and 1452 (A Novel Algal Production Technology for Biofuel, Bioenergy and Added Value Products)

#### **Potential Applications**

- Growth of microalgae for the production of biofuels and other chemicals
- Environmental remediation
- Accrual of carbon credits

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