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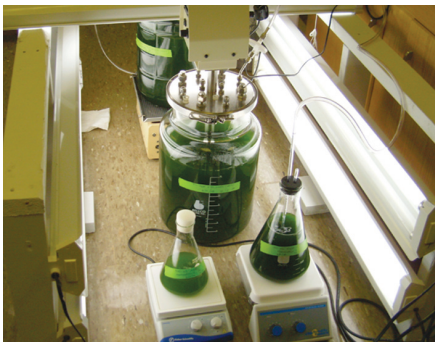
Texas AgriLife Research with General Atomics Pilots Microalgae Ponds in Pecos

Texas AgriLife Research and General Atomics, a San Diego-based high-technology company, received a $4-million grant from the Governor's Emerging Technology Fund and matching $4-million funding from the Department of Defense (including more than half a million dollars from the Air Force) to develop production systems for microalgae capable of producing biofuels.

Diesel and jet fuels are critical to our nation's economy and defense, and military operations require large quantities of fuel. Our nation consumes more than 40 billion gallons of diesel annually. Twenty-five percent of fuels for military use must come from renewable sources by 2020. Energy and financial analysts acknowledge that the world has entered an era of sustained higher crude prices. A clean, renewable, domestic source of fuel would have tremendous strategic and economic value to Texas and the United States.



Microalgae can produce significantly more biofuel per acre than any other potential source. Under ideal conditions, microalgae theoretically can produce 15,000 gallons of oil per acre per year in raceway (open) systems. A more realistic production goal would be 5,000 gallons per acre, and researchers are evaluating hybrid systems that could be much more productive. When compared with other plant sources, microalgae has no competitor. Palm produces about 500 gallons/acre, castor 130, canola 115, sunflower 90, and soy 60.

Specifically, microalgae can produce diesel and jet fuel. While there are many different forms of algae, General Atomics and Texas A&M have identified strains that possess high oil-producing potential. These strains of algae require large amounts of sunlight, brackish water, and carbon dioxide to thrive, all of which are readily available in the Permian Basin of Texas. As this technology evolves, it may also be an important carbon sink tied to coal-fired power plants, which could use carbon dioxide emissions and waste heat for algae growth.

The Process

Significant research and development activities will be located at several Texas A&M facilities and at General Atomics in San Diego. A demonstration facility has been constructed at the AgriLife Research and Extension Center in Pecos, Texas, with two sets of four ponds each: one large pond feeding into or from three smaller ponds. Paddlewheels are the propulsion system that moves the water and algae around the raceways, and pumps move the water from one pond to another.

A laboratory supports the production facility, identifying algae strains high in oil. Algae growth will be initiated in a laboratory bioreactor and then transferred to the ponds to continue growing. Algae double in size every few days and will be moved between the large pond and the smaller ponds. After one to two weeks in the ponds, the algae-water solution will be pumped into tanks, where the algae will settle to the bottom or top, depending on the strain, and valves on the tank bottom will be opened. The

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concentrated algae mix will be tested for lysis or cell wall rupture to allow release of the lipids. The Texas A&M/General Atomics partnership anticipates a phased research and development program leading to a demonstration system within four years that

- Demonstrates algae production systems up to a quarter acre in size
- Scales up the most promising system to a pre-commercial size
- Constructs and operates a commercial-sized operation of 50 to 100 acres.

Research Objectives

Specifically, the first phase of research also will include

- Evaluating and selecting algal species with high oil-producing capacities
- Developing a small aquaculture laboratory
- Developing rapid analytical techniques for *in situ* testing
- Optimizing environmental conditions for microalgae growth and oil production

Outcomes

Revolutionary changes in algae growth efficiency and separation technology could create an algae biofuels industry that is economically competitive with current fuel prices. If a successful system can be demonstrated, 2,000-acre production systems may be a reality for the Permian Basin of Texas and the Southwest. For each 2,000-acre unit, Texas A&M economists predict about $190 million dollars per year in local economic impact.

The Texas AgriLife Research and Extension Center at Pecos endeavors to become the premier microalgae research center in the nation, the go-to place for information for those desiring to grow microalgae.

For more information, contact

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