Top 10 Technologies: Bioenergy Feedstocks â€” Bigger Yields In Algae Utopia

Led by chief technology officer Dr. Vikram Pattarkine, researchers at Origin Oil are focusing on algae as a third-generation feedstock that doesn't rely on arable land or energy crops with inconsistent yields. But growing algae in large, open bioreactors is prone to contamination, and traditional methods for extracting the oil are energy-intensive. Pattarkine is addressing these problems through the development of a closed bioreactor and a Quantum Fracturing™ process.

The Helix Bioreactor™ contains an array of internal light sources that are arranged in a helical pattern and tweaked to different wavelengths and frequencies to maximize their efficiency. A dynamic biofeedback control system responds to changing conditions in the algae culture by adjusting the lighting parameters, creating a disco-like utopia where food is plentiful, gate-crashers are locked out and reproduction is irresistible.

During the growth process, the CO2 and nutrients used to feed the algae are fractured into a micro-bubble slurry and injected directly into the culture to increase the efficiency of nutrient absorption. This use of fluid fracturing and mass transfer has been dubbed Quantum Fracturing. The same concept is used when the oil is extracted from the algae; carefully pulsed electromagnetic fields and pH modification using CO2 combine with Quantum Fracturing to break cell walls and release oil. In the conventional process, algae biomass goes through an extensive dewatering process before oil can be extracted.

So how does the yield compare to other feedstocks in terms of oil extracted per hectare? "We're still calculating the exact numbers, but our preliminary estimates are phenomenal," says Pattarkine.

The result is a high-yield, consolidated Single-Step Extraction™ process that eliminates the need for dewatering, and accomplishes oil extraction and separation in a single step. Unlike other energy crops, the algae can be grown and processed in a consistent controlled environment to produce the crude oil used to manufacture biodiesel and other biofuels.

What About Energy Crops?

- Jatropha euphoria swept the world earlier this century due to the plant's drought resistance, ability to grow well in marginal soil and relatively high oil content. But support for jatropha is waning with Friends of the Earth

releasing a report that questions the plant's ability to yield commercially viable amounts of oil and BP's recent withdrawal from a joint venture with D1 Oils.

- Fast-growing switchgrass uses an extensive root system to gather water from deep below the ground surface, making it ideal for arid or non-irrigated land with hard, shallow soil. It requires lower energy inputs than corn and soy due to its low maintenance and fertilizer requirements, and has a large energy output. Although the yield per acre is better than many other feedstocks, the amount of land required to produce enough ethanol to replace 100 percent of the U.S.'s fossil fuel requirements has been estimated at nearly half a billion acres, which is huge considering that the total area used for farmland is less than 1 billion acres.
- Camelina is a member of the mustard family that has yellow flowers containing twice as much oil per acre as soy. It doesn't need much water and is tolerant of cold, arid land unsuitable for food crops. Great Plains Oil and Exploration company is partnering with farmers around the country to grow the plants, namely in Montana, while it sets up facilities to convert the crop into biodiesel.
- Sweet sorghum's high sugar content and capability to grow almost anywhere in the U.S. has it emerging as a promising biofuel feedstock. In Destiny, FL, where real estate developer Anthony Pugliese and Subway Restaurants' founder Fred DeLuca are building "America's first eco-sustainable city," the crop is being grown to test for the high yields, water efficiency and pest resistance that were reported in early investigations.