From pond to pump?

ExxonMobil
Taking on the world's toughest energy challenges.™

From pond to pump?

ExxonMobil has joined forces with a leader in biotech research to develop the raw material for vehicle fuels from an unlikely source.

An algae-covered pond may not be one of nature's most pleasing sights. But to scientists, it offers a tantalising vision of the future for fuels made from renewable sources.

In its continuing search for new and diverse technologies to help meet the world's growing energy demand, ExxonMobil has undertaken an innovative corporate research and development initiative to create a next-generation biofuel. If successfully developed, this algae-derived biofuel could be used to manufacture a wide range of fuels that meet the same specifications as today's products, thus adding to current supplies.

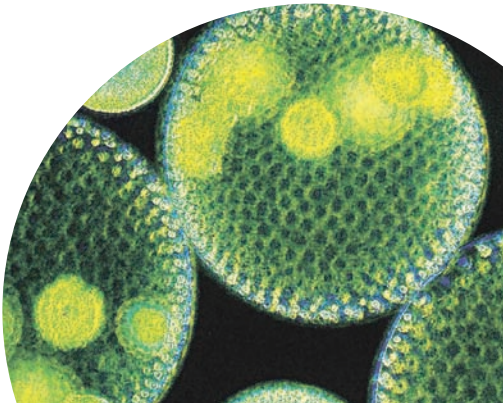
ExxonMobil will be collaborating with Synthetic Genomics Inc. (SGI), a prominent biotechnology company focused on developing genomic-driven products, to explore algae as a commercially viable alternative to crude oil for making petrol and other vehicle fuels.

If the companies achieve certain research and development milestones, the R&D cost could total more than US$600 million.

The best of the best

The project brings together SGI's high level of expertise in biology, specifically all aspects of genomic research, and ExxonMobil's engineering and technical know-how, coupled with the company's proven ability to "scale up" a concept to commercial status.

"The biological challenge is to identify the strain of algae that is most prolific at producing the desired bio-oil," says Dave Marler, biofuels programme manager at EMRE's corporate strategic research lab. "That's why the front-end work will be focused on research at SGI. They'll be searching for the right algae strain and determining how to maximize hydrocarbon production."



From left to right:

Algae can be grown in either open or closed photobioreactors, and can be produced using land or water that is unsuitable for growing food crops.

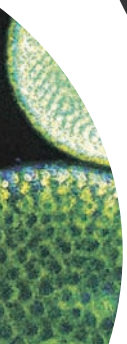
ExxonMobil's Dave Marler examines samples of algae, which can yield more than 2,000 gallons of fuel per acre per year.

Challenges and benefits

Developing algae fuel from its creation in a lab to its distribution via local petrol stations will be a tremendous undertaking that could take decades.

"We need to focus on developing a fuel that can be used within the current supply system and with the existing vehicle fleet," says Jeff Beck, EMRE's corporate strategic research manager. "We have to consider alternatives that fit within the available processing and transport infrastructure.

Biofuel manufactured from algae-based bio-oils contains similar molecules to petrol and diesel, so we can use them in the same infrastructure we use today – something we can't do as easily with many other sources of alternative energy."



But algae-based fuels also offer other major benefits. Unlike other biofuels, hydrocarbons from algae can be produced using land and water unsuitable for crop plant or food production.

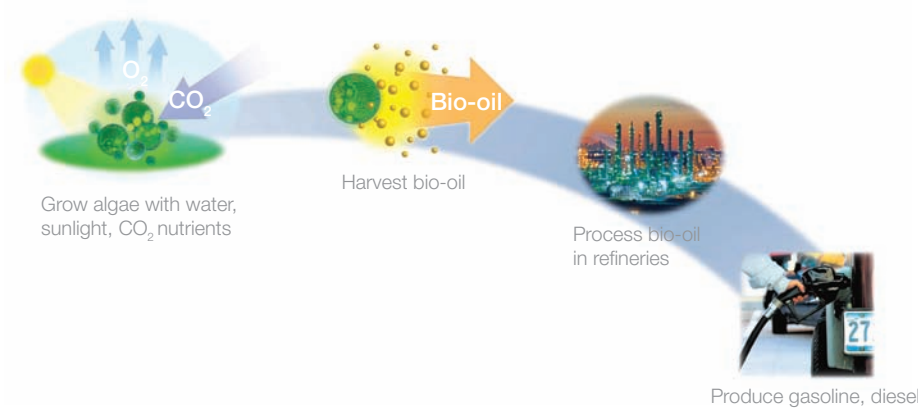
And because algae feed on carbon dioxide, algae production can help reduce greenhouse gas emissions. "Algae don't emit carbon dioxide," says Beck. "They consume it. And they would need a lot of it for commercial production."

Large-scale algae production sites, for example, could use carbon dioxide from nearby power or manufacturing plants that generate large amounts of the gas. A production site could act as its own carbon capture and conversion project, in addition to producing algae-based fuel.

Algae also produce hydrocarbons at much higher rates than other plants. Currently, algae can yield more than 2,000 gallons of fuel per acre per year, compared with 50 gallons for soy oil and 650 for palm oil.

They can also be grown year-round in special man-made ponds or enclosed photo-bioreactors exposed to abundant sunlight.

Producing biofuel from algae



Harvesting algae is a continuous process throughout the year, compared with production of plants such as corn, which are typically harvested once a year and stored for later use.

Algae need sunlight, water, carbon dioxide and some nutrients to grow. Since algae production does not require fresh water, it can thrive in brackish or salt water. Even treated waste water can be used, as the water itself acts a nutrient to foster algae growth.

“Algae are prolific,” says Marler. “You can produce large quantities per acre of land – as much as three times greater than other biofuel sources. That means you use less land and less energy per volume of biofuel produced.”

“We’re just getting started,” says Jeff Beck, “and plenty of unknowns lie ahead. We need a solution that combines innovations in biology, process chemistry and engineering. This effort takes companies with diverse backgrounds and leadership positions in their respective fields working together.

“In the end,” says Beck, “the joint effort between ExxonMobil and Synthetic Genomics presents a promising opportunity to break new ground in helping to meet the world’s energy demand.”

Published by Esso UK Limited.

To contact us:
Phone: 01372 222000,

Write to: Public & Government Affairs,
ExxonMobil House, Mailpoint 8,
Ermyn Way, Leatherhead,
Surrey KT22 8UX UK

Or send an e-mail to:
uk.publicaffairs@exxonmobil.com

Please visit our website:
www.exxonmobil.co.uk

Credits:
Author: Bill Corporon
Photography: Keith Wood
Article courtesy of ExxonMobil