Environmental Studies Program

Issues Update: BIOFUELS

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Keywords
Biofuel, biodiesel, third generation biofuel, greenhouse gas, fossil fuels

Overview

- Biofuels are produced from living organism or from metabolic by-products
- Biofuels drastically cut back on the emission of greenhouse gasses into the atmosphere as opposed to the use of fossil fuels
- A fuel must contain over 80% renewable materials in order to be considered a biofuel
- Biofuels are most commonly used to power vehicles, heat homes, and for cooking
- The two most frequently used biofuels are ethanol and biodiesel which are considered 'first generation' biofuels
- First generation fuels are made by either the fermentation of starches and sugars (ethanol) or by the mixing of vegetable oils/animal fats with conventional diesel fuel (biodiesel)
- Other less commonly used biofuels include vegetable oil, biogas, bioethers, wood, grass cuttings, and agricultural waste.
- The use of algae, known as a 'third generation' biofuel, is becoming popular because of its low-input and high-yield in the production of biodiesel. Algae can produce up to 30 times more energy per acre than land crops but the oil as of yet is more difficult to extract.
- There has been controversy over the effectiveness of biofuels in the reduction of greenhouse gasses because of the amount of land that is cleared to grow biofuel crops
- Some recent research suggests that the amount of emissions produced in the clearing of land in addition to the loss of that land's carbon absorption properties can actually add up to more pollution than that of fossil fuel production.
- This hypothesis is known but not widely accepted in the scientific community

WHAT'S NEW…

Researchers with the U.S. Department of Energy's Lawrence Berkeley National Laboratory are making strong headway towards the creation of artificial photosynthesis as a means of reducing carbon dioxide into a useable transportation fuel.

The idea of this project is to create an artificial leaf that can duplicate the steps of photosynthesis. The leaf would capture solar photons and then have a catalytic system in place which would oxidize water. As explained by Heinz Frei, a chemist at the Berkeley Lab, the "photooxidization of water molecules into oxygen, electrons and protons (hydrogen ions) is one of the two essential half reactions of an artificial photosynthesis system- it provides the electrons needed to reduce carbon dioxide into a fuel."

The next step in this process seems to be combining the water oxidation half reactions with the carbon dioxide reduction step in an artificial leaf type system. If successful, this process could produce a carbon neutral transportation fuel.

CASE STUDY: Imperium Renewables Trying to Stay Alive

Introduction

Imperium Renewable, a biodiesel plant in Gray's Harbor, Washington, is struggling to stay afloat due to cheap petroleum imports and broken promises from the US Congress. The company has been losing money converting edible oils into fuel and despite its large popularity as an up and coming business in 2004 has received limited funding.

Approach

It costs Imperium Renewables $2.70 in soybean bean oil to convert $1.50 worth of biodiesel bus fuel. Although there is a $1 federal subsidy, with the added cost of transportation of the fuel, it becomes extremely difficult to make buyers pay 2-3 dollars more than the competing petrol alternative. When Imperium began in 2004, a time when veggie oils were cheaper than they currently are today, Congress blessed the up and coming business and promised to help subsidize costs.

Results

Five years later most of Imperium's employees have been let go. Small profits and loss of oversees contracts have made it extremely difficult for the company to stay in business. Turns out that there was a catch in the federal mandate. It was only to apply if the EPA found that biodiesel reduced greenhouse emissions, which there seems to be some debate about. Most of the US' 176 biodiesel producers are not doing much better than Imperium. The biggest reason they are still alive today isn't due to the production or sale of their own biodiesel but the harboring of other companies' fuel instead.

Outstanding/Unresolved Issues

Imperium Renewables was given a $345 million stock offering with a Hawaiian Utility company in which Imperium would import a large amount of biofuel. The offering was pulled, however, when the biodiesel market went south. Now the Hawaiian company, whose environmental impact statements are based on the use of biodiesel are in jeopardy of losing their business as well as seriously hurting the already dwindling Imperium.

Resources

Turning Sunlight into Liquid Fuel:
http://www.alternative-energy-news.info/turning-sunlight-into-liquid-fuel/

References

Forbes 183 (8): 40-42