Abstract

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BIOFUELS FROM ALGAE
(December 2010)

Biofuels have received considerable attention recently. This attention stems from many factors, some of which are recent developments in biofuels production technology, the quest for independence from foreign oil, reduction in emissions and greenhouse gases and an improvement in the local economy. Additionally, government supports in the form of research grants for technology development, tax incentives and mandates have made biofuels more attractive than before.

Algae biofuel technologies, being the third generation biofuel technology, hold the promise to enable production of high quality biofuel while offsetting carbon emissions. Biofuels from algae appear to solve the problems associated with first- and second-generation biofuel technologies. Algae are fast growing organisms that need sunlight, carbon dioxide and water to generate energy that is stored in algal cells in the form of lipids. These lipids can be extracted from algal cells and converted to biofuels such as biodiesel or renewable diesel. Many companies, both small and large, have announced investments in algae biofuel technology. Of these, the major investment announcement (worth $600 million) was made by ExxonMobil in July 2009. The U.S. government is also supporting research in the form of grants and tax incentives. While some pilot plants are being built to eventually commercialize the algae biofuel technology, no commercial plant exists yet.

In this report, PEP presents process designs and associated economics for producing 30 million gallons/yr (100,000 mt/yr) of biodiesel using three different microalgal technologies. We examine the production of algal oil from microalgae grown using the open raceway pond method followed by its conversion to biodiesel. We also examine the process design and economics of producing biodiesel from microalgae using photobioreactor technology. Both of these photo-autotrophic technologies are then compared in design and economics to heterotrophic microalgal technology where glucose is used as a carbon source in the absence of sunlight or other light.

This report will be of interest to biofuels producers, technologists, investment communities and the government looking to evaluate algae biofuel technologies vis-à-vis other green technologies.
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For detailed marketing data and information, the reader is referred to one of the SRI Consulting programs specializing in marketing research. THE CHEMICAL ECONOMICS HANDBOOK Program covers most major chemicals and chemical products produced in the United States and the WORLD PETROCHEMICALS PROGRAM covers major hydrocarbons and their derivatives on a worldwide basis. In addition the SRIC DIRECTORY OF CHEMICAL PRODUCERS services provide detailed lists of chemical producers by company, product, and plant for the United States, Western Europe, Canada, and East Asia, South America and Mexico.
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