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BIOFUELS PRODUCTION

ALTERNATIVE FUELS & ADVANCED TRANSPORTATION TECHNOLOGIES

introduction

The advanced transportation sector plays a vital role in California's economy and in the day-to-day lives of its residents. This evolving industry sector comprises establishments that focus on vehicles, technologies and fuels that help reduce petroleum dependence and greenhouse gas emissions. The California Air Resources Board (ARB) reports that cars and trucks account for almost 40% of greenhouse gas emissions statewide. According to the California Council on Science and Technology, biofuels provide cleaner air as they produce at least 50% fewer emissions than gasoline and diesel.

Biofuels production refers to converting animal or vegetable fats through a chemical process called transesterification, yielding biodiesel and ethanol products. Biofuels can be produced domestically from renewable feedstock and waste products such as soybean oils, sunflower oils, algae, sawdust, grass trimmings, domestic refuse, charcoal, agricultural waste and dried manure. As alternative fuels, such as biofuels, gain momentum in the transportation sector, there are not only positive outcomes for the environment and the health of the population, but also potential for employment opportunities.

Businesses in the biofuels production industry desire employees with field experience and hands-on training in plant operations, particularly facilities that run on pumps. Both incumbent workers and those just starting their careers need to have appropriate training and education to maintain or find employment in the rapidly changing industry. To address this need, the California Energy Commission (Energy Commission) commissioned a series of studies from the California Community College Chancellor's Office Centers of Excellence (COE). This industry profile is part of the series, available at www.coecc.net/transportation.

An analysis by Environmental Entrepreneurs shows that the biofuels market may grow to more than \$60 billion over the next decade, with a potential to create more than 18,000 jobs from the many bio-refineries expected to operate nationwide in the next few years.

Many of the advanced biofuel businesses are located in California. Policies such as the Low Carbon Fuel Standard (LCFS) in California set requirements to lower emissions from transportation fuels, increasing the demand for biodiesel statewide. The LCFS rewards companies that produce biofuels in California. Fuel standards set by the federal Renewable Fuels Standard and the LCFS could lead to the production of nearly 3 billion gallons of low-carbon fuel annually, if companies adhere to them, according to the Environmental Defense Fund.

A number of factors are contributing to the development of this emerging industry in California, including the following:

● ● **CALIFORNIA IS INTERESTED IN NON-FOOD CROP BIOFUEL SOURCES.**

The California Legislature passed a resolution in 2013 that urged the U.S. Congress or the U.S. Environmental Protection Agency to amend the U.S. Renewable Fuel Standard to favor non-food crop biofuel sources and to push the development of advanced fuels such as cellulosic ethanol.



“Advanced biofuels are those fuels that have less than half the carbon intensity of fossil fuels and minimize their impact on food production.”

– Environmental Entrepreneurs (E2)
www.e2.org

● ● **TRENDS AND ISSUES RELATED TO ADVANCED FUELS, TECHNOLOGIES, & INFRASTRUCTURE IN CALIFORNIA ARE REVIEWED ON AN ANNUAL BASIS.**

The Energy Commission is required to submit a report to the governor on a biannual basis that outlines major energy trends and issues the state faces related to transportation fuels, technologies, and infrastructure. The report includes the examination of the potential effects of alternative fuel use, vehicle efficiency improvements, and changes in transportation modes related to public health and safety, the economy, resources, the environment, and energy security.

● ● **INDUSTRY LEADERS ARE STEPPING IN WITH INCENTIVES.**

Propel Fuels offers a rebate program for fleet customers whose monthly purchases total more than 500 gallons of biodiesel blends and E85. The program provides a rebate of \$0.03 per gallon for purchases of less than 1,000 gallons of biofuel monthly and \$0.05 per gallon for those purchasing 1,000 or more.



The volatility of biofuels production and resistance from opponents of new environmental regulations has slowed the growth of this alternative fuel industry.

● ● **VOLATILITY OF DEMAND FOR BIOFUELS AND REGULATIONS AFFECT THE INDUSTRY GROWTH.**

Those familiar with biofuel production in California see the future of this particular field as the most fragile due to slow growth and regulatory hurdles. In interviews, industry managers attributed the instability to the frequent changes in demand for the fuel and the unpredictability of government support needed to build new plants.

● ● **OPPOSITION FROM THE PETROLEUM INDUSTRY HAS AFFECTED PROPOSED LEGISLATION TO ACCELERATE THE UTILIZATION OF ALTERNATIVE FUELS.**

The petroleum industry lobbied against a proposed state assembly bill targeting an issue biofuel producers identified as their biggest barrier to growth – the high cost of financing biofuels due to regulatory volatility. The legislation would have allowed California’s state treasurer to purchase carbon credits at pre-agreed prices from producers developing biofuel projects, and the state could have then sold the long-term credits to petroleum refiners that needed to meet their requirements under the low-carbon fuel standard. As a result of opposition to the state mandates and the oil industry’s objections to the measure, the price of the credits dropped in value by about 50% in 2013. [Source: Business Week]

“THE FUTURE OF BIOFUELS PRODUCTION IS FRAGILE DUE TO SLOW GROWTH & REGULATORY HURDLES.”

– CALIFORNIA COMMUNITY COLLEGES CENTERS OF EXCELLENCE, INDUSTRY INTERVIEWS



seeding innovation

In 2007, California passed the Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act (AB 118). Created under AB 118, the Alternative Renewable Fuels and Vehicle Technology Program (ARFVTP) provides funds to “develop and deploy innovative technologies that transform California’s fuel and vehicle types to help attain the state’s climate change policies.” This program appropriates approximately \$100 million a year in grants, loans or loan guarantees for the development of alternative fuels and new vehicle technologies.

Assembly Bill 8 (AB8) in 2013 committed up to \$20 million a year from the Alternative and Renewable Fuel and Vehicle Technology Program. These investments are aiding industry leaders in developing new biofuels and processes for distribution.

Because the biofuels production industry is volatile due to frequent changes in demand for fuel and unpredictability of government regulations, hiring is often unsteady as well. Design, engineering and construction of biofuel plants are often outsourced, while the operation and maintenance of facilities are handled locally. Jobs in biofuel production typically emphasize field experience and hands-on training at plants. Any experience at bulk liquid manufacturing plants (such as dairy, petroleum, chemical, soup, etc.) is highly valued in prospective employees as skills acquired there are considered transferable to biofuels production.

Entry-level jobs in this industry:

- ● **Laboratory assistants or technicians** are responsible for taking samples and analyzing/testing for quality and content in a lab setting. Skills and knowledge areas critical for this job include laboratory experience; knowledge of chemistry and biochemistry; testing experience; knowledge of safety procedures in a laboratory setting; and attention to detail. In the future, candidates for these positions will need to have an understanding of the biofuel process.
- ● **Maintenance technicians** are responsible for inspecting, maintaining and repairing the plant equipment. Skills and knowledge areas critical for this job include hands-on experience or training in operations and maintenance (ideally at a manufacturing plant); understanding of safety procedures around chemicals; hands-on training with pumps, boilers, lines, and welding; and general tradesman skills, such as electrical, mechanical, instrumentation, and heating, ventilation, and air conditioning.
- ● **Equipment engineers** are responsible for integrating all of the equipment into the plant operation. Skills and knowledge areas critical for this job include mechanical and electrical engineering; handling equipment and heavy machinery at a plant; understanding of the industrial process, electrical principles, safety, etc. Two-year degrees in mechanical or electrical engineering are acceptable if the applicant has a lot of hands-on experience.
- ● **Assistant plant managers/operators** are responsible for supporting plant managers and help oversee all of the plant operations and maintenance and monitor control systems. Skills and knowledge areas critical for this job include past experience at a manufacturing plant; background in chemistry; understanding of automated control systems; understanding of the industrial process; and computer skills for plant operation.

Training for jobs at biofuels production plants is typically conducted “on-the-job”.

Due to the specialized equipment, procedures and processes involved, training is very detailed and intense and can take several months to a year to complete.

Although much of the training is conducted on site, there are some skill and knowledge areas that could be taught at a community college, including:

- ● **Bulk liquid manufacturing**, such as how to control systems, as well as operate, maintain and repair pumps at a plant.
- ● **Hands-on laboratory training**, focused primarily on chemical testing and analysis. This would also include taking some biology classes.
- ● **Knowledge of the different types of biofuels**, as well as familiarity with the various conversion processes of plants (e.g. anaerobic digestion).
- ● **Plant safety**, or understanding of safety procedures at a plant and/or around chemicals.





DATA AND INFORMATION INCLUDED IN THE INDUSTRY PROFILE WERE COMPILED FROM THE FOLLOWING PUBLIC AND PROPRIETARY SOURCES:

Assembly Bill 118: California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007; California Council on Science and Technology; Assembly Bill 2390; Business Week “Oil Industry Kills California Assembly Bill to Support Biofuels Expansion;” Centers of Excellence, Industry Interviews Environmental Defense Fund; Environmental Entrepreneurs; National Center for Environment Economics; U.S. Department of Energy

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afdc.energy.gov/laws/laws/CA/tech/3251



This industry profile is one in a series of workforce reports on alternative fuels and advanced transportation in California; funding for the series was provided by the Alternative and Renewable Fuels and Vehicle Technology Program of the California Energy Commission. The series was produced by the California Community Colleges’ Centers of Excellence for Labor Market Research. Read more at www.coecc.net/transportation.



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