BIOFUELS FROM GEOTHERMAL

The production of biofuels is a popular issue as it is a domestic product that reduces our dependency on imported fossil fuels for the transportation sector of our economy. Two types of biofuels are produced: ethanol and biodiesel, both of which are used as a blend with conventional fuels to power cars and trucks. The main controversy is the balance between energy input and energy output, as some reports contend that more energy is needed to produce the fuel as is produced from the fuel. The issue appears to be how you analyze the various energy inputs such as from fertilizer, growing the product, transporting it to market and the energy input in the refining process, as well as the benefits of the byproducts. Many of the steps require the use of fossil fuels, and thus, this is where geothermal energy can contribute, by replacing some of the energy input.

ETHANOL PRODUCTION

The Model T in 1908 was designed to either run on gasoline or ethanol; however, due to cheaper gasoline, it wasn't until the 1970s oil shock, that ethanol was of interest again. But, it wasn't until around 2000 that ethanol emerged as a substitute for methyl tertiary butyl either (MTBE), an oxygenate that reduced air pollution, but caused problems when it leaked into aquifers.

Today, corn is the major product used in ethanol production in the United States, with about 20% of the US production or 12 billion bushels of corn used annually. This increased demand is great for the farmers, as it has doubled the price of corn in one year to about $4.00 a bushel. This price, of course, affects cattle feed and then the cost of meat to consumers. To counter the use of corn, cellulosic ethanol is being investigated that comes from fibrous materials like corn husks and rice hulls, as well as fast-growing reedy crops that require little fertilizer or tending, such as switch grass and timber industry wastes.

Ethanol can be blended with gasoline as high as 85% ethanol to 15% gasoline, referred to as E-85, which is presently offered at about 1,000 gas stations in the United States. Only about 2.5 percent of the nation's cars are flexible fuel vehicles that can handle this mixture. Also, the energy content of ethanol is lower than gasoline, thus, it takes about 1.5 gallons of ethanol to drive as far as one gallon of gasoline. Despite all of these limitations, ethanol production is widely supported by Congress with few opponents.

BIODIESEL PRODUCTION

The idea of using vegetable oil for fuel has been around for a long time, as Rudolph Diesel, the inventor of the diesel engine, experimented with fuels such as peanut oil around the 1890s. However, due to the cheap and plentiful availability of petroleum distillates, commercial production of biodiesel in the United States did not being until the 1990s.

In the United States, the majority of biodiesel is made from soybean or canola oils, but is also made from waste sources such as used cooking oils or animal fats. In Europe, biodiesel is mainly produced from rape seed, which unfortunately, due to the high price has cut demand across the EU. More recently, interest has been in producing biodiesel from algae, some of which have over 50% oil content.

Since biodiesel is more expensive and has engine compatibility issues, it is mixed at 2% (B2) to 20% (B20) with conventional diesel. The use of biodiesel reduces hydrocarbons (CO_2) and particulate emissions; however increases nitrogen oxide emissions. At 100% biodiesel, CO_2 emissions are reduce by over 75%. Biodiesel is non-toxic and biodegrades four times faster than conventional diesel. Biodiesel does not flow as well as petroleum diesel in cold weather causing operating issues in colder climates. 100% biodiesel also tends to reduce fuel economy by about 11 percent.

ENERGY EFFICIENCY

Unfortunately, there are not uniform opinions on the efficiency and economics of biofuels production. A study by Cornell and the University of California Berkeley concluded that more energy was required to produce ethanol and biodiesel than was produced in it use. On the other hand, a study by NREL in the use of biodiesel with an urban bus concluded that biodiesel yields 3.2 units of fuel product energy for every unit of fossil energy consumed in its life cycle. A study from the University of Idaho which analyzed both of these reports, concluded that the answer was somewhere in between and that the value of the byproducts, such as animal feed, needs to be considered. In any event, the use of geothermal energy certainly will contribute to the energy balance and economics in the production of either fuels as described in the accompanying articles.

The Editor

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