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Christopher Reddy: A closer look at biodiesel's potential

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WOODS HOLE -- RAPID INCREASES in crude-oil prices and projected decreases in oil supplies have made biodiesel a highly touted alternative fuel. Its proponents say that this mainly soybean-based fuel could substitute for petroleum-based fuel, reducing dependence on foreign oil and cutting carbon-dioxide emissions to the atmosphere.

Despite this enthusiasm, biodiesel's potential impacts on the environment and energy are more complicated than it appears at first glance. Even the term "biodiesel" is confusing. Diesel engines were developed in the late 19th Century by a talented German engineer, Rudolph Diesel, who used high compression to ignite fuels, hence eliminating the spark plug. Diesel had a strong social consciousness and a soft spot for farmers, who he hoped could use virgin vegetable oils to fuel his engine, instead of using inefficient steam engines. But Diesel died penniless, most likely by suicide.

By 1900, Diesel's engine had created a stir, but the virgin vegetable oils were found to be too viscous and problematic — think of running your car with canola oil. These problems inspired others to chemically modify the vegetable oils into more practical mixtures with lower viscosities — which create what we now call pure biodiesel.

Biodiesel is used to formulate a range of fuels, ranging from 100 percent biodiesel, called B100, to biodiesel blended with petroleum-based diesel. B2, for example, is made of 2 percent biodiesel mixed with 98 percent petrodiesel. Almost any diesel engine can run on B2. B20, for its part, has engine performances comparable to those burning 100 percent petrodiesel. However, most vehicles have to be modified to run on B20 or higher, which poses problems for engines in colder regions.

Recent initial experiments by my laboratory and others have revealed that, so far, the bio-component in biodiesel blends is overall less polluting and safer for the environment. However, it is important to note that a spill of B20 still contains 80 percent petrodiesel. That's better than 100 percent petrodiesel, but only 20 percent better. We have also found that retailers of biodiesel products can be careless, creating inaccurately labeled blends. For example, one sample we analyzed advertised as B20 was actually closer to B60, which would potentially damage an unsuspecting buyer's vehicle.

The main source of biodiesel is soybeans. They remove carbon dioxide from the atmosphere to grow and then return an equivalent amount to the atmosphere when the biodiesel is burned, for an approximate net zero increase in greenhouse gases. Still, a recent study calculated that if every soybean produced in the United States was used to make B100, the net effect on U.S. oil demand would be a 3 percent decrease. This is a small contribution to solving our energy woes, but one that shouldn't be

overlooked.

It also has great symbolic value. If biodiesel were used for municipal buses — and prominently proclaimed — it would help educate the public that we cannot rely on petroleum fuels forever and that we should explore alternative fuels.

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