

## Biodiesel's benefits to Minnesota

Climate change is an issue that has become increasingly important in the past decades. One specific area of major concern is the emission of CO<sub>2</sub> and its effects on the world's air quality. One major contributor to carbon emissions is the use of fossil fuels for transportation. Currently, diesel engines run off of petroleum-based diesel. However, an incorporation of biodiesel into the Diesel engines presents benefits to both the state of Minnesota and the planet as a whole.

Minnesota is a state in which agricultural products play a large role in the economy. In 2013, the sale of crops such as soybeans, flaxseed, and canola contributed close to \$4.3 billion to the economy (Patterson, 2015). Not only do these products make up a large portion of the economy, but they are also able to be transformed into biodiesel. Since Minnesota's economy is, in part, dependent upon these crops, increasing their range of popular use would benefit both Minnesotan farmers and the state. Petroleum-based fuels are mostly imported to the United States, and are not a source of net revenue for Minnesota. As of 2016, the United States had a net petroleum import of 4.87 million barrels per day (U.S. Energy Information Administration, 2017). However, having crop-based biodiesel as a fuel source could potentially reduce the amount that the U. S. needs to import while adding a source of revenue to Minnesota's economy. As well as coming from Minnesotan crops, according to the U.S. Department of Energy (2017), biodiesel can also be produced out of animal fat and restaurant grease.

With the city of Duluth having one of the country's highest air quality ratings, Minnesota prides itself in keeping the air clean (Peeples, 2011). As well as helping the economy, biofuels present an opportunity to reduce carbon emissions. According to a study by the Argonne National Laboratory, the use of biodiesel was proven to "[reduce] carbon dioxide emissions by 74% compared with petroleum diesel" (U.S. Department of Energy, 2017). The U.S. Department

of Energy (2017) also stated that the reason that biofuels reduce carbon emissions is because the crops that are used to grow the fuel reabsorb the carbon dioxide from the atmosphere. In this way, biodiesel presents itself as a step in the right direction for fighting climate change by reducing carbon emissions and coming from a renewable source.

In addition to promoting better air quality, biodiesel is also safer for the environment in case of a spill. The term “flashpoint” refers to the temperature that a substance such as diesel needs to reach in order to emit flammable vapors. The flashpoint of petroleum diesel is at 52 degrees Celsius whereas the flashpoint of biodiesel is at 130 degrees Celsius (U.S. Department of Energy, 2017). This higher flashpoint prevents spilled fuels from igniting and causing excessive damage to the environment.

Taking into consideration that biodiesel has certain properties that are different from diesel, one might wonder how these different properties might affect a regular diesel engine. Currently, biodiesel is normally used in conjunction with petroleum diesel as a fuel blend in vehicle engines. This is in large part due to what is called the cloud point of the fuel. The cloud point refers to the temperature where small ice crystals can start forming in the fuel and begin to affect how the fuel flows. In the cold winter climate of Minnesota, biodiesel can sometimes be problematic for engines due to its relatively high cloud point compared to petroleum diesel (Nowatzki, J. et. al, 2012). However, a large benefit of using biodiesel is that it improves engine lubricity. Lubricity describes a fuel’s ability to prevent the wear and tear of moving engine components. Improvements in lubricity have been seen in a large range of biodiesel/petroleum diesel fuel blends in blending ratios even as low as 1%. One benefit of this is that petroleum diesel in past years has been subject to federal regulation which reduced its sulfur pollution down to 15 parts per million. The flip side to this regulation is that it decreased the lubricity of petroleum diesel. However, since biodiesel can improve lubricity in such low amounts, it

provides a way of both reducing sulfur pollution and preserving lubricity within an engine.

Therefore, although high amounts of biodiesel can prove to be problematic in Minnesota's cold winter months, low ratios of biodiesel mixed in with regular diesel is already enough to yield some of the environmental benefits seen in higher concentrations of biodiesel (U.S. Department of Energy, 2017; Nowatzki, J. et. al, 2012).

In conclusion, biodiesel has many benefits to the state of Minnesota compared to petroleum diesel. It improves air quality, it comes from a renewable source, it can be a source of revenue for the state, and even in low amounts, it can improve lubricity within a diesel engine without having to cause problems in Minnesota's low winter temperatures.

## References

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