Just a few years ago, few people would have envisioned fat trimmings from a meat processing plant or fryer grease from a restaurant being used to make a renewable diesel and jet fuel. But that’s what is quickly happening today thanks to a few companies, including Dynamic Fuels, LLC.

Formed in 2007, Dynamic Fuels is an equal joint venture between Tyson Foods, Inc., of Springdale, AR, a leading producer of chicken, beef, and pork, and Syntroleum Corporation of Tulsa, OK, a technology company. The goal of the venture is to add value to non-food grade fats, oils, and greases by converting them into advanced renewable fuels.

Dynamic Fuels broke ground on a renewable diesel plant in Geismar, LA, in late 2008 and began operations in November 2010. Unlike the ethanol and biodiesel industries that predominantly use food grade ingredients such as corn and soybean oil to produce fuel, Dynamic Fuels uses non-food grade fats, oils, and greases. In addition, renewable diesel offers performance and environmental advantages over traditional fuels and is a sustainable alternative to fossil fuels.

The Louisiana location was chosen by Dynamic Fuels for several reasons. Geismar, which is situated between Baton Rouge and New Orleans, offers the needed infrastructure such as access to ports, along with an ample workforce. The state of Louisiana also offered attractive financing options that were friendly to businesses and job creation.

The facility was built and designed to produce up to 75 million gallons of fuel per year. It currently employs 50 people and approximately 30 contractors. Since completing start-up, the plant has produced and supplied biofuel to some highly-visible customers, including commercial airlines and the U.S. military.

What is Renewable Diesel?

Renewable, synthetic diesel fuel is not the same as biodiesel. It is a “drop-in” biofuel that is a chemical copy of the petroleum-based version allowing it to be used in the same engines and distribution systems as fossil fuel. The fact this fuel can drop into existing distribution systems – storage tanks, pipelines, and the like – is significant since the cost of a new infrastructure would severely restrict its uses.

At Dynamic Fuels, once the feedstock reaches the plant, it goes through a pre-treatment system, then into a chemical process called hydro-treating. Afterward, a proprietary process rearranges the shape of the molecule based on the customer’s application. Ultimately the fuel is distilled into three different products: renewable diesel, naphtha (a blending stock), and liquid petroleum gas.

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Compounds such as sulfur and nitrogen are removed during the refining process. What remains is a renewable fuel that burns efficiently and cleanly. Dynamic Fuels’ renewable diesel is very low in the three major categories of emissions – nitrogen oxides, sulfur (almost zero), and aromatics (zero).

The renewable diesel and jet fuel produced by Dynamic Fuels offers substantial performance and environmental advantages over petroleum-based fuels, such as higher energy content, better cold flow properties enabling it to function effectively in cold weather, and reduced carbon dioxide (CO₂) emissions.

The renewable diesel fuel can be used in all climates and is suitable for arctic and jet fuel applications. For example, fuels used in aircraft are subjected to temperature extremes exceeding 50 degrees Fahrenheit below zero at high elevations.

The diesel is synthetic since it is made from sources other than petroleum. The Dynamic Fuels production process yields the same molecule produced in traditional petroleum diesel processing. However, the difference is that synthetic fuel does not contain the impurities that give petroleum diesel its characteristic odor and color.

Feedstock Flexibility

The Dynamic Fuels plant is designed to have the flexibility to convert a variety of bio-feedstocks into fuel. Animal fat, vegetable oil, used cooking oil, and grease are all possible sources. Hydrogen is the other ingredient needed to produce the fuel.

As one of the nation’s leading producers of chicken, beef, and pork, Tyson Foods has access to ample supplies of feedstock that can potentially be used in the Dynamic Fuels plant. In addition, Tyson Foods has the resources to help coordinate the procurement of other feedstocks and is always looking to identify high quality, low cost options. Since start up, Dynamic Fuels has predominantly used yellow grease and tallow, but is also pursuing the use of other next generation feedstocks such as algae oil.

Customer Base Growing

Renewable diesel producers are working to develop a broad base of customers for its product. For example, the fuel can be used by conventional diesel producers as a premium blending fuel to help petroleum diesel meet government standards. The fuel may also particularly appeal to the operators of fleet vehicles and city buses who are seeking ways to reduce emissions in cities subject to large amounts of pollution. Other markets include the military and commercial airlines that have expressed interest in ultra-clean renewable jet fuel. Of course, there is a smaller but growing market in the “green” movement – people and businesses who want to use sustainable fuels and reduce emissions.

Renewable jet fuel has recently been successfully used in regularly scheduled commercial airline flights in Europe and the United States. In June 2011, KLM Royal Dutch Airlines became the first airline in the world to operate a commercial flight on biokerosene, which included renewable jet fuel supplied by Dynamic Fuels. KLM used a blend of 50 percent conventional jet fuel and 50 percent renewable jet fuel in

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Renewable Diesel’s European Player

While Dynamic Fuels is finding renewable diesel success in the United States, Neste Oil has found its place as the world’s leading supplier of renewable diesel with four plants scattered throughout the world – two in Finland, one in Singapore, and one in the Netherlands – for a combined annual capacity of two million metric tons (approximately 544 billion gallons). Driven by renewable energy legislation both in the European Union and individual countries, Neste Oil’s two plants in Finland came online in 2007 and 2009, the Singapore plant was completed at the end of 2010, and the refinery in Rotterdam, the Netherlands, started up in September 2011 (see “Biofuels Bulletin” on page 16).

Neste Oil’s refineries are designed to have the flexibility to convert a variety of bio-feedstocks such as animal fat, vegetable oil, used cooking oil, and grease into fuel. During the first seven months of 2011, the company’s renewable diesel plant in Singapore primarily used tallow imported from Australia before switching to lower cost palm oil. An incentive for renewable diesel producers to use tallow if selling the biofuel on the European market is that, according to the Renewable Energy Directive, biofuels produced using processed animal fats and/or used cooking oil count double towards greenhouse gas emissions savings mandates.

Neste Oil has also recently entered the aviation fuels market. In mid-July 2011, Lufthansa launched a six-month biofuel trial on four daily flights between Hamburg and Frankfurt, Germany. An Airbus A321 ran one engine on a mix of 50 percent regular jet fuel and 50 percent biosynthetic kerosene produced by Neste Oil and derived from biomass consisting of animal fats and jatropha and camelina oils.

Rendered fats, oils, and greases are transformed into a clean renewable diesel fuel.
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both engines of a Boeing 737-800 aircraft that carried 171 passengers from Amsterdam, the Netherlands, to Paris, France. KLM also scheduled more than 200 commercial flights between the two cities in September 2011 using the same fuel. This demonstrated the performance and environmental advantages of renewable jet fuel.

In the United States, Alaska Airlines became the first airline in the country to use biofuel on commercial flights, which was sold by Dynamic Fuels. The flights took place in November 2011 and involved a Boeing 737 flying from Seattle, WA, to Washington, DC, and a Bombardier Q400 traveling from Seattle to Portland, OR, operated by sister carrier Horizon Air. These flights were selected to demonstrate the use of biofuel on a transcontinental route as well as a short route. The trips were the first of 75 regularly scheduled flights Alaska Airlines and Horizon Air made using the biofuel blend as part of an effort to raise awareness of alternative commercial aviation fuel.

In December 2011, the U.S. Defense Logistics Agency signed a contract to purchase 450,000 gallons of advanced drop-in biofuel, the single largest purchase of biofuel in government history. According to government officials, the fuel will be used in the U.S. Navy’s demonstration of a Green Strike Group in the summer of 2012 during the Rim of the Pacific Exercise, the world’s largest international maritime exercise.

The fuel for the Navy will be manufactured at Dynamic Fuels’ Geismar plant using U.S. sourced yellow grease as well as algae oil as feedstock. The fuel will be delivered to the U.S. Navy in May 2012. Dynamic Fuels has previously provided the U.S. military with fuel for testing and this contract demonstrates that the company is building momentum for the sale and use of its renewable diesel, and confirms the Navy recognizes the performance and environmental advantages of the renewable fuel.

Looking Forward

Renewable diesel producers will continue to explore ways to add value to the feedstocks it procures and cultivate relationships with customers who value the performance and environmental advantages provided by the producer’s fuels.

For biofuels to be more cost competitive, companies like Dynamic Fuels must be able to continue to scale the technology by producing larger volumes. This will require cultivating premium markets, identifying new applications, and developing long-term customer relationships.

No one said U.S. efforts to increase the production of alternative fuels would be easy. However, the creation of alternative fuels businesses like Dynamic Fuels is proof that progress is being made and that commercial-scale renewable diesel production is becoming a reality. As one recent former U.S. president put it, “Reality challenges and rewards. I believe our best days are yet to come.”

To see video of Dynamic Fuels’ renewable diesel plant, visit www.youtube.com/watch?v=zsI1dov9Xbw.