



JAKE VESTAL

Biodiesel Generates Savings in Rural Costa Rica

Sustainability initiatives are only sustainable when they save money, which challenges any biofuel production process to be economical as well as environmentally friendly. Earlier this year, I searched for a market in which biofuels presented a fundamentally positive value proposition — free of government incentives, environmental considerations, and political agenda.

The search was difficult in the U.S., where an array of tax credits and incentives promote biofuel. It was often hard to determine whether a producer would be making money without government support. In several cases, I think the producers themselves were not quite sure.

Expanding my search worldwide, I focused on regions for which I knew the native language — which eliminated everywhere except Spain and South America, minus Brazil. I sought warm climates (biofuel gets gummy in the cold), a trained agricultural workforce, high levels of education, and a business-friendly government.

I found what I was looking for in Santa Clara, Costa Rica. Agregados H&M (www.grupohym.com) is a producer of stone-derived aggregate products, including sand, gravel, and other materials used in road and building construction. But for the vision of owner Ricardo Herrera, H&M would seem an unlikely setting for a biofuel facility. Nevertheless, Don Ricardo, as he is addressed by the citizens of Santa Clara, saw an opportunity for cost savings when he studied biofuel production on his own. Now, every diesel-burning engine at H&M, from the quarry equipment to Don Ricardo's Audi, burns biofuel produced onsite at his facility.

It wasn't long before I was exchanging email with Sergio Mendez, who manages public relations for biodiesel in addition to some aspects of operations at H&M, and booking a flight.

The experience taught me to look at fuel not just as a commodity purchased from a gas station for personal vehicles. Many niche areas exist in which biofuel is immediately profitable for producers with the right resources. Don Ricardo has the advantage of being his own customer — eliminating product distribution costs, as well as the costs to bring conventional petro-diesel to his site.

At H&M, production begins with Mendez, who travels to restaurants and butchers throughout Alajuela collecting used cooking oil and *el sevo* — the cow and pig byproducts discarded by butchers. To recover oil from the discarded cuttings, H&M cooks the *sevo* in a large open brazier fueled by the fatty precipitate produced in previous

batches. The cooked solids that are not suitable for biofuel are sold for nonconsumption use for about \$1/kg.

The oil recovered from the *sevo* is combined with the used restaurant oil and reacted with methanol and potassium hydroxide at 55°C, producing biodiesel contaminated with solids and dissolved methanol. The liquid product from the methanolysis step is decanted at ambient temperature to separate the useful oil from the crude natural glycerin.

After decanting, methanol and other volatiles are off-gassed and the resulting mixture is passed through three filters in series. The material removed from the filters looks like it includes unreacted, high-molecular-weight, non-biofuel fats attached to the small solid contaminants dispersed throughout the mixture.

The filtered product is transferred to a storage tank that is fitted with a gas-station-style fuel pump.

Mendez and Don Ricardo claim to have tested the fuel according to ASTM D6751, the Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels, and found it far exceeded the minimum methanol concentration and met all other requirements. H&M's 30+ pieces of heavy machinery (cement mixers, trenchers, earth movers) and even Don Ricardo's Audi Q5 have all run fine for more than six months on nothing but H&M-produced fuel, despite the "NOT FOR BIODIESEL" warning on the Audi's fuel cap cover that Don Ricardo proudly pointed out.

Don Ricardo estimates that, overall, he saves about \$144,000 annually by producing about 35,000 L of fuel per month. Yet he acknowledges that biofuel from restaurant oil and *el sevo* "does not have a future." The problem is availability of feedstock — H&M has already cornered the restaurant oil and *el sevo* market in the Alajuela province, and there is not much room to expand. Don Ricardo believes that alternative sources, such as jatropha, could also be made profitable, but that remains to be seen.

H&M's experience demonstrates the role that micro-markets can play in the development of advanced biofuels if innovators continue to look outside the box for ways to improve the bottom line of their businesses.

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