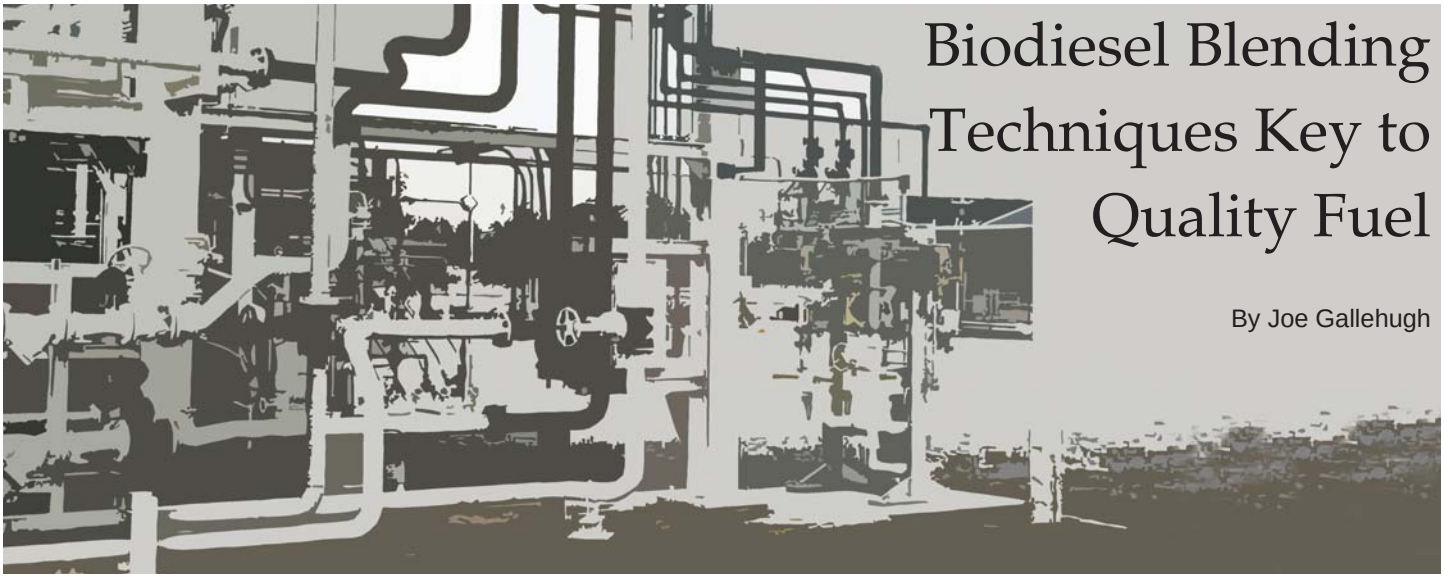
BIODIESEL
MAGAZINE

July 2008 www.BiodieselMagazine.com

HANDLING



Biodiesel Blending Techniques Key to Quality Fuel

By Joe Gallehugh

Establishing confidence with consumers is a critical step in the success of any new product or fuel. Consumer confidence is measured many ways—availability, on-time delivery, flawless service—but the most important is product quality. According to engineers from one technology company that supports the biodiesel supply chain, those seeking to capitalize on biofuels might evaluate the impact processes such as blending can have on product quality.

Marketers and distributors of biodiesel have a variety of different blending options available to them. Splash, sequential, hybrid, in-line, ratio and sidestream blending can have a huge impact on product quality and the consumer's level of confidence in biodiesel. Each type of blending carries with it a variety of costs and benefits.

"Blenders know that the most important part of product quality after good feedstock is to get the final product blended correctly," says Chuck Myers, electronics product manager for FMC Technologies in Erie, Pa. "They want to make sure the product is mixed correctly so they don't have their customers coming back to them with issues like failing engines and rough running. The preferred blending method will assist with a properly mixed product."

What are the different blending techniques and which ones contribute to producing high-quality biodiesel? Splash blending is when a marketer first pumps B100 into a tank, followed by diesel fuel. It could also be when a marketer first pumps diesel fuel into the tank, followed by B100. Either way, splash-blended products can have a tendency to stratify, failing to mix thoroughly unless some type of static mixer is used after the products are loaded.

"The biggest issue with splash blending is that if it doesn't get properly mixed, you dump it at a service station and it is still stratified when customers fill their tanks," Myers says. "One vehicle may get straight diesel and the next one may get a majority

of B100. Sequential blending may be better but the suggested method is in-line or ratio blending."

Sequential blending consists of loading multiple products, one at a time, through one meter and control valve. This method is commonly used for products that have similar density and viscosity, characteristics that enable them to mix well. The disadvantages of sequential blending biodiesel is that when products have dissimilar characteristics the blend may stratify in the fuel due to inadequate mixing or there is not enough room in the truck to get the required volume of each product.

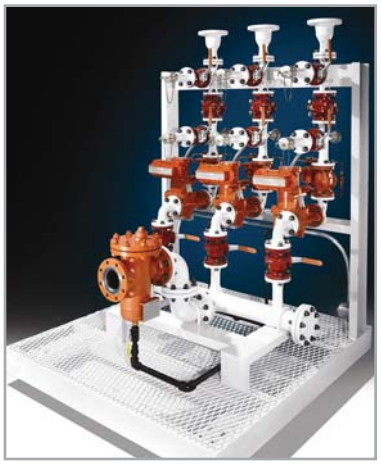
Ratio blending is achieved by loading multiple products into a tank at the same time. Ratio blending employs a meter and control valve for each product and a common header, thereby enhancing the mixture, more thoroughly integrating the final product.

Hybrid blending is essentially a combination of both sequential and ratio blending that is designed for ratio blending B100 into existing diesel oil sequential blenders.

Sidestream blending, sometimes referred to as injection or wild-stream blending, meters B100 into the main diesel line, allowing blending to occur directly upstream of the larger delivery meter. Sidestream blending aides in mixing as the blend passes through a meter that mechanically mixes the fuel.

Finding the Best Option

With so many options, which fits best with biodiesel? That depends on who's doing the blending, but most marketers know that the key to quality is getting products to blend thoroughly and stay blended throughout transportation, delivery and end use.



A tie-in skid is a configuration of equipment that is used at an existing loading rack to "tie-in" ethanol or B100 to be either blended or loaded as straight product into a transport. This skid has a four-inch feed line that is split into three, two-inch supply lines for the loading rack.

SOURCE: FMC TECHNOLOGIES INC.

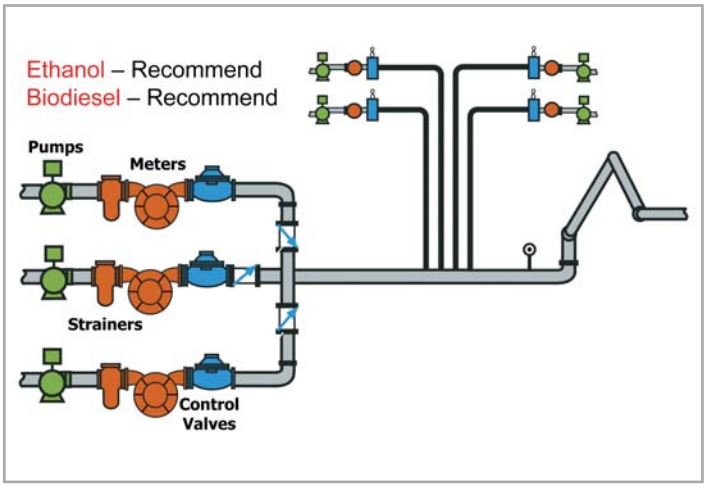
Alan Jones is the operations manager for Farm & Home Oil Co. in Macungie, Pa., 60 miles north of Philadelphia. Jones operates the Farm & Home terminal, off-loading railcars, storing vegetable oils (primarily soybean oil), and blending and loading tank trucks for distribution. Farm & Home has handled biodiesel for the past two years and runs a variety of blends ranging from 2 percent to 20 percent biodiesel and has seen increased demand recently for higher blends, especially from school districts and other government agencies. A large part of his business is Bioheat, a branded blend of regular heating oil and biodiesel used for residential home heating.

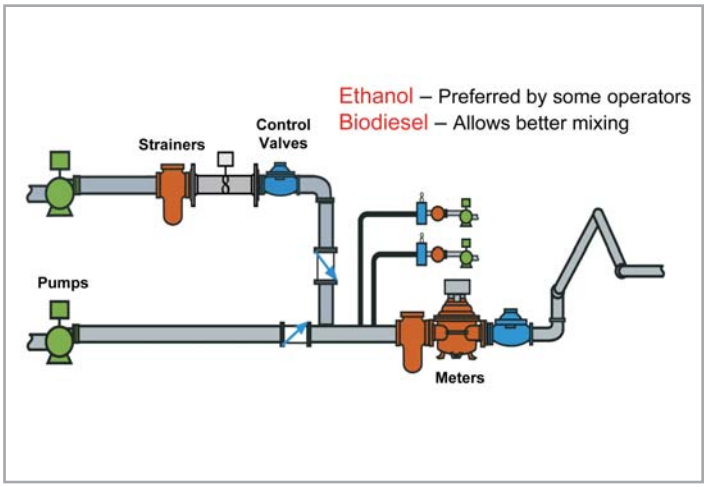
"I'm more comfortable with ratio blending," Jones says. "I think it delivers a better end product because it gets thoroughly mixed." Jones has considered using sequential blending but has never tried it because of concerns about separation.

"I understand that with sequential blending you can end up with product that isn't completely blended," he says. "I don't need product performance problems. That's the best way I know to lose a customer."

A key part of Jones' ratio blending process depends on equipment, something he believes makes a difference in overall product quality. He says he likes the flexibility the AccuLoad III provides when moving from lower blends of 2 percent to 5 percent, to higher blends of 10 percent and above. The AccuLoad controller is capable of accommodating typical ratio blending where all products are mixed in the piping downstream of the individual product control valves. It can also handle sidestream blending where the smaller of the components is plumbed in upstream of the main product delivery meter.

Another critical part of effective blending is properly sized measurement equipment such as strainers, meters and flow control valves. "I suspect we will see an increase in demand for a variety of types of biodiesel, low percentages and higher percentages," Jones says. "That's why I like equipment that gives me the flexibility to handle a wider range of flow rates. It's easier to adapt, and in today's market that's important."





Two typical layouts for blending biodiesel at the loading rack are shown. The ratio blending diagram, left, illustrates how products are blended downstream of the metering equipment, before the product goes into transport. The side-stream ratio blending diagram shows where the minor component of the blend is injected upstream of the combined product measurement system. Here it is measured as a component by the measurement system, then is connected and measured again by the combined product meter.

SOURCE: FMC TECHNOLOGIES INC.

Entering the Market

Lake Erie Biofuels, a 45 MMgy biodiesel producer located near the shore of Lake Erie in Erie, Pa., started blending biodiesel roughly seven months ago and has seen a marked increase in interest and demand for its products. "In the beginning we exported our first one-and-a-half million gallons," says Mike Noble, director of operations for Lake Erie Biofuels. "Domestically we have gotten a lot more interest recently."

Noble uses injection blending with a Smith Meter Accuload III controller for loading and unloading. The plant's first shipment of 99 percent biodiesel went to the export market in December 2007, and since that time Noble has shipped another 6 million gallons for export. To date the facility has produced and shipped a total of 9.5 million gallons of biodiesel.

The AccuLoad's controls also perform successful unloading of trucks without setting a preset volume. Controlled delivery is accomplished by the use of three digital inputs, configured as stop-, low- and high-flow switches. The switches are located on a float installed in an air elimination tank upstream of the meter. The inputs define when to open the control valve, when to advance from low flow to high flow and when to close the valve.

Noble previously consulted for Lurgi at a Cargill biodiesel plant but when the opportunity came to become part of Lake Erie and be involved in the construction and operation of a biodiesel plant from the ground up, he took it. In addition to special attention to blending, Lake Erie conducts a panel of five product tests on all inbound feedstocks, including acid value, moisture, soap and metals.

Throughout the blending and refining process Noble tests for density, flashpoint, total contamination, oxidative stability, acid value, and free and total glycerin. He tests for metals every two hours throughout the process. Once produced the biodiesel runs through cold-soak filtration to meet current

and future ASTM specifications. All biodiesel produced and stored by Lake Erie Biofuels is blanketed with nitrogen to maintain stability and eliminate moisture from the time it leaves the plant until it is delivered to finishing tanks, railcars, tanker trucks and ships.

The operation was built to produce the highest quality biodiesel and Noble says he is proud of the operation. "I've toured a large number of biofuel plants in my career and I don't know that anyone has the lab capabilities, blending and filtration systems that we have," he says.

Whatever blending technique a marketer selects doesn't matter unless attention to quality is maintained throughout the process. It's comparable to the widely heard axiom "garbage in, garbage out" in the early days of the computer industry. If biodiesel is going to be a significant part of the long-term global energy solution, quality must prevail throughout. ■

Joe Gallehugh is a freelance writer. Reach him at jgallehugh@triad.rr.com or (336) 254-0964.

BIODIESEL MAGAZINE

ARTICLE WAS PRINTED IN JULY 2008 ISSUE OF *BIODIESEL MAGAZINE*