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From by-product to co-product

Uncertainty in the biodiesel industry is leading producers to look to alternative revenue streams

Awakening a sleeping giant

The rapid rise in fuel prices in South Africa has made the biodiesel market viable sooner than expected

Regional focus: Biofuels in Africa

Blending recipes for biofuels are fairly similar throughout the industry but as companies create more diverse proprietary flex-fuels for special applications, assuring consistent long-term product quality will become more critical

New blends drive flexible equipment

New fuel blends can require more precise equipment to meet a wider range of product percentages and more sophisticated blending configurations in order to maintain quality.

Automakers currently cover up to 10% ethanol blends by warranty for standard vehicles, and ethanol blends up to 85% are approved specifically for use in flexible fuel vehicles.

However the American Coalition for Ethanol (ACE), based in Grand Forks, North Dakota, is leading efforts to overcome any technical or regulatory hurdles in the path of using mid-range ethanol blends like E20, E30, and E40. In fact, a 2007 study conducted by the University of North Dakota and the University of Minnesota found that optimum mileage for many vehicles was achieved with E30.

As more complex blends become more common, blending at the loading rack will become a more precise science. For example, marketers may choose to produce products that require a ratio-blended petroleum arm along with a sequential blended distillate arm, or a hybrid arm for ratio blending of biomass into sequential blended diesels. By selecting equipment that can accommodate any combination of blending techniques, marketers can save the downtime, costs and headaches involved with retooling.

Positive displacement measurement system for biodiesel blending

'Equipment always plays an important role in blending,' says Chuck Myers, product marketing manager for FMC Technologies Measurement Solutions. 'Getting the correct configuration that is flexible enough to control high and low percentages consistently is important to overall quality. This is even more important as marketers use new blends to create a competitive edge.'

Blending of two or more products by any method requires a recipe. The recipe is composed of percentages of components of the blend. Percentages of the recipe are determined by the seller or the oil company (octane dependent in some cases), and the buyer or the marketer. Ethanol percentages are currently regulated to a maximum of 10% ethanol in the US for use in standard automobiles and to 85% ethanol for flex-fuel vehicles.

Ultimately the objective of biofuels blending is to deliver an accurate, high-quality blend to meet the requirements of both the buyer and the seller. The seller is concerned about the exact volumes delivered in the blend recipe for billing purposes, inventory reconciliation, blend quality, regulatory requirements, safety and loading time. The buyer is most interested in exact volumes delivered in the

blend recipe and the quality of the blend. In most cases the quality of the blend, and of the final product, comes first for both the buyer and the seller.

'Our goal is to deliver the best quality ethanol enhanced fuels to our customers,' says Albert Katsumi, terminal engineering manager for Suncor in Toronto, Ontario in Canada. 'Our processes are engineered to ensure that we get the blend right the first time.'

Suncor began operating Canada's largest ethanol production facility, the St. Clair Ethanol Plant, in 2006. The facility currently produces approximately two hundred million litres (the equivalent of 52 million US gallons) of ethanol a year, 100% of which is blended at the rack. The facility produces 95-99% ethanol blends for the delivery in US and Canada for use as feedstocks.

'We're on our third generation blending operation now,' says Katsumi. 'For the last upgrade we conducted a six month study on virtually every type of rack-load blending equipment on the market before we purchased. We analysed every individual component because we wanted to make sure we blend the highest quality biofuels possible.'

Suncor's latest upgrade uses the Smith Meter SC 13 for biofuel metering equipment and uses the AccuLoad III SA in split architecture. 'We need equipment that delivers precise control but with the maximum flexibility because we're not sure where the market is going in the future,' says Katsumi.

When new recipes are developed, each has their own unique set of characteristics and those characteristics affect measurement. Parameters such as meter factors, API tables and density need to be considered for the individual components in the recipe in order to deliver an accurate blend and maintain component inventories. Any product delivery, including straight product loading, and any type of blending, requires that each component be capable of accurately flowing in a controlled mode and flow range throughout the delivery batch.

'The flow profile of a new recipe is most critical for ratio or hybrid blenders,' says Myers. 'If pumps, meters and flow control valves are not sized properly, the results can be erratic operation and possible off-spec blends.'

Products with similar characteristics, such as density and viscosity, will generally blend well. Products with different characteristics, or those that when blended simply do not mix or stay mixed, may dictate the method of blending. Biodiesel, for example, needs particular care to ensure consistent excellent quality.

Katsumi explains one quality variable that blenders deal with daily. 'When petroleum and ethanol are combined, reid vapour pressure (RVP), the ability of the blend to vapourise, is increased,' says Katsumi. 'Getting the right RVP for the season is an exacting process. If RVP is too high in the summer, the engine vapour locks and the car won't run. By contrast, if the RVP is too low in the winter, then there is not enough vapour in the engine and this impacts a car's start up and performance as well. With more sophisticated ethanol blends, testing will become essential.' ●

Commonly used load-rack blending types

Splash blending involves loading individual products into a truck through dedicated product meters, one after the other. Without some type of a mixer, splash blending does not work well in a truck because stratification may occur, leading to poor fuel quality.

Sequential blending consists of loading multiple products, one at a time, through one meter and control valve. The method is commonly used for products that have similar density and viscosity, characteristics that enables them to mix well. The disadvantages of sequential blending for some biofuels, biodiesel for example, 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 soyabean oil into existing diesel oil sequential blenders.

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

Tank truck load rack facility at Suncor in Canada

For more information
Please visit www.fmctechnologies.com/measurementsolutions

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