MEETING THE BIOFUEL COMPLIANCE CHALLENGE

Jeff Conroy from Authentix discusses the challenges and possible solutions for the quality assurance and source integrity of renewable biofuels

INCREASED reliance on biofuels to meet mandated greenhouse gas (GHG) reductions is increasing demand. Aside from the impact increased biofuel levels have on the ease of storage of the blends, the efficient running of a combustion engine, and the lower energy density of the blends, there is serious concern regarding sourcing increasing volumes of biocomponents to meet demand. The production of biofuels from non-sustainable sources or energy intensive processes can lead to reduced benefit or even an overall increase in emissions, so the pedigree of otherwise chemically identical biofuels becomes very important to ensure compliance with the overall goal of greenhouse gas reduction.

BIOFUELS – FIRST AND SECOND GENERATION

Historically, biofuels have been derived from gasoline/ethanol and diesel/fatty acid methyl esters (FAMEs) blends. Fuel manufacturers have been able to manage the sourcing, blending and supply of these products through their regular networks. ASTM and similar test methods for the monitoring of fuels for compliance with biocomponent levels are in place and ensuring compliance at various points in the supply chain is similar to those used for other fuel quality parameters such as octane and cetane.

To further illustrate the concern regarding the sourcing, in Asia, for example, palm oils are a source of FAME and damage due to deforestation is a problem resulting from increased demand, threatening rare and endangered species. In response, fuel suppliers are encouraged to source sustainable palm oil as the source of FAMEs to minimise the impact, such as those referenced by the Roundtable on Sustainable Palm Oil (RSPO).

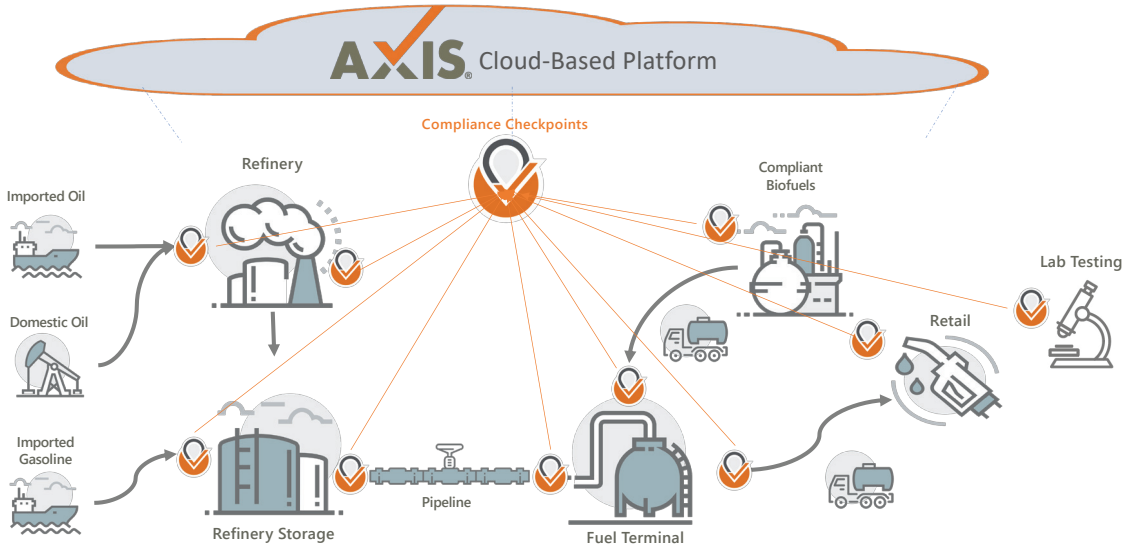
Second-generation biofuels, or advanced biofuels, are derived from food waste or other arable waste products. Another approach is to ensure biofuel components are sourced from producers that are using sustainable farming to minimise the environmental impact. This means that many otherwise chemically identical first- and second-generation biofuels carry different GHG reduction values, leading to an issue in discriminating between them in the supply chain and especially once blended into fuel.

Even more 'advanced' biofuels suffer from this chemical similarity characteristic. For example, hydrocarbons can be generated very energy efficiently from hydrogenation of vegetable oils for blending into fuels without the associated corrosion and bacterial bloom issues associated with ethanol and FAME. However, as with the second-generation biofuels, these are chemically indistinguishable once in the finished blended fuels. Regardless of the chemical composition of the biofuel, the ultimate impact on GHG reduction will be dependent on a number of factors including the type of raw materials, the method of manufacturing and the efficient delivery of those components to the marketplace.

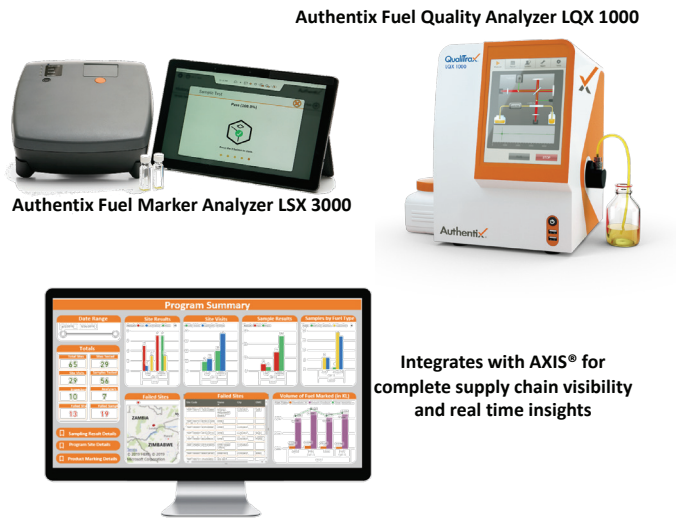
THE CHALLENGE

Many countries will incentivise the adoption of larger percentages of biofuels through reduced taxation of the blends (such as in Thailand) and are already considering higher tax credits for the second-generation biofuels (such as some EU member states). When considering tracking and quantifying the proper credits for some biofuels, this creates a new complexity in differentiating otherwise identical products. To comply with most specifications, the provenance of the products is mostly irrelevant if they meet the requisite compositional

01



02



and property specifications for the fuel. To show compliance with future biofuels initiatives and the associated tax and subsidy schemes, the source of the components will be as vital as the composition of the materials.

Tracking and ensuring compliance seems like a difficult challenge for the high volume, fast-moving global fuel supply chain. These biofuels could create a need for differentiated sourcing, storage and processing of what are otherwise normally fungible fuel components. This challenge creates an opportunity for operators to develop value-added services that take this into account and can provide assured sourcing of compliant materials. And fortunately, the technology and processes are in reach to make this happen.

POSSIBLE SOLUTIONS

While fuel supply chains have a wide variety of suppliers, the reality is that even with that flexibility there are enormous resources spent to ensure compliance. The testing of fuels and components by ASTM or other industry standard methods is part of the natural flow of products through the supply chain, including monitoring biofuel components. But conventional testing of otherwise anonymous materials will not be enough to ensure compliance with newer biofuel regulations. The ability to detect that a component is not only chemically correct but also came from a compliant source will be an added complexity.

The issue of detecting and quantifying otherwise identical fuels or components is not new to the fuel supply chain, due to taxation and subsidy. The US, UK, Eurozone nations and dozens of other nations all employ some sort of fuel integrity system. This ranges from centralised transaction recording systems that create an auditable paper trail to systems that include the colouring or marking of fuels to allow inspection and detection of these otherwise identical materials in the supply chain.

These fuel integrity programmes usually involve chemically marking fuel at the parts per billion level at refineries and/or terminal distribution points to enable the fuel to be authenticated as it travels through various downstream points of sale. The chemical marker enables accurate quantification using analysers in the field and/or laboratory. This has become a trusted and effective solution to validate fuel quality and authenticity.

New biofuels move this differentiation much further up the fuel supply chain. For example, a diesel fuel is typically completely fungible throughout its entire production, transport and storage and it is only when it is sold for end use that the differentiation between a high tax road fuel or a subsidised industrial fuel is created. In some cases, this means the last mile of distribution is all that is needed to monitor compliance. With biofuels this differentiation can take place even at the point of manufacturing, and should be tracked and monitored. While marking of fuels has largely been the responsibility of the final distributor for tax compliance, the potential marking of differentiated biofuels and providing transparency and traceability of the sources may provide an opportunity for transport, storage and blending operations to measure and monitor the content of the fuels to provide easy and reliable compliance for their own operations and as a value to their downstream customers.

With more than 25 years of experience designing and implementing fuel integrity solutions, Authentix has been at the forefront of developing technologies to rapidly identify, classify and validate fuel composition and properties for governments and oil marketing companies around the globe. The Authentix LSX hand-held devices can quantify parts per billion of unique markers in seconds to enable identification of marked materials. The Authentix LQX Fuel Analyzer is a portable desktop instrument that is capable of performing some ASTM tests, including FAME and oxygenate testing, directly on site in a matter of minutes. It can also estimate fuel properties and identify fuels with advanced chemometric modelling based on the global database of fuel data Authentix's experience and reach has allowed Authentix to build over years of operating fuel integrity programmes. All Authentix devices can be tied to the Authentix Information System (AXIS). AXIS not only aggregates the data from testing devices, but also connects to operators' data systems to bring together transactional and operation data with quality assurance data to streamline operations, automate workflows, and provide actionable intelligence for every point in the supply chain, enabling organisations to act quickly and decisively.

REALISING THE REAL VALUE IN FUEL MARKING AND QUALITY CONTROL

Ensuring compliance for advanced fuels will mean expanding the scope of the typical petroleum supply chain system to include pedigree information about sources of materials. Like any pedigree, fuel pedigree consists of a record of complaint transaction that allows transparency and traceability of the final fuel product.

Advanced technologies, combined with the ability to integrate and capture variable data points from multiple sources, enables a holistic, single window for complete visibility into supply chain integrity and performance. By implementing rapid fuel marker detection and fuel quality control sensing in the terminal or field, the data collected can provide the basis of a compliant pedigree for fuels. By generating insights through data analytics, operators and governments can better understand and execute long-term compliance solutions for their fuel supply chains.

For more information:

This article was written by Jeff Conroy, PhD, chief technology officer for Authentix. For more information on Authentix, the authority in authentication solutions, visit www.authentix.com.

01 Fuel pedigree is a record of compliant transactions throughout the supply chain

02 Authentix fuel integrity solutions