Getting the right mix

Wilks Enterprise has published a white paper looking at the effects of biodiesel feedstocks on infrared blend measurements

Feedstock	B20	Average Molecular Weight
Soybean	20.1	249
Yellow Grease	19.8	Unknown
Rapeseed [2]	20.6	281
Palm	20.2	239
Coconut	26.1	180

Table 1: Biodiesel feedstock comparison[1]

A new white paper published by Wilks Enterprise addresses the common concern among biodiesel blenders and distributors as to whether or not biodiesel made from different feedstocks such as soy, waste vegetable oil or palm oil will affect the blend measurement.

The data presented in the white paper, as well as the chemistry, shows that infrared measurements offer a reliable analytical technique for checking biodiesel blend.

Fuel blend analysis is important as the use of biodiesel as a diesel additive has increased dramatically over the past few years and will likely continue to increase. For fuel blenders, this means an added challenge to avoid an incorrect blend that could lead to regulatory fines, loss of customer confidence and damage to equipment.

Wilks says portable infrared analysers such as its InfraCal Biodiesel Blend Analyser offer a simple, accurate and low cost solution to on-site blend testing at locations such as the blending rack. The resulting costs of an incorrect blend can far outweigh the cost of an on-site biodiesel blend analyser.

A common question is 'What is the effect of biodiesel feedstocks on measurement accuracy?' However, measuring the percentage of biodiesel in diesel leads to several other questions before the question can be answered.

Fortunately for manufacturers of infrared instrumentation, biodiesel has a unique signature from diesel in the infrared range of the spectrum. This means that at a wavelength specific to biodiesel, which is the carbonyl band at 5.73 micrometers (1745cm-1), the intensity of the absorbance increases as the concentration of biodiesel increases. The change in absorbance is correlated to a percent biodiesel value.

The primary difference between the fatty acid esters in oils from various feedstocks is the length of the hydrocarbon chains and the number and position of the C=C bonds. Most feedstocks, such as soy, canola and yellow grease (or waste vegetable oil-WVO) have chain lengths between C16 and C22 with C18 predominating.

So how do differences in feedstock affect infrared measurements? The wavelength and intensity of a carbonyl absorption will generally be affected by the mass and nature of the atoms attached to the C=O group.

How does this translate to the primary concern of whether biodiesel blend measurements will be accurate?

The table shows the results from a B20 blend with five different feedstocks measured with a Wilks InfraCal Biodiesel Blend Analyser. As indicated in the B20 column, most of the feedstocks perform quite nicely for infrared analysis with the exception of coconut oil.

The third column of the table shows the average molecular weight of the FAME (fatty acid methyl ester). Notice that coconut oil is significantly different from the other oils with a molecular weight of 180. According to the molecular weight the coconut-based FAME should give a response of about 26.7 percent. Any infrared analyser can be calibrated specifically for a coconut oil so the concentration measurement will be correct in spite of the molecular weight difference. Conveniently, the biodiesel made from coconut oil does not perform well in cold or temperate climates so its use is restricted to more tropical parts of the world.

Infrared measurements typically see little effect from a majority of the biodiesel feedstocks, making infrared analysis a simple and reliable analytical technique for checking biodiesel blend.

Infrared instruments enable petroleum terminals, fuel distributors, fleet operators and regulatory agencies to make quick, on-site measurements with little or no technical training.

For a copy of the White Paper and further information on the InfraCal Biodiesel Blend Analyser for measuring blend ratio: **www.WilksIR.com**



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