Application Note Biodiesel





Introduction

For optimization and quality reasons, NIR analysis can quickly and cost-efficiently measure components in biodiesel and biodiesel raw materials such as animal fat, vegetable oils, soy, rapeseed, algae etc. The range of components is wide and includes mono-, di- and triglycerides, free glycerine, acidity, moisture and iodine value (IV) components. The chemical analysis is costly and time consuming, while the LipidQuant will make the analysis in less than one minute. The analyser can be placed in the production area and can be operated by plant personnel.

Analyser: The FT-NIR LipidQuant

The LipidQuant FT-NIR analyser is used for non-destructive analysis of liquid samples. The sample is poured into 8 mm lidded glass vials to avoid changing during the process and placed in the heating vial holder. The sample can be kept due to the sealed vial.

The LipidQuant is powered by the latest ABB Bomem FT-NIR technology and measures the entire spectrum of the sample, i.e. in the range 14000-3800 cm⁻¹ (700-2600 nm). It generates a large amount of high-quality spectral data, which makes it possible to precisely determine multiple components.

With no scheduled maintenance for five years, the LipidQuant is practically maintenance-free. It is equipped with parts with a long lifetime. For instance, the laser and NIR source have an expected lifetime of ten years.

LipidQuant is operated with the InfraQuant software, which makes it easy for everybody to work with analyses.

Calibration

The LipidQuant has a starter set of calibrations to be used for biodiesel from animal fat. Calibration models have been made for raw materials, intermediate products and finished biodiesel for components like moisture, acid number, free fatty acids, free glycerol, iodine value, soap and purity. A typical FT-NIR spectrum of biodiesel can be seen on the cover of this application note. All spectra are pre-processed with mean centring and 1st derivative Savitsky-Golay with 9 smoothing points. Partial Least Squares (PLS) models were developed based on the analytical and spectral data.

Property	Range	SECV
Moisture	0.1-0.8	0.055
Free fatty acid	2-26	0.92
Saponification	50-500	10
Acid number	0.3-0.7	0.03
Free Glycerine	0-0.024	0.002
Purity	0-0.5	0.02

To obtain the highest accuracy different models were developed for different intervals (see table 1).

Calibration Performances – global models

A plot of the predicted NIR values against the actual value for free fatty acid can be seen in figure 1 $\,$



Figure 1: NIR-predicted free fatty acids against actual value

Conclusion

The LipidQuant FT-NIR analyser is designed for liquid measurements. Biodiesel as well as raw materials and intermediate products from processing biodiesel can be easily measured in the LipidQuant giving quality parameters within less than one minute.

The analyser can be operated with models from Q-Interline or with customised models for specific customer products. The latter is easy to optimise and maintain, since the models become a property of the customer. Table 1: Performance of calibrations used in biodiesel production from animal fat

 and intermediate products:

 • Free glycerine
 • Methanol

 • Mono-glyceride
 • Ester

• Linolenic acid

• Free fatty acids

Saponification

Acidity

• Purity

Quality parameters in biodiesel, raw materials

- Mono-glyceride
- Di-glyceride
- Tri-glyceride
- Total glycerine
- Iodine value
- Moisture

Q-Interline A/S Københavnsvej 261 DK-4000 Roskilde

Phone: +45 4675 7046 Fax: +45 4675 7096 E-mail: info@q-interline.com Web: www.q-interline.com

