

Application Note AN-NIR-126

Biodiesel content in diesel with near-infrared spectroscopy

Monitor the fuel blending process within seconds

The properties of biodiesel fuel, which is produced from vegetable oils or animal fat, are very similar to petroleum-derived diesel, but biodiesel pollutes less. In most countries the common biodiesel blend is B20, which ranges from 6% to 20% biodiesel content. Measuring the biodiesel content in diesel is important, as higher levels can cause deposits in older diesel engines, clogging the fuel filters and pumps. Fuels with high levels of biodiesel also tend to absorb more moisture compared to petroleum-derived fuels. With near-infrared spectroscopy (NIRS), the biodiesel content is determined in seconds without any sample preparation. Compared to other test methods like those used in ASTM D7467, biodiesel content analysis with NIR spectroscopy saves time and enables the implementation of online process monitoring with fiber optics.

EXPERIMENTAL EQUIPMENT

Twenty-one diesel samples with varying biodiesel content from 0% to 20% were measured on the OMNIS NIR Analyzer Liquid (Figure 1) in transmission mode (1000–2250 nm) using 8 mm disposable vials. The vial temperature was set and monitored at 30 °C with the built-in vial sensor to ensure consistent measurement performance.

OMNIS Software was used for all data acquisition and prediction model development.



Figure 1. OMNIS NIR Analyzer and a sample filled in a disposable vial.

Table 1. Hardware and software equipment overview.

Equipment	Article number
OMNIS NIR Analyzer Liquid	2.1070.0010
Holder OMNIS NIR, vial, 8 mm	6.07401.070
Disposable vial, 8mm, transmission	6.7402.240
OMNIS Stand-Alone license	6.06003.010
Software license Quant Development	6.06008.002

RESULT

The obtained NIR spectra (Figure 2) were used to create a prediction model for quantification of biodiesel content in diesel. The quality of the prediction model was evaluated using a correlation diagram (Figure 3) which displays a high correlation between the NIR prediction and the lab method. The respective figures of merit (FOM) confirm the feasibility during routine analysis.

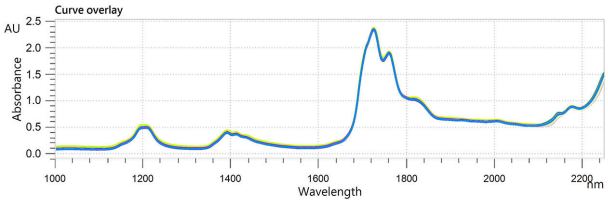


Figure 2. NIR spectra of biodiesel blends analyzed on an OMNIS NIR Analyzer Liquid with 8 mm vials.

Result biodiesel content

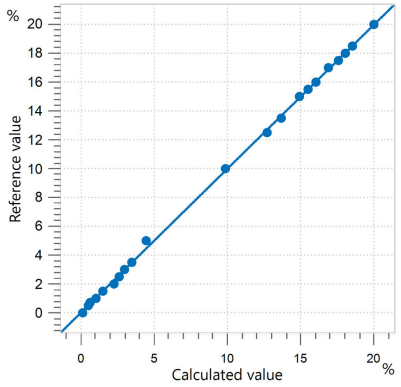


Figure 3. Correlation diagram and the respective FOMs for the prediction of biodiesel content in diesel. The reference value was determined by volumetric mixing of biodiesel and petroleum-derived diesel.

SEC (%)	SECV (%)	R^2CV
0.14	0.16	1.000

CONCLUSION

This Application Note shows the results of a biodiesel content analysis test without the need for any sample preparation, using near-infrared spectroscopy in place of other more time-intensive analytical techniques. This ultimately leads to a reduction in workload and the related costs. Alongside the biodiesel content test, additional fuel quality parameters like cetane number, moisture, or flash point can be determined with NIRS.

CONTACT

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CONFIGURATION



OMNIS NIR Analyzer Liquid

Spectromètre proche infrarouge pour échantillons liquides.

L'OMNIS NIR Analyzer est la solution de spectroscopie proche infrarouge (NIRS) développée et produite selon les normes de qualité suisses pour les analyses de routine tout au long de la chaine de fabrication. L'application des technologies les plus récentes et l'intégration dans le logiciel OMNIS moderne se reflètent dans la vitesse, le maniement et la flexibilité d'utilisation de ce spectromètre NIR.

Apercu des avantages de l'OMNIS NIR Analyzer Liquid :

- Mesures d'échantillons liquides en moins de 10 secondes
- Régulation de température sur l'échantillon de 25 à 80 °C
- Détection automatique de l'insertion et du retrait d'échantillons du récipient d'échantillon
- Intégration simple dans un système d'automatisation ou liaison avec d'autres technologies d'analyse (titrage)
- Prise en charge de nombreux récipients d'échantillon de différentes longueurs de chemin



Support OMNIS NIR, flacon, 8 mm

Support de flacon pour l'OMNIS NIR Analyzer pour flacons à usage unique de 8 mm (6.7402.240).



Flacon à usage unique, 8 mm, transmission, Qté 100

100 flacons en verre (borosilicate) à usage unique avec une longueur de chemin de 8 mm pour des analyses de liquides lors d'une transmission. Les flacons à usage unique sont fournis avec les bouchons de fermeture correspondants (quantité = 100).

Compatible avec :

- Support OMNIS NIR, flacon, 8 mm (**6.07401.070**)
- Support DS2500 pour flacons à usage unique 8 mm (**6.7492.020**)

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Licence OMNIS autonome

Elle permet l'exploitation autonome du logiciel OMNIS sur un ordinateur WindowsTM.

Caractéristiques :

- La licence comprend déjà une licence pour appareils OMNIS.
- Elle doit être activée via le portail d'octroi de licences Metrohm.

OMNIS
A WHOLE NEW LEVEL OF PERFORMANCE

Licence logicielle Quant Development

Licence logicielle pour la création et l'édition de modèles de quantification dans une installation du logiciel OMNIS Stand-Alone.