



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.

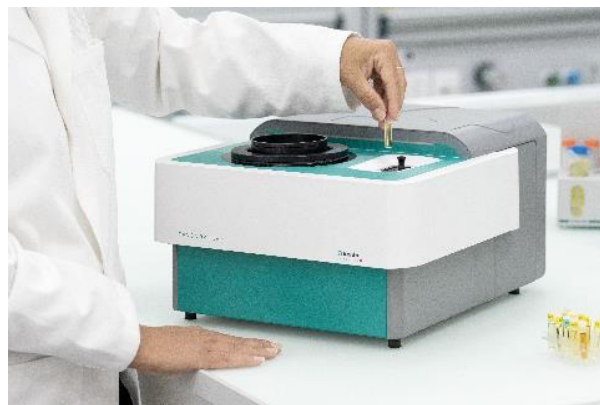


Figure 1. OMNIS NIR Analyzer and a sample filled in a disposable vial.

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.

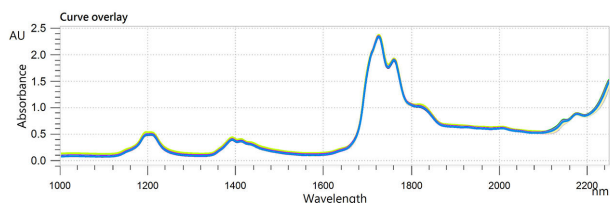


Figure 2. NIR spectra of biodiesel blends analyzed on an OMNIS NIR Analyzer Liquid with 8 mm vials.

Result biodiesel content

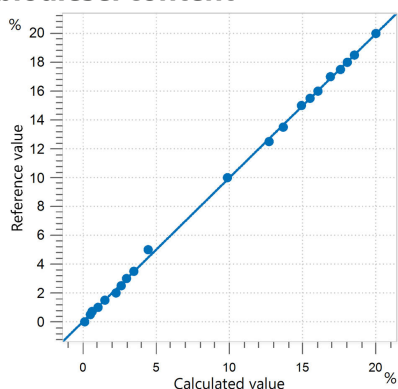


Figure 3. Correlation diagram and the respective FOMs for the prediction of biodiesel content in diesel. The reference value was determined by volumetric mixing of biodiesel and petroleum-derived diesel.

SEC (%)	SECV (%)	R ² CV
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.

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CONFIGURATION



OMNIS NIR Analyzer Liquid

Near-infrared spectrometer for liquid samples. Developed and produced in accordance with Swiss quality standards, the OMNIS NIR Analyzer is the near-infrared spectroscopy (NIRS) solution for routine analysis along the entire production chain. Its application of the latest technologies and its integration in the modern OMNIS Software are reflected in its speed, operability, and flexible utilization of this NIR spectrometer. Overview of the advantages of the OMNIS NIR Analyzer Liquid: Measurements of liquid samples in less than 10 seconds; Temperature control on the sample from 25–80 ° C; Automatic detection of the insertion and removal of the sample vessel; Simple integration in an automation system or link with additional analysis technologies (titration); Supports numerous sample vessels with different path lengths;

OMNIS NIR8 mm

Vial Holder for the OMNIS NIR Analyzer for 8 mm disposable vials (6.7402.240).





8 mm100

透過した液体を分析するための光学的距離 8 mm のガラス製 (ホウケイ酸塩) 使い捨てバイアル 100 個。使い捨てバイアルには閉じ蓋 (個数 = 100) が付属されています。

次の製品と互換性があります:

- ホルダー OMNIS NIR、バイアル、8 mm (6.07401.070)
- 使い捨てバイアル 8 mm 用の DS2500 ホルダー (6.7492.020)

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WindowsTM コンピューター上の OMNIS ソフトウェアをスタンドアロン操作することが可能になります。

特徴:

- ライセンスには、既に1つのOMNISデバイスライセンスが含まれています。
- メトローム・ライセンシングポータルにて、アクティブ化する必要があります。

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Quant Development

Software license for the creation and editing of quantification models in a stand-alone OMNIS Software installation.