



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.

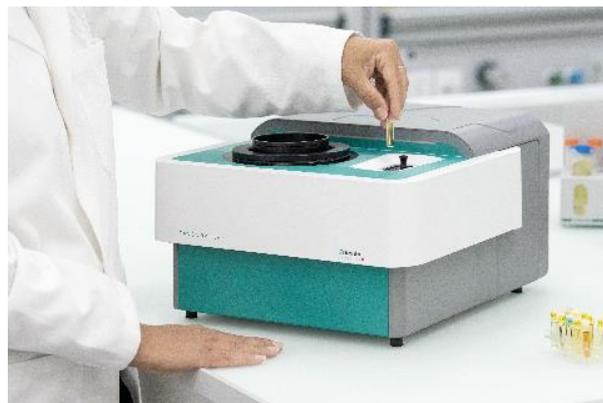


Figure 1. OMNIS NIR Analyzer and a sample filled in a disposable vial.

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.

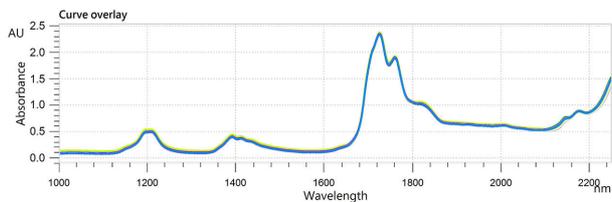


Figure 2. NIR spectra of biodiesel blends analyzed on an OMNIS NIR Analyzer Liquid with 8 mm vials.

Result biodiesel content

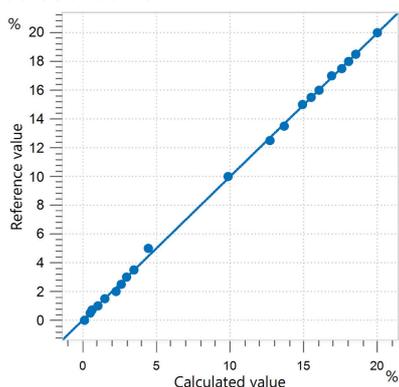


Figure 3. Correlation diagram and the respective FOMs for the prediction of biodiesel content in diesel. The reference value was determined by volumetric mixing of biodiesel and petroleum-derived diesel.

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

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

液体サンプルのための近赤外スペクトロメーター。

OMNIS NIR Analyzer は、スイスの品質基準に従って開発・製造された、生産チェーン全体に沿ったルーチン分析のための近赤外分光法 (NIRS) ソリューションです。最新技術の適用と最新の OMNIS Software への統合は、この NIR スペクトロメーターの速度、ユーザビリティ、柔軟な使用に反映されています。

OMNIS NIR Analyzer Liquid の利点の概要:

- 10 秒未満で液体サンプルを測定
- 25° C ~ 80° C のサンプルの温度制御
- サンプル容器の取り付けと取り外しの自動検出
- オートメーションシステムへの統合、またはその他の分析技術 (滴定) との連結が容易
- 様々な光路長を有する多数のサンプル容器に対応

OMNIS NIR8 mm

8 mm 使い捨てバイアル (6.7402.240) のための OMNIS NIR Analyzer 用バイアルホルダー。





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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