



Application Note AN-NIR-129

# Dried pet food analysis by near-infrared spectroscopy (NIRS)

## Rapid determination of moisture, protein, fat, and ash

Pet food testing involves accurate monitoring and control of moisture, protein, fat, and ash content. This allows pet food manufacturers to satisfy nutritional adequacy requirements, meet regulatory guidelines, and provide high-quality foods to pet owners.

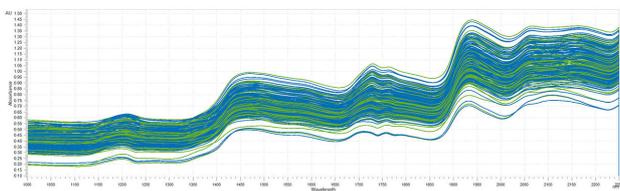
Traditional analysis methods are often slow and

labor-intensive. Near-infrared (NIR) spectroscopy provides a fast, nondestructive alternative for analyzing these key quality control parameters with minimal sample preparation. This study evaluates the use of NIR spectroscopy in the pet food industry for efficient and reliable quality control during dried pet food production.

## EXPERIMENTAL EQUIPMENT

199 dried pet food samples (mainly dog and cat food) from different suppliers were analyzed in whole and ground forms on an OMNIS NIR Analyzer Solid (Figure 1). The samples were added to an OMNIS sample cup and analyzed in diffuse reflection mode. To include sample variety, the sample rotated during measurement to collect spectra from different locations. The automatically averaged spectra values were used for model development. Reference values were obtained by official methods such as ISO 6496 (moisture), ISO 5983 (protein), ISO 5984 (ash), and ISO 6492 (fat).

The obtained NIR spectra (Figure 2) were used to create prediction models for the different reference parameters. An external validation set was used to verify the predictive performance of the calculated prediction models. Correlation



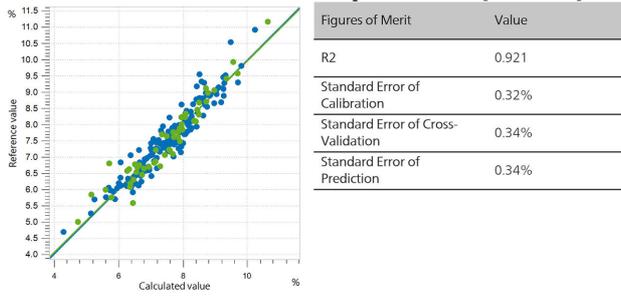
**Figure 2.** NIR spectra of pet food samples. Data was obtained with an OMNIS NIR Analyzer Solid. Spectra shown in blue have been used to calibrate the model, while green spectra have been used for validation.



**Figure 1.** OMNIS NIR Analyzer Solid

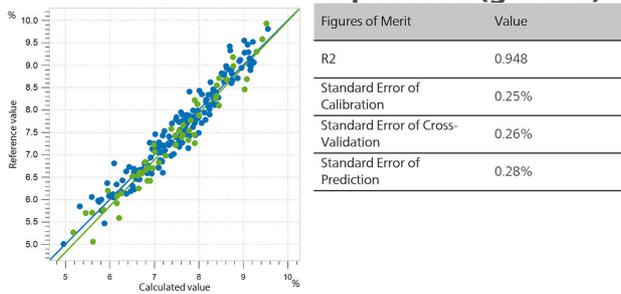
diagrams, which display the relation between the NIR prediction and the reference values, are shown in Figures 3–10 together with the respective figures of merit (FOM).

### Result moisture in dried pet food (whole)



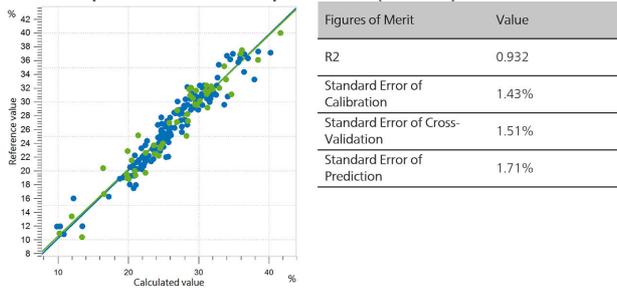
**Figure 3.** Correlation diagram and the respective FOMs for the prediction of moisture in dried pet food (whole) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

### Result moisture in dried pet food (ground)



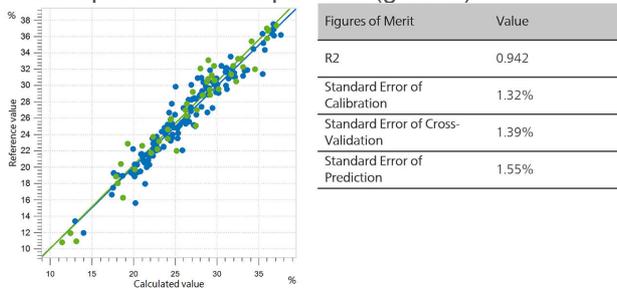
**Figure 4.** Correlation diagram and the respective FOMs for the prediction of moisture in dried pet food (ground) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

### Result protein in dried pet food (whole)



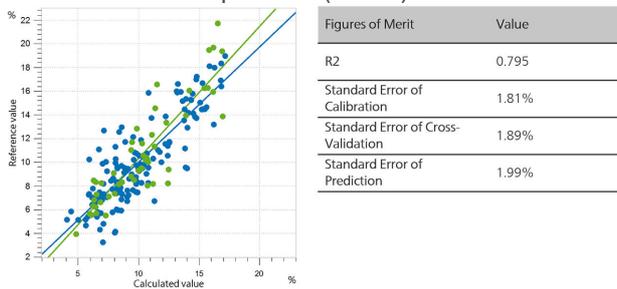
**Figure 5.** Correlation diagram and the respective FOMs for the prediction of protein in dried pet food (whole) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

### Result protein in dried pet food (ground)



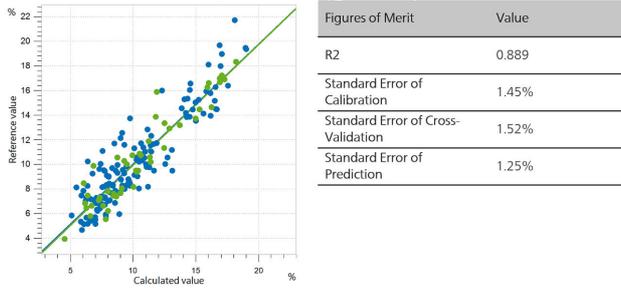
**Figure 6.** Correlation diagram and the respective FOMs for the prediction of protein in dried pet food (ground) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

### Result fat in dried pet food (whole)



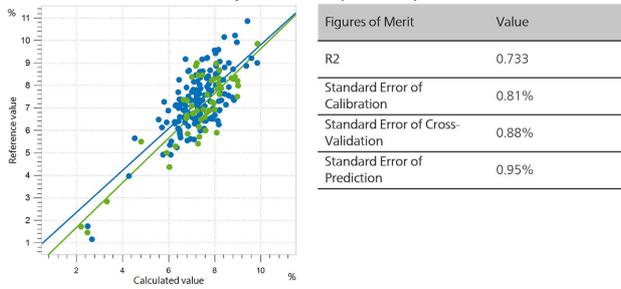
**Figure 7.** Correlation diagram and the respective FOMs for the prediction of fat in dried pet food (whole) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

### Result fat in dried pet food (ground)



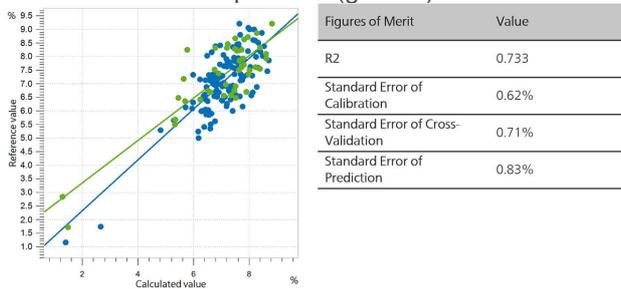
**Figure 8.** Correlation diagram and the respective FOMs for the prediction of fat in dried pet food (ground) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

### Result ash in dried pet food (whole)



**Figure 9.** Correlation diagram and the respective FOMs for the prediction of ash in dried pet food (whole) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

### Result ash in dried pet food (ground)



**Figure 10.** Correlation diagram and the respective FOMs for the prediction of ash in dried pet food (ground) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

This Application Note demonstrates the feasibility of using NIR spectroscopy for the analysis of several pet food quality parameters, including protein, moisture, fat, and ash. Results indicate that lower prediction errors can be obtained when grinding pet food samples before their analysis. A comparison between different methods used for the analysis of

pet food clearly highlights the significant time-saving potential of NIR spectroscopy (**Table 1**). Furthermore, the simplicity of the analysis and the availability of a pre-calibrated instrument, using the **pre-calibration, dry pet food, solid (6.06008.027)**, make both the implementation and the application of NIR spectroscopy with OMNIS NIRS straightforward.

**Table 1.** Overview of time effort for the analysis of different parameters in pet food by traditional methods and NIR spectroscopy.

Parameter	Standard	Process	Estimated time
Moisture	ISO 6496	Oven drying	2.5 hours
Protein	ISO 5983	Kjeldahl method	4.0 hours
Fat	ISO 6492	Soxhlet extraction	4.0 hours
Ash	ISO 5984	Incineration	4.0 hours
Moisture, protein, fat, ash	ASTM D6122	NIR spectroscopy	1.0 minute

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## CONFIGURATION



### OMNIS NIR Analyzer Solid

固体および粘性の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 Solid の利点の概要:

- 10秒未満で固体サンプルと粘性サンプルを測定
- 不均質なサンプルでも再現性のある結果を得るための自動マルチポジション測定
- 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
- 多数のサンプル容器に対応

### OMNIS NIR100 mm

大型サンプル容器 OMNIS NIR、100 mm (6.07402.110) 用大型ホルダー。

サンプル容器の確実な配置と回転を可能にします。



### OMNIS NIR100 mm

様々なサンプル位置における反射中の粉末および顆粒のスペクトル記録のための大型サンプル容器。

次の製品と互換性があります:

- 大型ホルダー OMNIS NIR、100 mm (6.07402.100)



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## OMNIS

Windows™コンピュータ上の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。
- 他のコンピュータに移行することはできません。

## Quant Development

スタンドアロン型 OMNIS Software のインストールにおける定量化モデルの作成と編集のためのソフトウェアライセンス。

近赤外分光法による、家畜・愛玩動物用乾燥飼料中の湿気、プロテイン、脂肪、配分含有量の測定のための OMNIS プリキャリブレーション。