Analysis of Free Fatty Acids and Moisture in Greases Using the Diode Array 7200

Introduction

Compositional analysis of grease is vital to running a rendering plant and to formulating pet foods and feeds. The composition affects processing of the materials and selling & buying of this important ingredient thereby impacting profitability. Rendering plants can use the essentially real time analysis to monitor and control the process avoiding production of out–of–spec material. Pet food and feed plants can use the system to optimize formulation and cost control of ingredients.

The Near Infrared Reflectance (NIR) technique is particularly suited for measurement of poultry meal, but in the past instrument limitations have not permitted users to reap the full benefits of NIR. Sample preparation requirements such as grinding or special cups, and a small analysis area made analyses laborious, time consuming and error-prone.

Diode Array 7200

The DA 7200 is a new full-spectrum, NIR instrument designed for use in the feed and feed related industries. Using novel diode array technology it performs a multi-component analysis in only 6 seconds with no sample grinding or sample preparation required.

During this time approximately 300 full spectra are collected and averaged. As the sample is analyzed in an open dish, the problems associated with sample cups are avoided and operator influence on results is minimal.

Experimental

Approximately 100 samples with reference values were supplied by a large US rendering company. Spectral data was collected on a DA 7200 equipped with the Disposable Cup Module. With this module, samples can be analyzed in disposable plastic cups, thereby eliminating the need for clean–up after the analysis. Perten Instruments developed calibrations using Partial Least Squares (PLS) regression. Multiplicative Scattering Correction (MSC) was used as a data pre-treatment to improve the calibration models.

Results and discussion

The DA 7200 results are very accurate when compared to the results from the reference methods. Statistics for the respective parameters are presented in the table below and graphs are displayed on page 2.

| Parameter	Range	Samples	R^2	SECV*
Free fatty acids	0.6–34.8	101	0.95	2.1
Moisture	0.01–1.28	101	0.82	0.12

The differences between the DA 7200 and the reference method are of the same magnitude as typical differences between two different reference labs. The DA 7200 is more precise than the reference methods meaning that replicate analyses are much more repeatable and representative.

In summary it is concluded that the Diode Array 7200 can analyze greases for the aforementioned constituents. The large spot size and analysis area remove the effects of sample heterogeneity thereby producing more reliable and representative results. The speed allows users to easily and accurately analyze many samples a day in nearly real time.

Moisture

Moisture is an important control parameter at rendering facilities, and the DA 7200 predicted the moisture content of the samples with an accuracy which is higher than what is typical for the reference method.
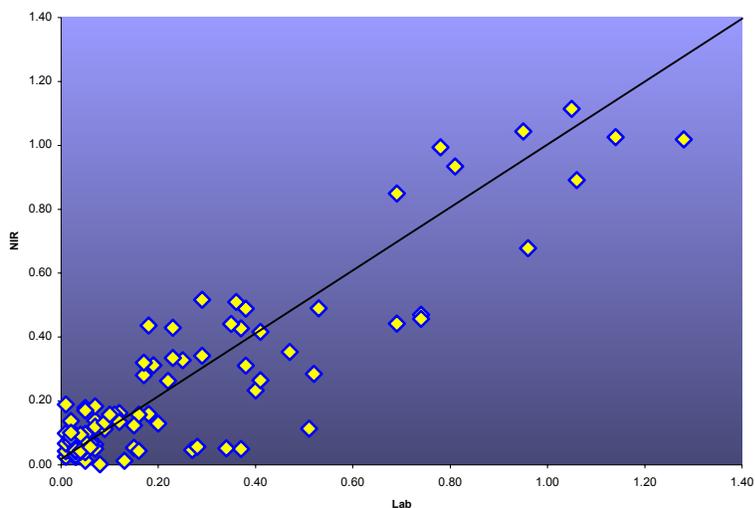
Free fatty acids

The DA 7200 performed very well across the wide range of free fatty acids. Both rendering companies and grease users will be able to benefit from the fast and accurate results of the DA 7200.

---
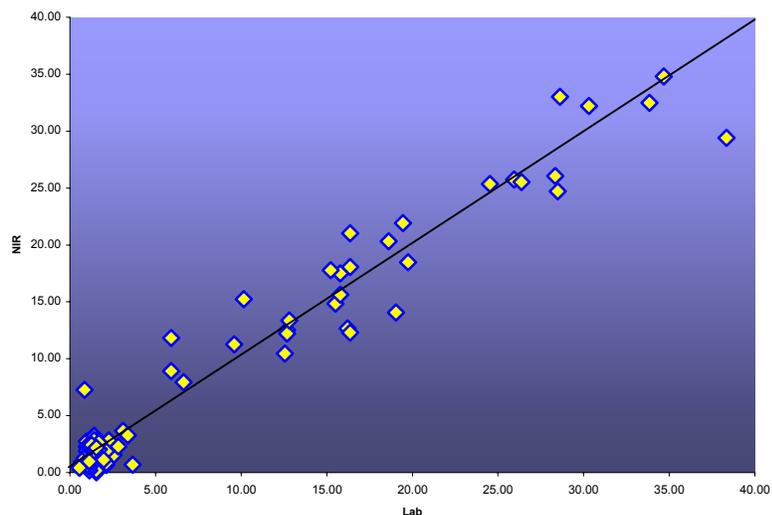
* SECV is the standard deviation between NIR and Lab data calculated in a way that describes the future performance of the calibration.