Polytec

NIR spectroscopy
for agricultural applications.
Application note

Quality control of grain and seeds

With over 20 years of experience, Polytec offers a comprehensive platform for analytical applications in the agricultural sector and provides turn-key solutions to agricultural businesses.

With Polytec's near-infrared spectrometers for grain quality testing, you can test product quality relevant parameters quickly, efficiently and cost-effectively. The system can be operated stationary at the laboratory as well as mounted on the harvester for mobile operation.

Wheat is one of the most widely grown crops in the world. Many years of research have continuously increased the quality and yield of wheat. New varieties of wheat, resistant to fungal infestation and adapted to climatic changes lead to steadily increasing production and quality. The following application can be followed for all common seeds such as rye, barley, maize, oats, etc.

Wheat grains consist of approx. 70% starch, approx. 14% water, 10-12% protein and approx. 2% fat. However, the quantities of the above-mentioned ingredients vary greatly, depending on the variety, fertilisation and water supply during the growth phase.

NIR technology is established in the seed industry as a laboratory reference method. The advantage of NIR technology is the non-destructive analysis of all parameters with a single measurement and without the use of environmentally harmful chemicals.

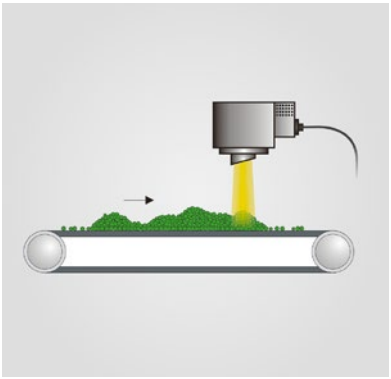
Continuous technical developments have led to the NIR technology being widely used in agricultural practices, i.e. directly on the field. Exhaustive sampling, long waits for results as well as costly and time-consuming laboratory analyses are no longer necessary. For this field of application, Polytec offers optimised solutions due to robust system design and the possibility to install probes at different positions in the harvester.

The near-infrared spectrometers from Polytec, optimised for laboratory and inline use

The Polytec Advanced Spectrometer (PAS) systems with optimised near-infrared spectral range and robust design enable the analysis of the composition of unprocessed grains as well as crushed and milled grains. In combination with chemometric techniques, NIR spectroscopy can be a simple, fast and accurate method for quantification of these parameters in cereals at any stage of the production process.

The analyses are carried out by using the reflection measuring head developed by Polytec, which is installed in the process via a shatterproof window. The reflection measuring head is connected to pipes or the outer wall of storage tanks.

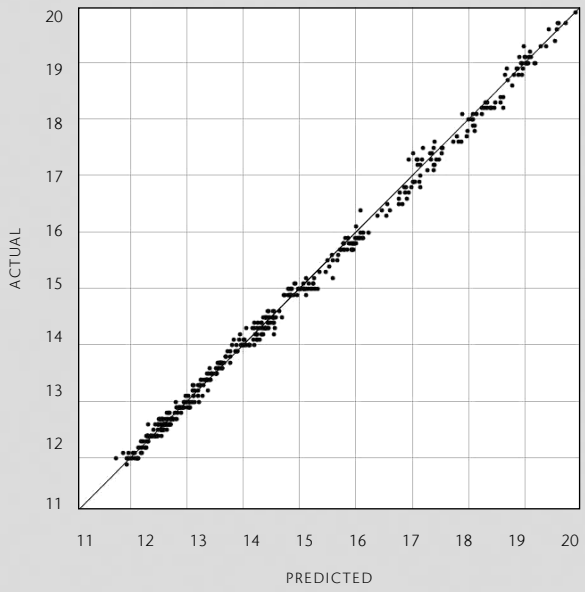
The distance measuring head enables measuring above the conveyor belt or directly in the collecting bin of the harvester. Thanks to the installation above the bulk material, direct contact with the sample is avoided. Both measuring heads can be easily adapted for use in the laboratory and thus guarantee full flexibility in the application.



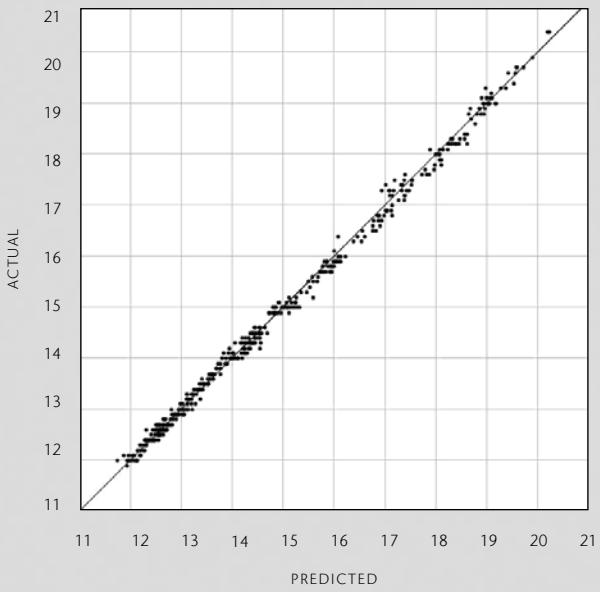
Parameter	Min (%)	Max (%)	RMSECV
Moisture	11.9	24.1	0.1391
Protein	7.8	14.6	0.2650

Min: Minimum reference value in the calibration data sets.
Max: Maximum reference value in the calibration data sets.
RMSECV: Root mean square error of the cross-validation for the calibration data set.

Moisture in wheat



Protein in wheat



Use of NIR technology directly on the harvester

Polytec's NIR spectrometers for direct use on the harvester enable the analysis and determination of the composition of unprocessed wheat grains directly in the field. Parameters essential for harvesting and further processing, such as moisture and protein content, are displayed on a monitor directly in the driver's cab. This allows the driver to respond quickly to deviations and focus on the analysis results when harvesting different fields and wheat varieties. Due to its small diameter and compact design, the measuring head can be easily integrated into the vehicle and the basic spectrometer can be safely accommodated in the driver's cab in a space-saving manner.

Advantages of NIR technology:

- Modular concept for convenient integration and safe operation
- Reproducible system setting through internal, fully automatic referencing
- Sample presentation with working distances up to 500 mm
- Direct connection to field management software packages
- Automatic assignment of logistic information
- Improved measurement accuracy through standardisation and filtering of spectra
- Comprehensive data output including measurement uncertainty and outlier diagnosis

Results displayed in the driver's cabin

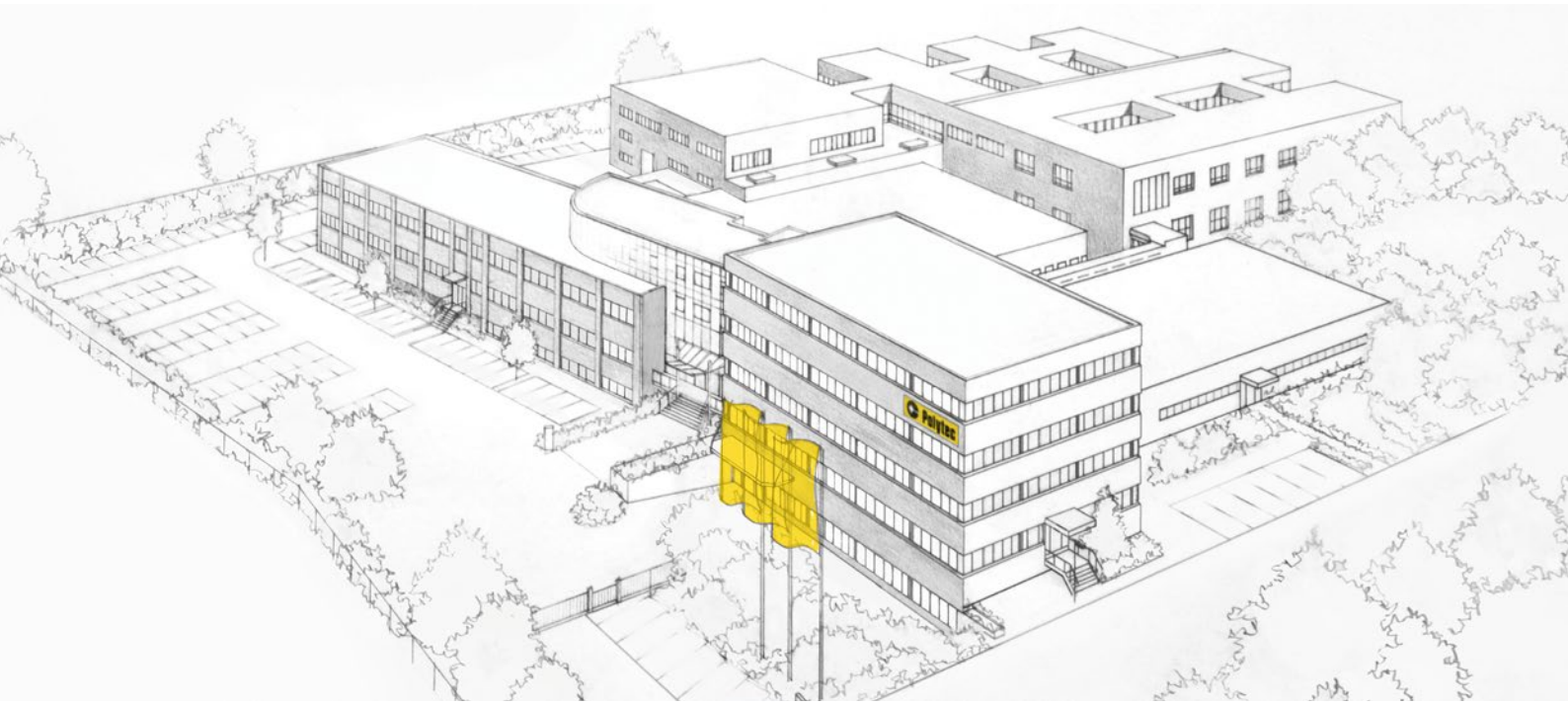
Support with application and calibration

Polytec's application team has comprehensive knowledge of instruments and applications. Our specialists are at your disposal to support method development, either remotely or in your production area.

Service and maintenance

With many years of experience in NIRS technology, Polytec's inline spectrometer series is designed to provide years of trouble-free operation. However, should a problem appear, a worldwide network of Polytec companies and representatives are available to help you and and solve the issue. We are committed to professional installation and offer a high standard of service after delivery to all our customers.

Contact measuring head integrated in collecting hopper of the harvester.



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