

Feed Milling Industry Analytical Solutions

Charles Loubersac d'Hotel
Managing Director, Perten Instruments
(France)

IAOM-MEA Capetown meeting
Sat. dec. the 3rd 12:20 – 12:45

Who are we ?

Specialists in quality control of grain, flour, food and feed





FUNCTIONAL ANALYSIS

- Falling Number™
- Glutomatic™
- Lab mills
- DoughLab
- RVA
- Texture analyser TVT
- Bread volumeter BVM
- Hardness SKCS

COMPOSITIONAL ANALYSIS

- DA 7300 In-line
- DA 7400 On-line
- DA 7250 At-line
- Aquamatic AM 5200
- Inframatic 8600/9500/8800

What we do?

What for ?

Our customers require us for their Quality Control in :

Flour milling, grain storage & trade, baked goods & snackfoods, dairy, meat processing, oilseeds processing, petfood, starch production, seed breeding, wood panels/composites & resins, tobacco...

They trust us because we create innovative tools and rely on a long term legacy

- **40 years NIR experience**
- **Approx. 20.000 NIR systems world wide**
- **Lab, In-line and On-line NIR Analyzer**

Global Expertise – Local Support





This is Why I am here.....

QC in Feed milling industries. Reminders...

- The goal is to make the right feed for a dedicated animal.
- Right feed at the right price : a balance between availability of raw materials, price, and the right formula for a dedicated animal.
- Quality aims for consistency in production with the optimized fomulation
- Optimized formulae are determined by nutritionists.
- In MEA countries, feed mills are often a complementary business for flour millers
- The main components in the feed are byproducts of the milling business.

QC in Feed milling industries. Reminders...

- Feed millers sell animal feeds with very well defined nutritional content. Protein, fat, fiber, starch etcetera ... all need to be within very tight limits in order for the animals to grow at the right pace.
- The optimal contents are different for different animals such as pigs, poultry, cows or fish, and also different at different stages in the animal's life. All in all it's not uncommon for a feed miller to produce 100 different feeds.

QC in Feed milling industries. Reminders...

- To produce these, the feed miller mixes raw materials such as grain, grain byproducts, oilseed meal, amino acids, vitamins and other additives.
- The trick for them, in order to be profitable, is to mix the right proportions and use as little as possible of the expensive high protein ingredients such as oilseed meal, fish meal or distiller's dried grain.
- This is done by analyzing the major raw materials to determine the composition, which makes it possible to calculate the most efficient mix – Least Cost Formulation is the term used by the industry for this.

Managing a feed mill from a QC point of view requires :

- Know feed formulation constraints of feed ingredients and how to purchase them
- Know the fundamentals of feed quality assurance
- Know good feed manufacturing practices and feed manufacturing regulations
- Understand the appropriate uses of feed additives and feed product enhancers
- Know how to formulate animal feed premixes, concentrates and complete feed products
- Understand the fundamentals of least-cost feed formulation and parametric analysis
- Know the different feed products required for each animal species and how to design feed formulations

Feed Quality Assurance

1. Nutritional analysis of feedstuffs and feed ingredients
2. Ingredient purchasing
3. Ingredient Quality Assurance
4. Feed Processing Quality Assurance
5. Finished Feed Quality Assurance

SO : you need a lab for wet chemistry, testing all, all the time, internally or outsourced.

This is protein (Kjeldahl or Dumas), fibers, starch, oils (Soxhlet), moisture ovens, muffle furnace for ash, precision balances, HPLC if amino acids, etc...

Plus some well trained personnel, lots of chemicals, lot of time, lot of money.

Analysis where you need it most :

- Incoming ingredients
- According to their availability and price,
- Rapid, in time, full compositional analysis, in order to formulate effectively
- Control the process & intermediate
- Control every end product to check specifications & consistency.

An NIR instrument is a very good investment for all feed millers with a yearly production of at least 25,000 tons and can be a good investment also for smaller sites.

Economic benefits

- Improved ingredient testing
- Improved Least Cost Formulation
- Optimized drying
- Optimized fat addition
- Decreased lab costs
- Improved consistency (consistency IS you quality)



What can NIR analyse ?

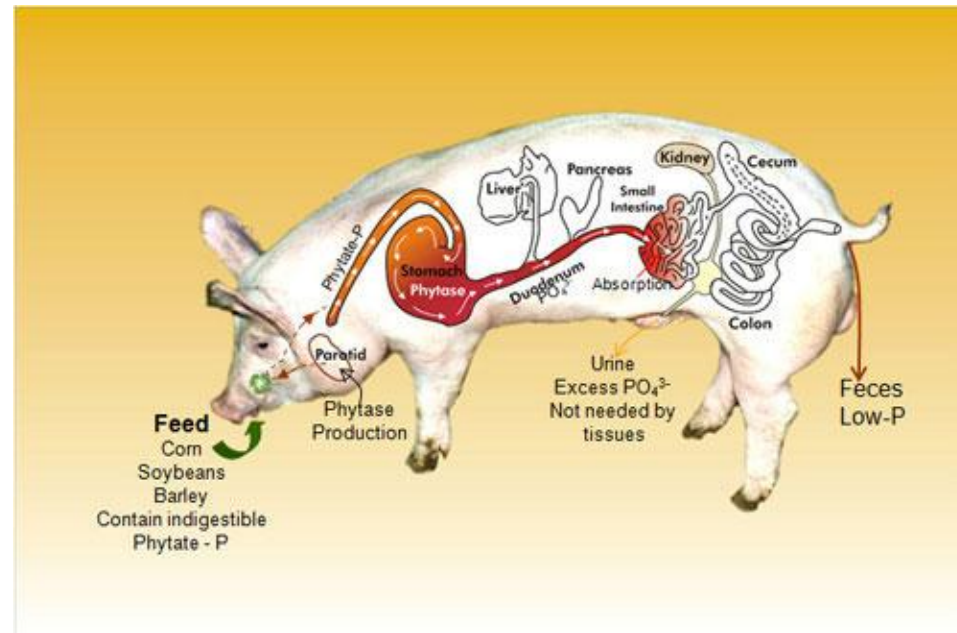
- Moisture, Fat, Fiber, Starch, Energy, Ash, Amino acids...

Why Near-Infrared (NIR) Spectroscopy is relevant

- Avoids a big lab
- Saves times & money
- Improves repeatability of the results
- Enhances flexibility
- Allows testing of much more, much faster than before

But it depends on :

- **The right instrument**
- **The right calibrations**
- **The right service**



How accurate is NIR?

- Reference methods dictate :

- Moisture	Acc. 0.2%	Time 2-6 h
- Protein (Kjeldahl)	Acc. 0.5%	Time 2-4 h
- Protein (Dumas)	Acc. 0.2%	Time 10-20 min
- Ash	Acc. 0.04%	Time 4-6 h
- Oil (Soxhlet)	Acc. 0.3%	Time 2-4 h
- Starch	Acc. 0.6%	Time 2-4 h
- NIR accuracy is quite similar comparing to the reference methods, but it's much faster!

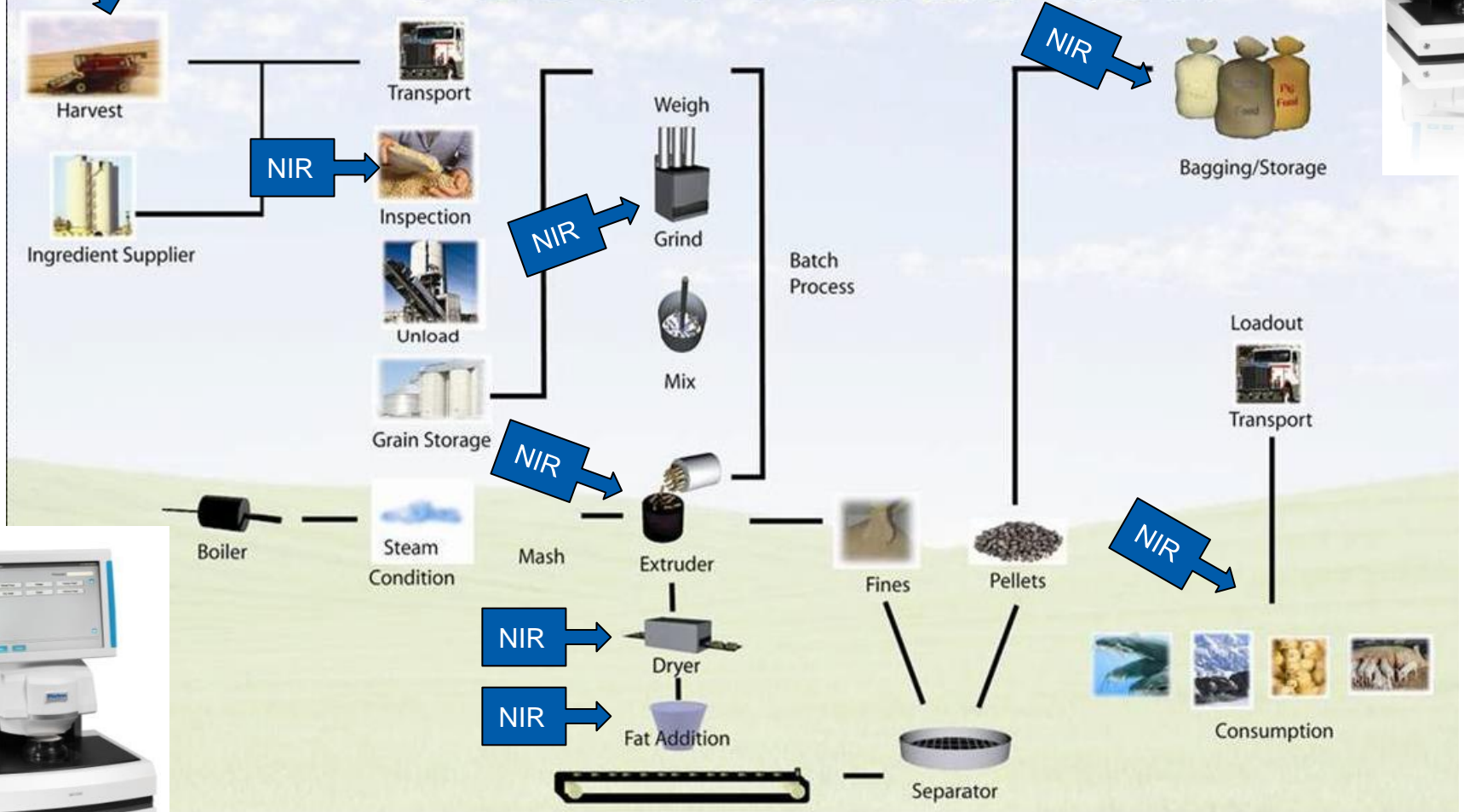
NIR is a Mature Technique

Used for about 35 years in agriculture

- Filter Instruments – 40 years old
- Scanning monochromators – 35 years old
- Fourier Transform (FT) – 25 years old
- Diode Array – 20 years



Feed Production



Where NIR can be used ?

User requirements

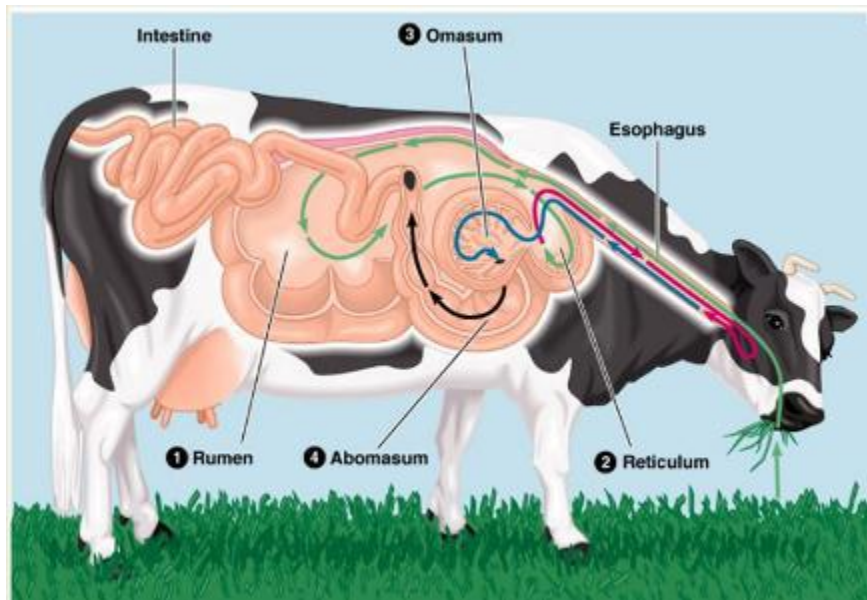
Analyze samples as they are

If samples are analyzed in their natural shape and condition, time is saved and analysis results are not influenced by sample preparation such as grinding or operator errors



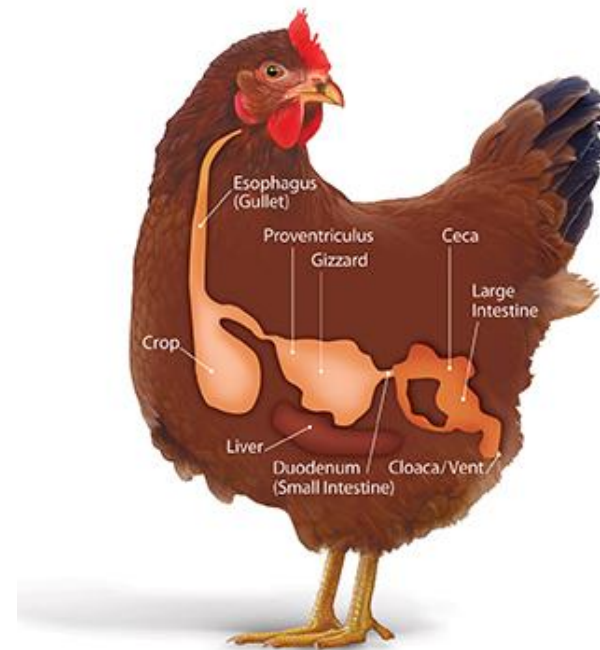
Rapid analysis

- Time is often important, and the less time spent waiting in front of an instrument, the better
- Some types of samples change so quickly that they must be analyzed in seconds, not in minutes.



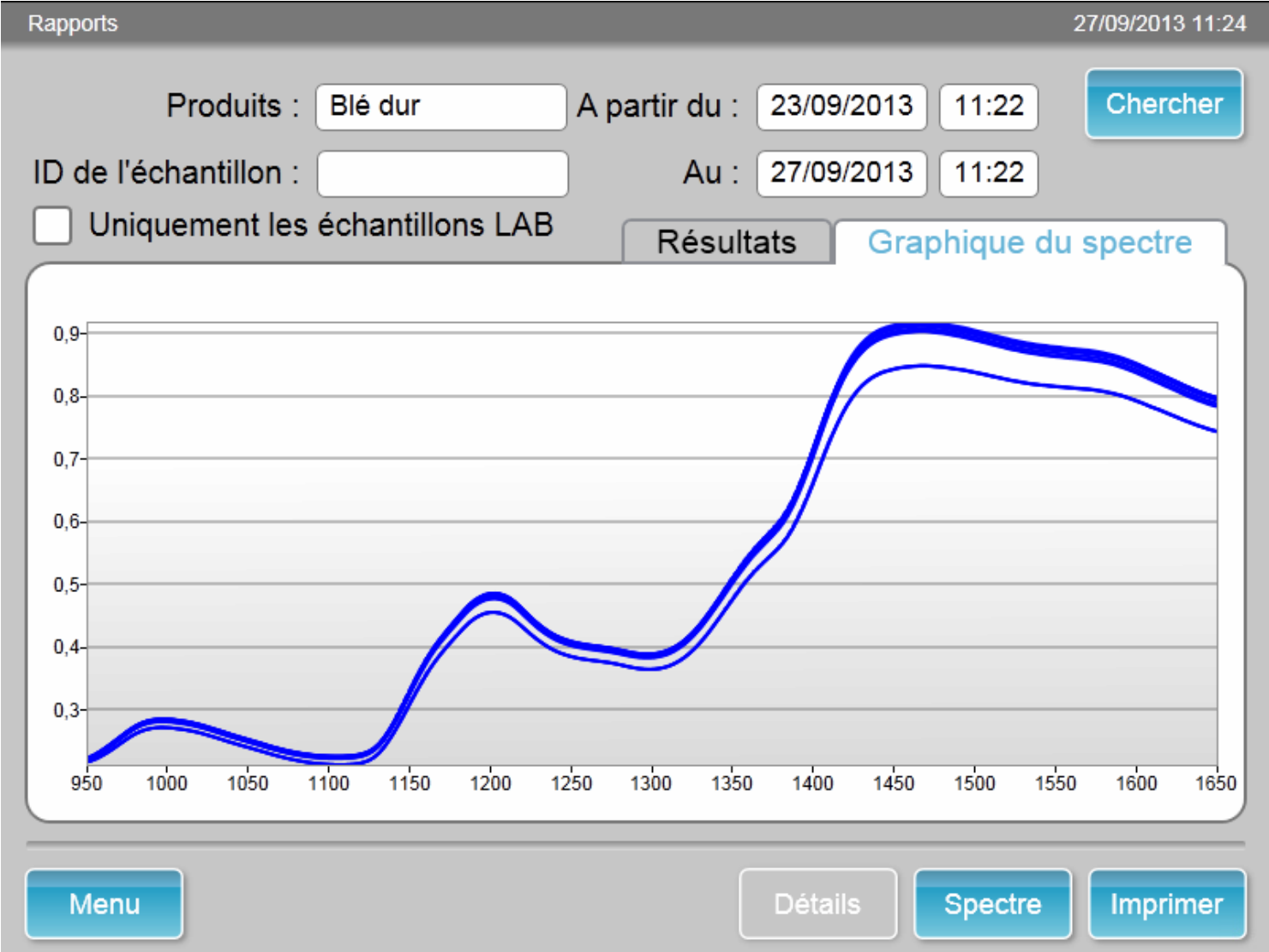
Non-contact analysis

- Any glass surface in contact with the sample introduces potential errors
 - Finger prints
 - Scratches
 - Sample cross-contamination



Few spectroscopy facts

Spectrum from high detectivity sensor



System requirements

Critical characteristics

- Very good S/N ratio on shorter wavelengths
- No glass touching the sample
- Analysis of large sample surface in only seconds



Perten Instruments experience in Feed NIR

Perten NIR portfolio

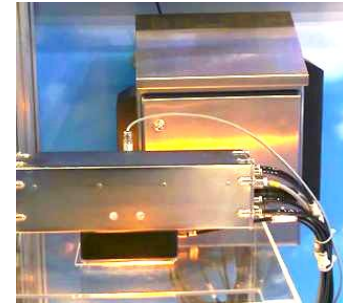
- Diode Array (DA) Technology
- Same technology platform



DA 7250 At-line
system



DA 7300 In-line
system



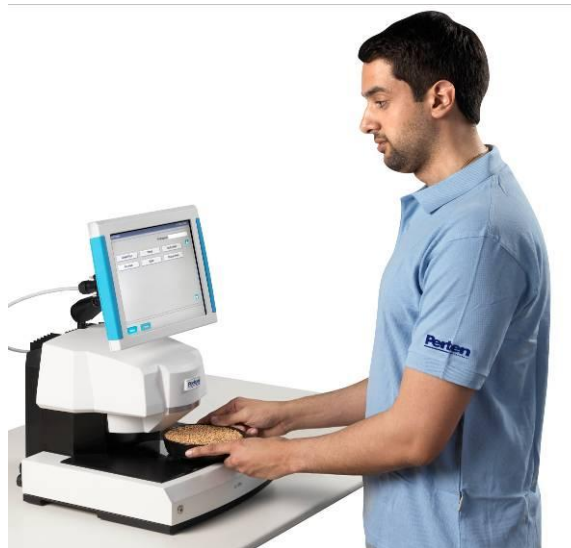
DA 7400 On-line
over belt system

DA 7250 : 3rd generation Diode Array!

Same Platform for the lab & the process

Lab/At-line – Online – Inline

All maintenance, service, software, calibrations are the same
EASIER



DA 7250 At-line system

Advantages:

- no preparation
- 6 seconds
- non-contact
- no cleaning



DA 7250 SD



DA 7250 At-line



Applications:

Flour, meal, pellets, snacks,
pasta snacks, extruded products,
cheese, meat, meat products,
liquids, ...



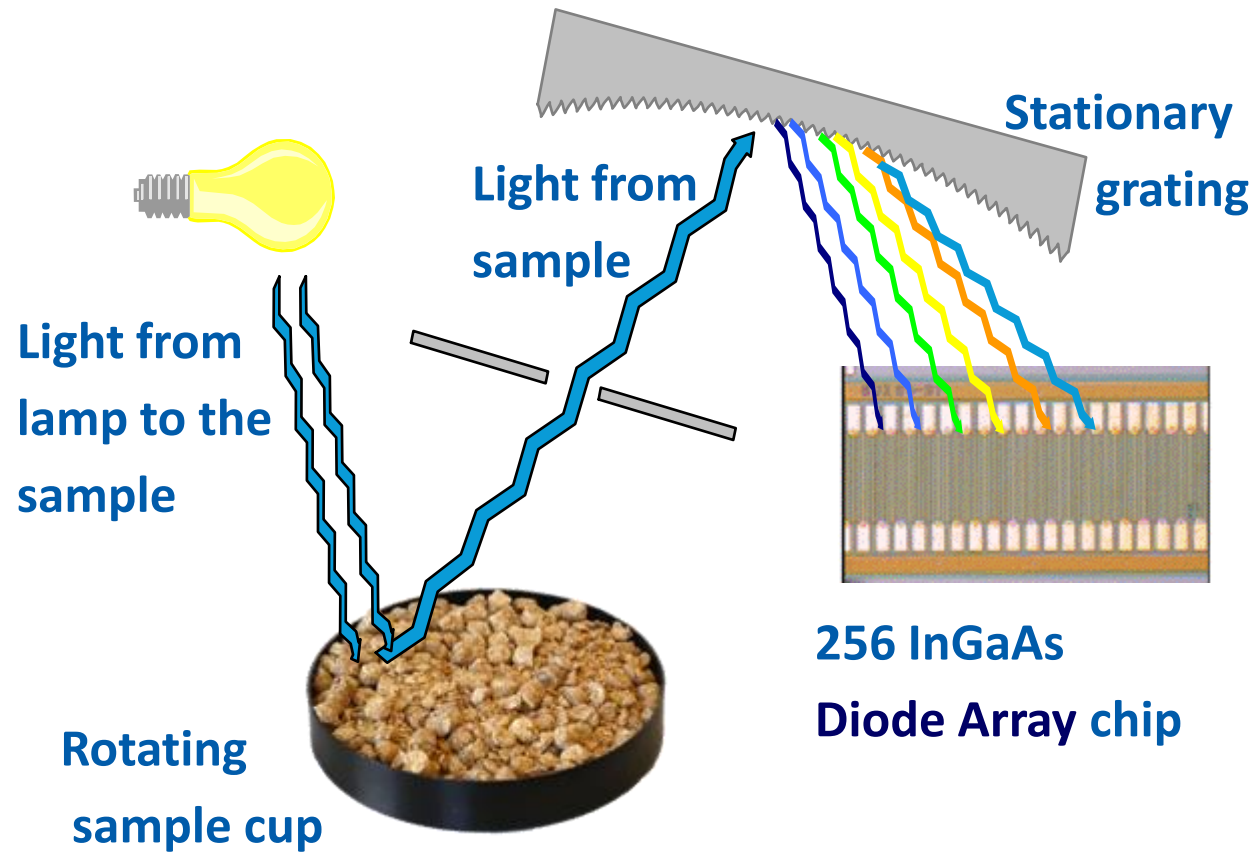
DA 7250 specifications

DA 7200 at-line & DA 7300 Online system:

- Diode Array (DA) Technology
- Same technology platform (256 InGaAs detector)
- Same wavelength range 900 – 1700 nm
- Outstanding stability (automatic baseline)
- Low cost of ownership & maintenance
- OPC server, VPN tunnel, Team Viewer available
- Calibration transfer to Online system possible



System without moving optical parts



USE

DA7250 use requires no training.

The easier the use, the less errors in the manipulation leading to a more precise result

Three steps:



Pour the sample in the dish. No sample preparation.



Select the product to analyse from the list on the screen



Place the sample cup on the DA7250.
Test begins and result is displayed in 6 sec.

DA 7250 At-line system

Networking software: *ResultPlus*



Administrator



ResultPlus - Server



Accurate Analysis:

**Anything
Anywhere
Anytime
Anybody**



DA 7250 NIR

Anything

Any type of sample. Pellets, powders, grains, slurries & pastes, pasta, greases, oil, liquids and more...

- **Short wavelength optimized for Agri products**
- **Large sample surface analysed**
- **Open dish presentation**
- **Large range of calibration packs available**



Anywhere

Dedicated to the lab but also to the manufacturing process area

- **Fully protected, IP65**
 - No fan IP65 – no dust at all,
 - No foreign material can damage the device
 - Magnetic dish rotation
- **Resistant to vibrations**
 - No moving opticals. Maintenance free
 - SSD drive. Far more reliable than HDD
- **Temperature range 5 to 40°C**
 - Stable temperature of optics



Anytime

- **Self checking of the wavelength scale by a 7 peak Xenon lamp reference. No adjustment required. No normalization required**
- **Flexible operation with no cleaning between samples. No cross contamination**
- **6 seconds test with quick data collections/exports**



Anybody

The user can be either the lab technician or any of the production personnel

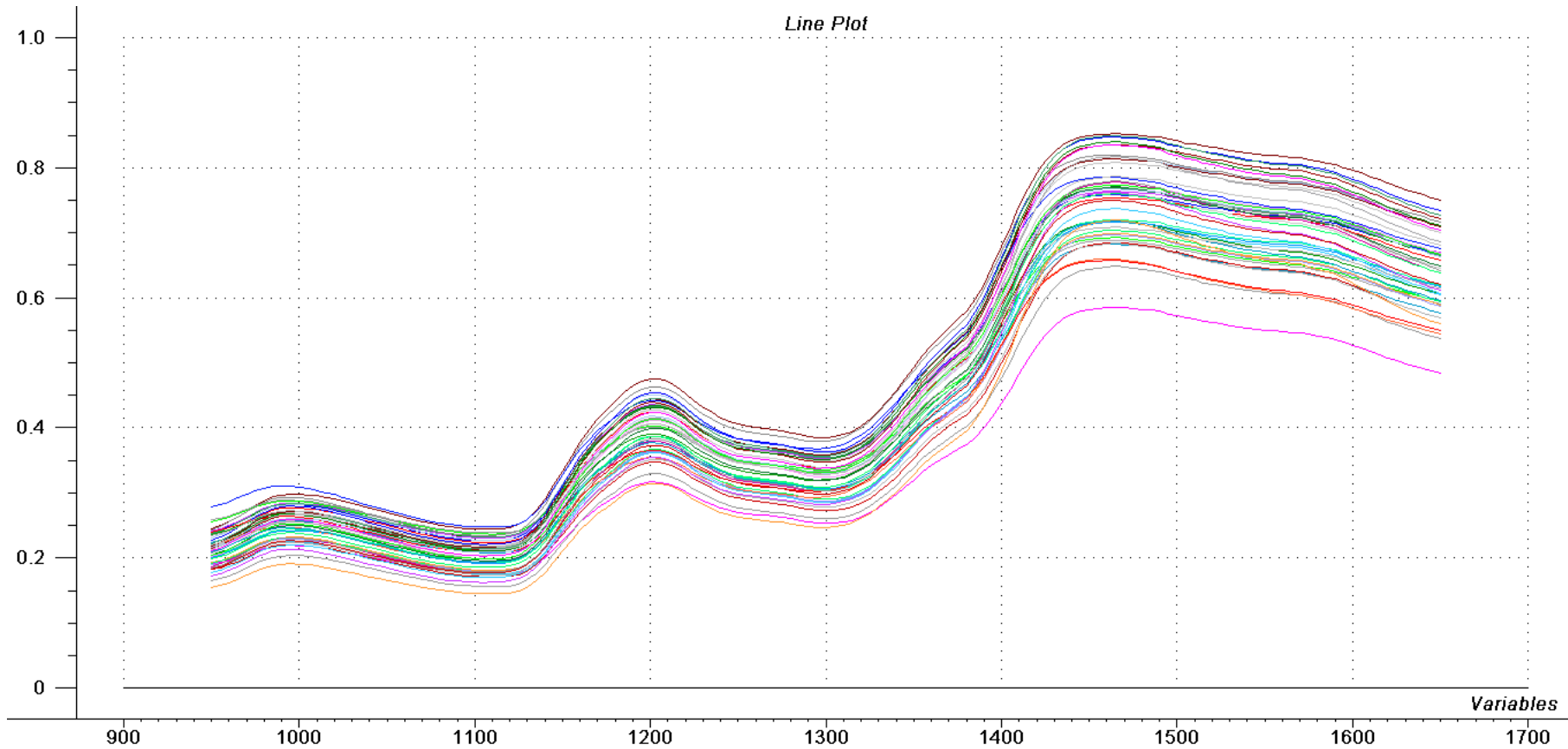
Any operator can supply a precise & reproducible results

- **Very little manipulation of the device**
- **Touch screen with a very intuitive software**
- **Stand alone device - No computer required**



Calibrations

Calibrations : what is it ?

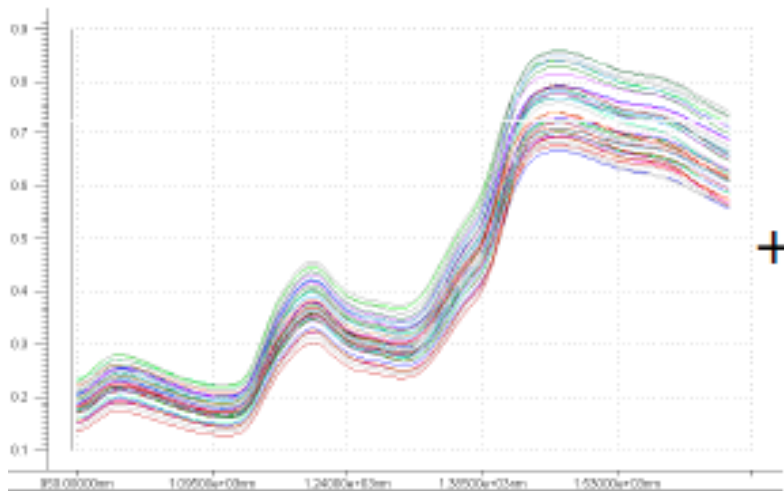


950 - 1650 nm

NIR = Chemiometrics

n valeurs laboratoires

n spectres infrarouges

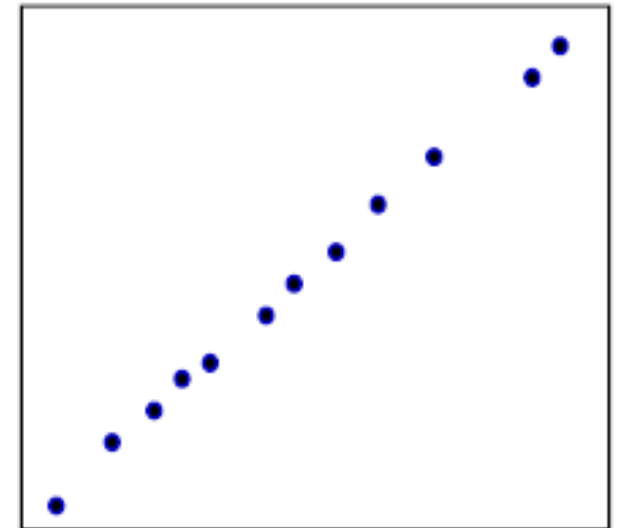


+

Val 1
Val 2
Val 3
Val 4
Val 5
Val n

=

N
I
R



LAB

Perten Calibrations

- **We have an available library of calibrations, the largest in the Agrifood industry**
- **With databases which include more than 150 000 reference samples**
- **This allows to basically “plug and play” our calibration to your need by simply adjusting it with your reference samples and our support. We have an absolute transferability of our calibrations between devices.**



Perten Instruments' Feed and Petfood Calibration Package

Ingredient calibrations

- Robust, proven calibrations are available for all major feed ingredients: grains, grain by-products, oilseed meals and other protein sources. Calibrations are for unground samples.

Finished feed calibrations

- We have proven matrix calibrations available for all major feed types. Generally poultry and pig feed would be analyzed by our Monogastric Feed Calibration, and cattle and other ruminant feed by the Ruminant Feed Calibration.

Local Calibrations ?

Local

- Some Raw materials are purchased locally. They often form the major component of the final feed.
- Purchased locally from local agro-industries or byproducts from the flour miller
- Africa has its own specific raw materials: peanut meal or hulls, cotton seeds meal or hulls, sorghum & millet, local fish meal, rice flour, palm oil or meal, molasses, copra meal...
- Very dedicated NIR calibrations are required. Tailor made !
- EU/US companies supplying calibrations are often have no experience in these African products

The « *locked in* » process

- With no experience in the calibration process, feed mills are relying on international companies that sell calibration packages together with the supply of their ingredients, improvers and formulations for a contractual period.
- They are basically making big money out of you.
- We believe, with little training, our customers can be able to manage their own calibrations.
- With no « locked in » calibration/ingredient supplier
- You manage your formulation process and buy from whomever you want for your improvers and ingredients at the best market price.

Service

- Device and calibrations need to be serviced
- Contract-based maintenance with different levels
- Calibrations are enhanced according to the raw materials evolutions
- New calibrations can be implemented any time
- Distance connection is the key.
- Perten is well acknowledged for the excellence of its customer service.
- Our international level of expertise is servicing your local, tailor-made needs.

QC in Feed milling industries. Take aways...

- Flexible use from raw material to end products
- Process monitoring and control
- Real-time understanding of the production process
- Reduction of lab cost
- Anytime, Anywhere, Anybody, Anything
- You are enabled to look after yourself with no « locked-in » contract for calibration expertise or ingredients supplier



ANALYSIS WITH VALUE

QUESTIONS ?

BREAD IS LIFE

