

FOSS

ADVANTAGE OF UTILIZING NIR IN RAW MATERIAL QUALITY ASSESSMENT

ANALYTICS BEYOND MEASURE

Himanshu Saxena : Short Introduction

FOSS

Education:

Masters in Food Engineering
(APJ Abdul Kalam Technical University, Lucknow)
Executive Program in Sales and Marketing
(IIM Calcutta)

Current Employment: With Foss, Since 1st November 2017

Present Location: New Delhi

Responsibility: ISM-Feed & Forage (Indian Sub-Continent)

Professional experience : 15+ Years in Analytical instrumentation in field of Food and Agri.

Major areas of expertise: NIR Spectroscopy.



Harshita Joshi: Short Introduction

Education:

B. Tech – Electrical and Electronics Engineering

Banasthali University, Rajasthan

Schooling: St. Mary's Convent Nainital**Current Employment:** With Foss India, Since 1st November 2021**Present Location:** PUNE**Responsibility:** Marketing Manager**Professional experience :** 4+ years in product marketing and Marcom.
Previously worked with Schneider Electric India Pvt. Ltd.

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QUALITY CONTROL IN POULTRY INDUSTRY

ANALYTICS BEYOND MEASURE

ROLE OF QUALITY CONTROL LABORATORY IN FEED OPERATIONS

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Minimize re-works and Process losses

Meet end customer specifications

Fair Payments

Comply Govt. regulations

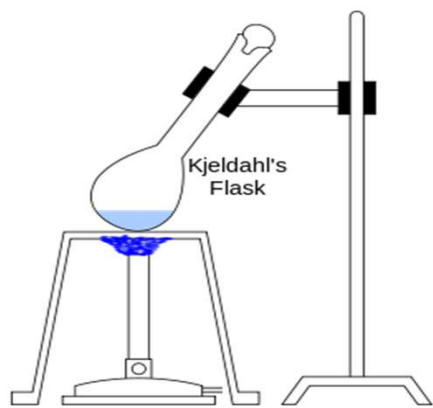
Raw Material Quality Control & Segregation

Product Quality and Brand Creation



DIFFERENT TYPE OF LABORATORY SET UPS

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- Basic Glassware Assembly
- Low initial setup cost
- Suitable for Smaller companies with very low volumes
- Serve Compliance objectives
- Need Highly skilled Lab staff

- Semi- Automatic Instruments
- Medium initial set up cost
- Suitable for Tier 2-3 companies with sample loads of >20 samples per day
- Ease of Use, Safety
- Reduce turnaround times by over 5 times.
- Lower consumption of chemicals and power.
- Compact, Lower Footprint
- Separate instrument for each analysis

- Advanced Labs with NIR and other advanced Analytical tools
- High Initial Set up cost
- Suitable of bigger and Growing companies
- Instant results
- Negligible Running costs
- High ROI
- Can be used in combination with or to replace Chemical Instruments
- Multiple parameters in 1 test.

CHALLENGES WITH WET ANALYSIS

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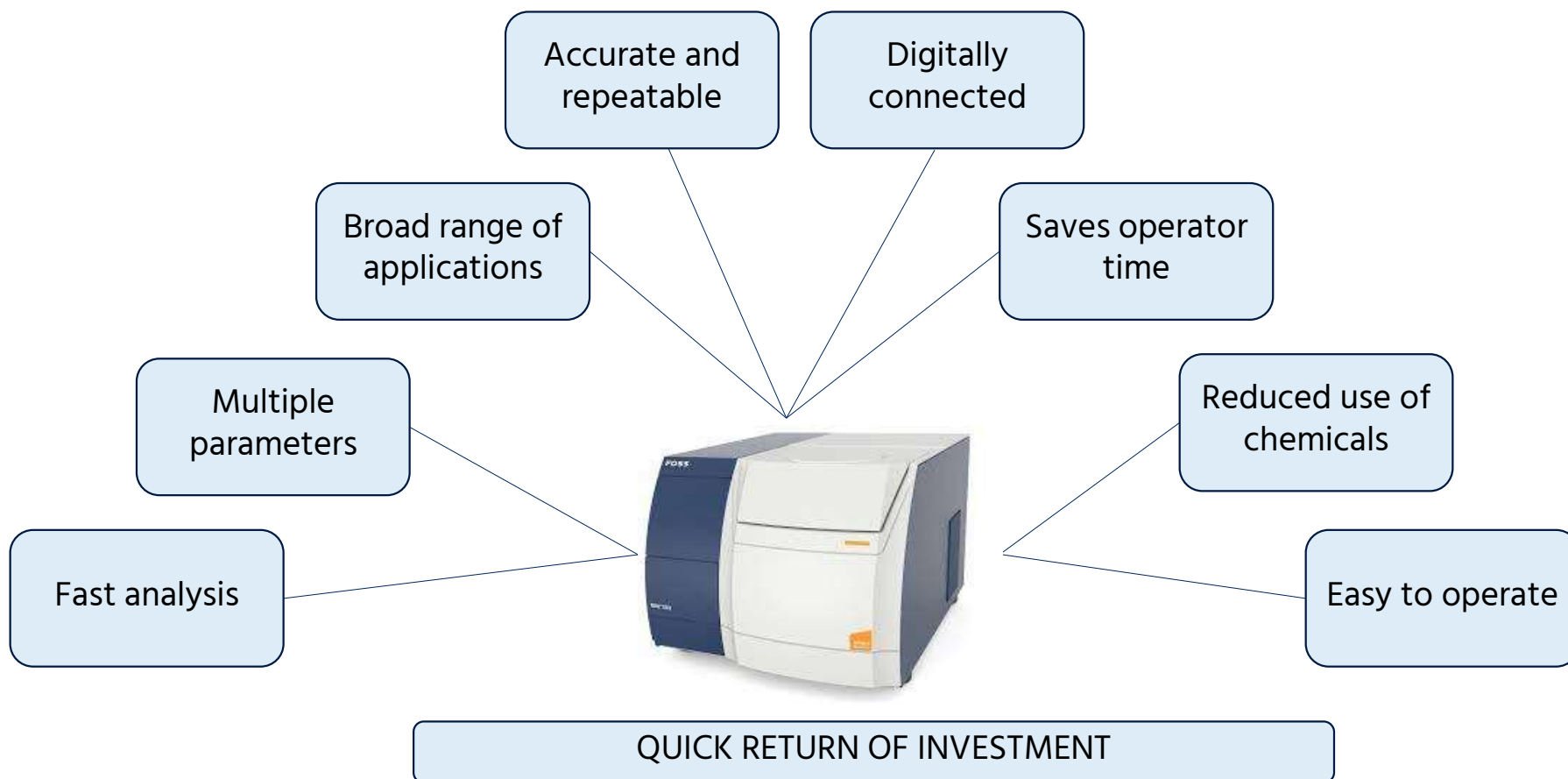
ANALYTICS BEYOND MEASURE



BENEFITS OF NIR OVER CHEMICAL ANALYSIS

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ANALYTICS BEYOND MEASURE



NIR APPLICATIONS/UTILITY IN FEED

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Applications

- Vegetal Ingredients
 - Vegetal By-Products
 - Cereals and Grains
 - Vegetal Protein Meals
- Animal by-products
- Fish and Fish Meals
- Meat and Meat products
- Food Ingredients and processed Foods
- Finished Animal Feeds
- Various Edible Oils/Liquids/slurries,

Parameters

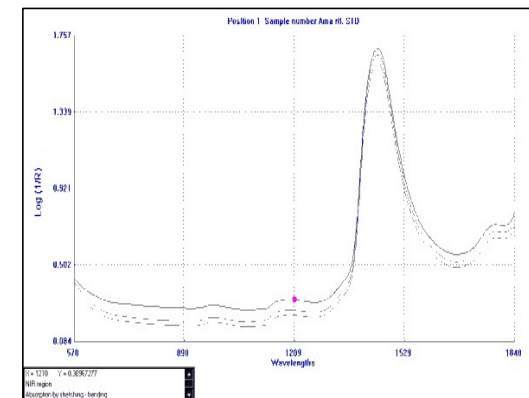
- Protein
- Moisture
- Fat
- Ash
- Fiber
- Starch
- FFA, IV, PV, SV in Oils
- Fatty Acid Profiling
- Amino Acid Profiling
- Calculated parameters
- Many More

FOSS global ANN calibrations are comprised of thousands of samples from a large variety of raw materials. Therefore, you can use new types of raw-materials and source from new locations without changing or updating the calibration

NIR: WORKING PRINCIPLE

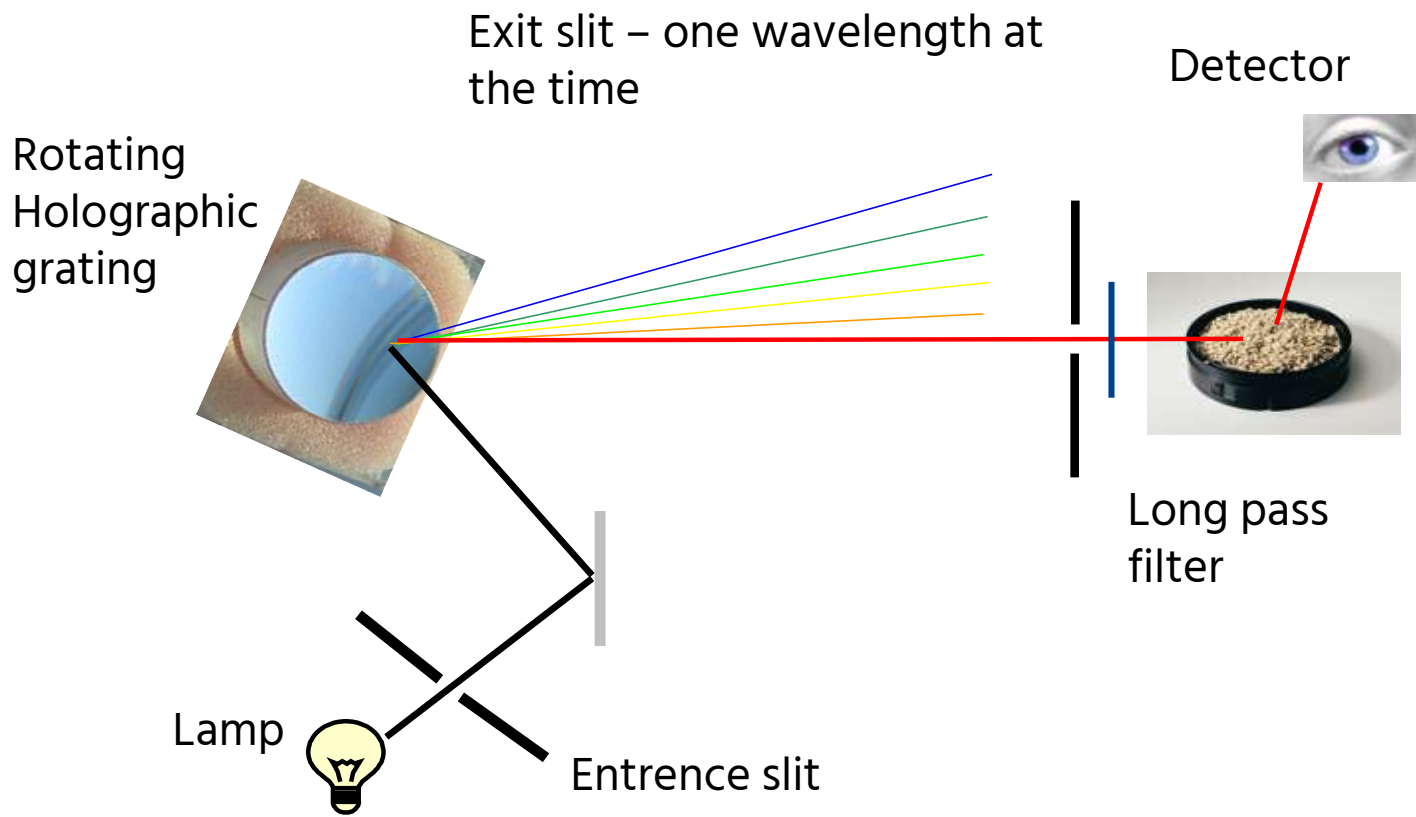
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- Near Infrared technology is based on a combination of sophisticated spectroscopy and powerful mathematics
- Near Infrared light is directed onto a sample
- Reflected light is modified according to the composition of the sample and the NIR instrument generates a "scan"
- The scan is interpreted by the calibration model and the results are predicted
- The reliability of the results depend on the quality of the NIR instrument and the quality of the calibration



PRE-DISPERSIVE MONOCHROMATOR BASED NIR SPECTROSCOPY

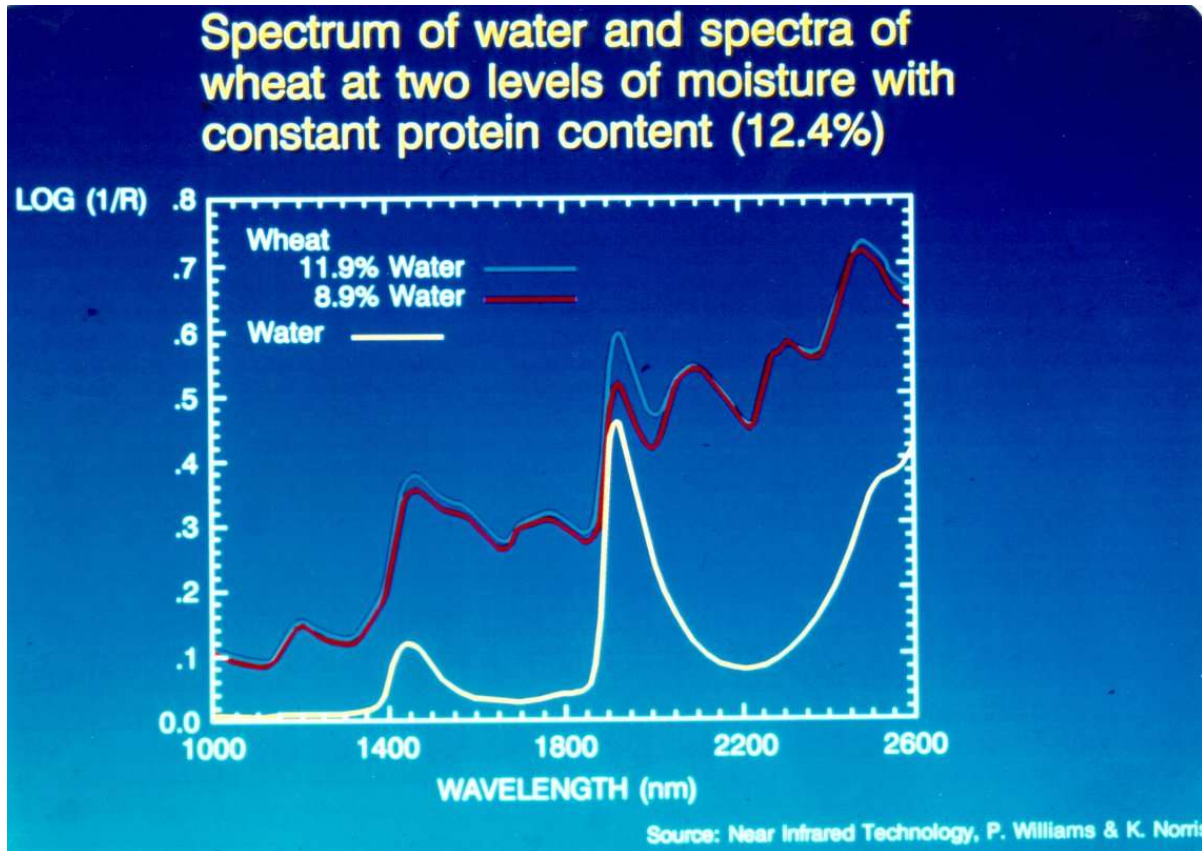
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- Tried and tested technology
- Full Wavelength Options
- Better performance
- Most Suitable for Feed Applications
- All sample types
- High Cost

THE SPECTRUM (ABSORBANCE PATTERNS)

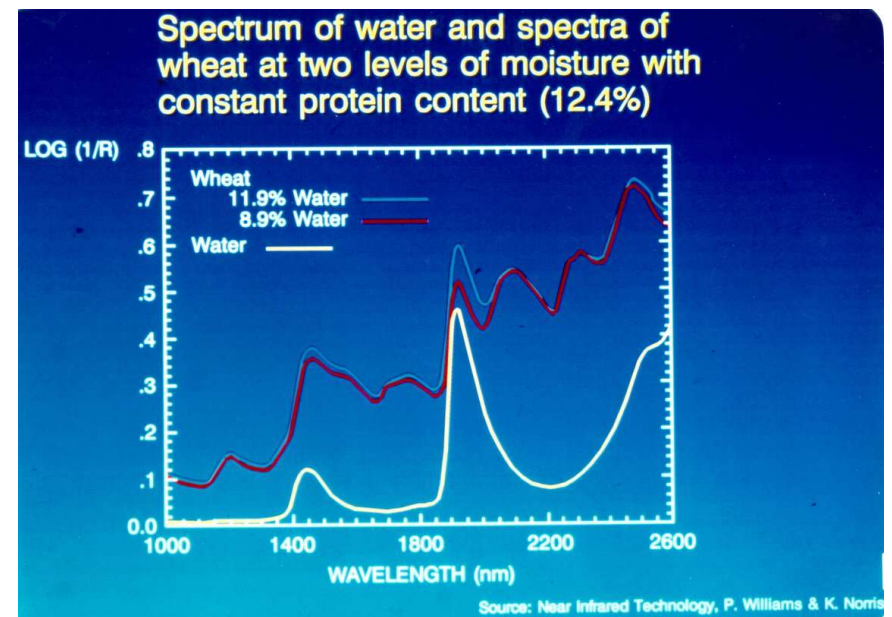
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HOW GOOD IS THE NIR?

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- NIR is an empirical method
 - The NIR instrument needs to be trained to recognize different parameters and concentrations.
1. Analyze a set of samples with reference method and NIR
 2. The data is combined in the calibration software
 3. A calibration is developed.



WHAT IS A CALIBRATION?

FOSS

- An equation describing the relationship between the absorbance at specific wavelengths and the composition of the sample
- In its simplest form it will look like this (Multiple Linear Regression):

$$\text{Moisture} = 13.6 + 87.7 * (\log 1940) - 86.3 * (\log 2310)$$

$$Y = C_0 + C_1 * A_1 + C_2 * A_2 + \dots + C_n * A_n$$

Calibration Techniques include ANN, PLS, others

WHO DEVELOPS CALIBRATIONS?

FOSS

- NIR Companies (FOSS) offer calibrations for Proximate parameters. With over 200 installations in India, Foss has a robust NIR database for poultry Industry for a range of proximate parameters.
- Feed Additive companies also offer their own calibrations, especially for Amino Acids.
- Other third party organizations (labs/institutes) may develop and offer NIR services. Eg. Agrivet
- Customers develop their own Calibrations using Calibration development softwares..

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NIRS™

**AN ECONOMIC TOOL FOR
POULTRY INDUSTRY**

ANALYTICS BEYOND MEASURE

VOLATILE CONDITIONS IN FEED INDUSTRIES



Extreme climate conditions with extended drought or heavy rains affect raw material availability, quality and prices



Growing focus on animal nutrition and how improvements in feed composition can increase feed conversion rates



Digitalization offers new ways for to engage with partners and also more efficiently manage processes across operations

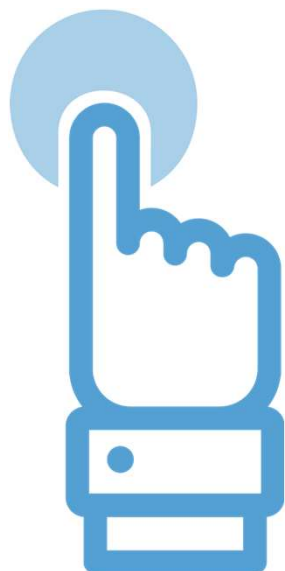


Globalisation and growing regional competition challenge profitability and put additional focus on driving efficiency gains in operations



**THROUGH DISCUSSIONS WITH
INDUSTRY PROFESSIONALS**

**WE HAVE IDENTIFIED THREE KEY AREAS
WHERE NIR TECHNOLOGY
CAN MAKE A DIFFERENCE:**



Faster Analysis

"We need test methods to be fast and with low unscheduled downtime so that we can always optimize the quick processes in feed"

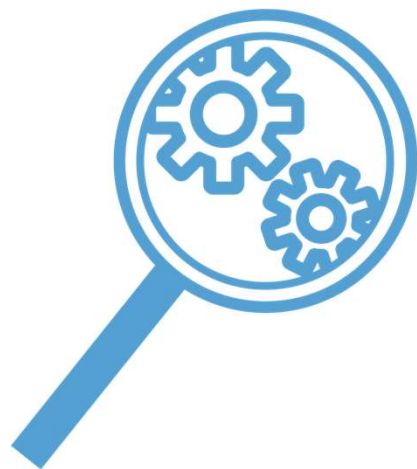
Reference methods take a long time and also consume many chemicals. NIR methods are fast but also needs to be easy to use by the persons needing the information and with lowest possible downtime so that the necessary data for optimizing operations can always be obtained.



Results you can trust

“We must have accurate methods and results than can be trusted when dealing with suppliers and customers on quality issues”

Having highly accurate and reliable results allows to better pursue claims towards suppliers which in many case can provide very fast pay-back on the investment. It also enables producing much closer to product specification to avoid giving away costly raw materials.



Smart data management

“Generating data is not enough. We need to make sure we can easily access and integrate the data with our other solutions so that we can better benefit from our analytical work”

Companies look for opportunities to access and manage data across operations to run operations more efficiently. At the same time, digitalisation offers opportunities to make integrate solutions and customize data-flows to suit the organisations needs

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NIRS™ DS3

**ADVANCED FEED
ANALYSIS FOR
EVERYONE**

ANALYTICS BEYOND MEASURE



A SmartAnalytics solution

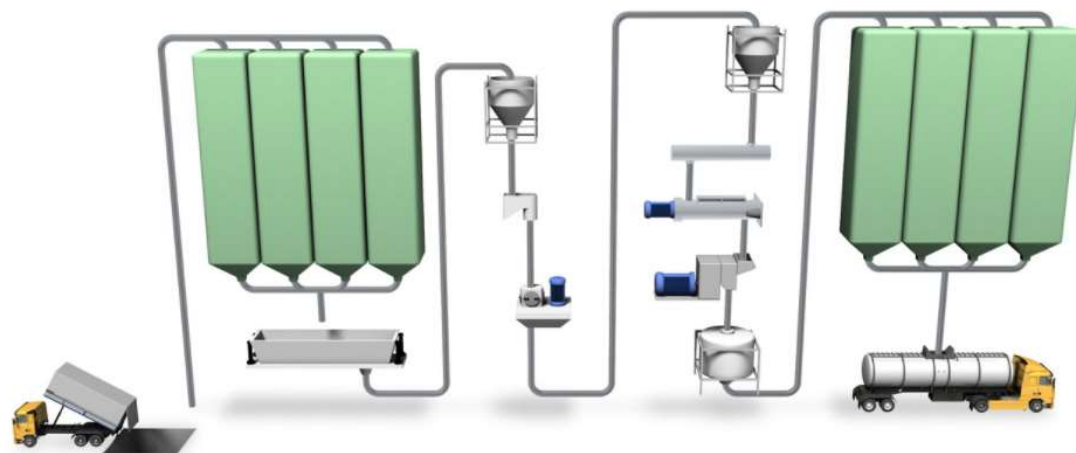
FOSS **NIRS™ analysers** combine fast, easy to use and dedicated instrument technology with digital intelligent, connected and integrated services. This helps customers save money, improve quality and reduce operation risks. We call it SmartAnalytics. FOSS **NIRS™ analyser**

- Is **ALWAYS READY**.
- Delivers **RESULTS YOU CAN TRUST**.
- Enables **SMART DATA MANAGEMENT**.

EASE OF USE MAKES ANALYSIS A GREATER PART OF DAILY OPERATIONS

Reduce raw material costs, optimize production processes and improve product quality.
The NIRSTM DS2500 covers analytical requirements across feed operations

- Control quality of feed ingredients, in-process samples, pellets, etc.
- Analyse solids, slurries and liquids on the same instrument
- Push-button operation – anybody can operate



MAKE QUICK DECISIONS WITH THE NIRS™

Feed industries operate in volatile environments where quick decisions are needed, whether checking raw materials at the gate or monitoring the short batch processes in the industry.

By having a fast and accurate method of analyses, customers can save money on raw material and better improve product quality

- Analyse several parameters in less than one minute
- No or limited sample preparation needed
- Easy cleaning



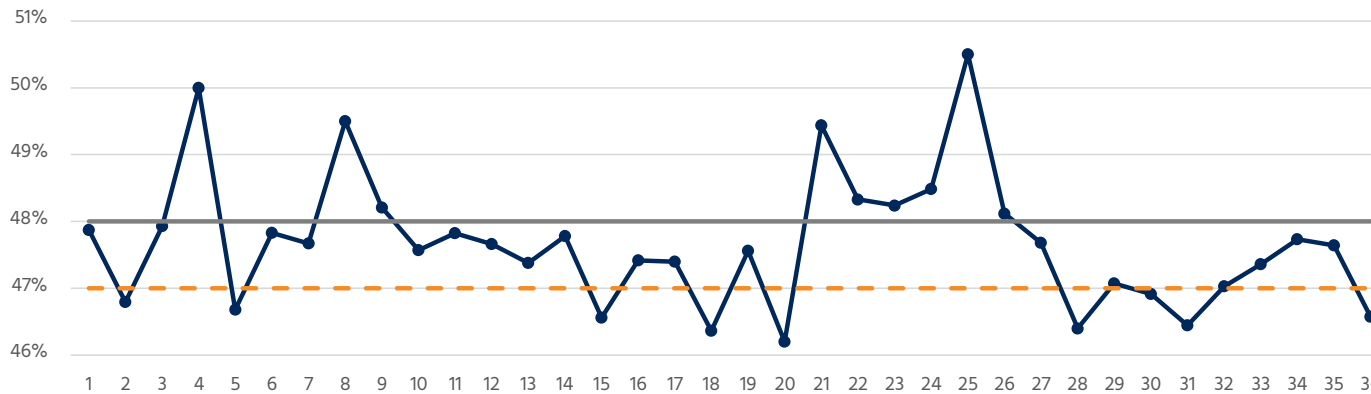
PAY THE RIGHT PRICE FOR YOUR RAW MATERIALS AND REDUCE COSTS

Not all raw materials meet specification
 Feed raw materials have natural variation that challenge consistent feed production. When analysing all raw material batches, feed millers can better pursue financial claims against their suppliers

Substantial potential from claims - example
 10,000 tons/yr soy bean meal.
 Claims possible on 20% of deliveries
 Average claim per ton below claim threshold: 10 USD.
 Claims per year: 10,000 x 20% X 10 USD = 20,000 USD

ANALYTICS BEYOND MEASURE

Protein variability in soybean meal



**Save
20,000
USD**

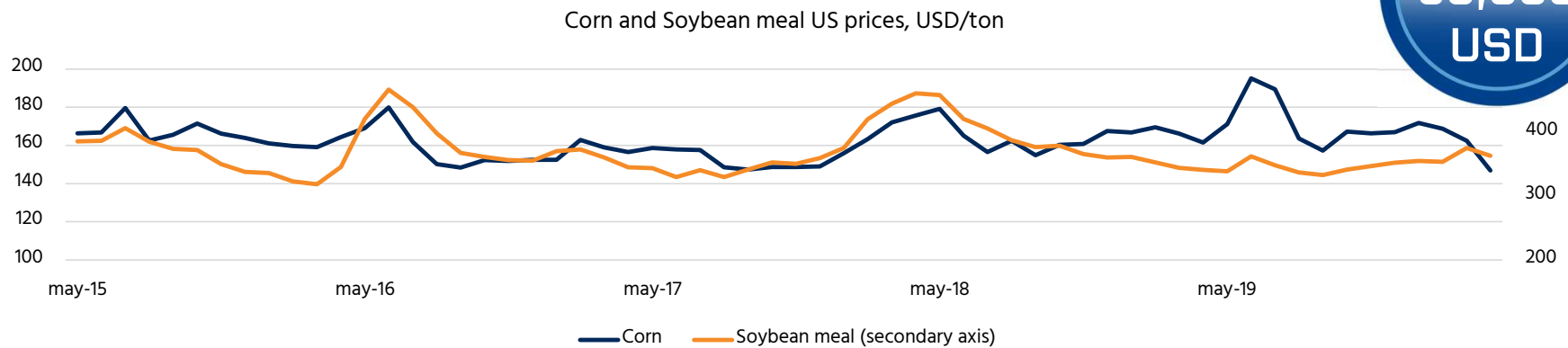
SPECIFICATION
 THRESHOLD FOR CLAIM

SAVINGS ON RAW MATERIAL SUBSTITUTION

Variability in raw material prices and quality
 Raw material prices vary significantly over time, and with quality changing from batch to batch, feed producers need to continuously reformulate batches to minimize their raw material costs.

Savings on least cost formulation - example
 When a feed mill is able to reduce raw material costs by 0.5%, savings equal ~ 1 USD per ton of feed or 50,000 USD per year for a mill producing 50,000 tons per year.

**Save
50,000
USD**



Pricing data source: Index Mundi



Results you can trust

Accurate & reliable results
to improve performance

APOLLO B.V.

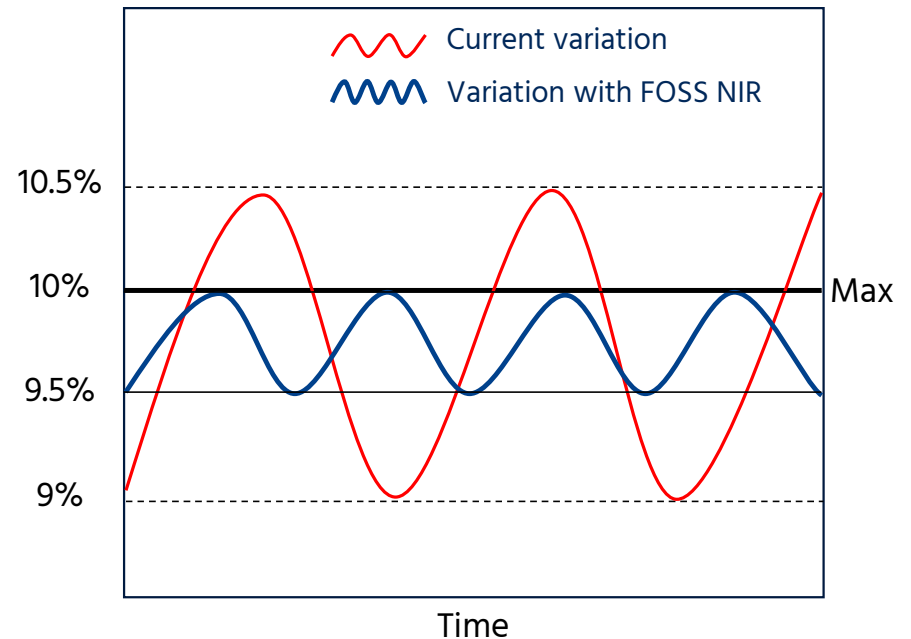
HIGH ANALYTICAL PERFORMANCE FOR FAST RETURN ON INVESTMENT

FOSS

Producer closer to specification, reduce raw material costs, and improve final product quality

- Wavelength range of 850–2500 nm for high performance and more parameter options
- Monochromator based with high signal-to-noise ratio for optimal quantitative analyses
- Stable solution with no drift for consistent results and full calibration transferability
- Accurate with high repeatability and lower costs than chemical analyses

Feed moisture content - example



SAVINGS ON EXTERNAL LABORATORY COST

FOSS

EXAMPLE FROM SMALL MILL ONLY HAVING FEW SAMPLES

External reference analyse is slow and costly

Feed mills relying on external reference analyses wait several days for results – often raw materials are used-up and final products dispatched when results become. And the analyses cost per sample is high.

Inhouse NIR reduces analytical costs

Example: A feed mill sends 10 weekly samples for to an external lab. With NIR, only 1 weekly sample is needed for validation. Yearly savings can be $(10-1) \times 50$ weeks / year \times 100 USD /sample = 45.000 USD



SAVINGS ON NIR VERSUS CHEMICAL ANALYSIS

FOSS

EXAMPLE: MEDIUM SIZED MILL WITH OWN CA SOLUTIONS

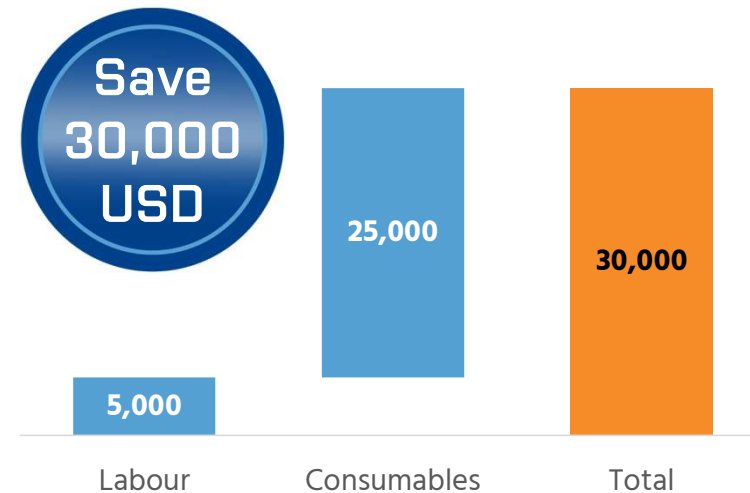
Time and reagents main costs on chemical analyses

Although faster and less expensive than external reference analyses, even automated chemical analyses has quite some labour and consumables costs associated

Inhouse NIR reduces analytical costs

Replacing most of daily chemical analyses with NIR can help reduce labour cost, reagent costs and other consumable costs. For a mill doing 20 samples per week, the savings can be USD 30.000 per year

Savings on variable analyses costs USD/year



FOSS GLOBAL FEED CALIBRATIONS

APPLICATIONS

Vegetal Ingredients

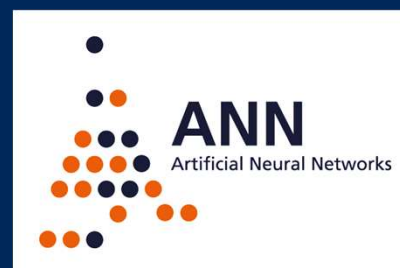
- Cereals and Grains
- Vegetal Protein Meals
- Vegetal By-Products

Animal by-products

- Fish Meal
- Compound Feed
- Grass and Corn silage

PARAMETERS

- Protein
- Moisture
- Fat
- Ash
- Fiber (incl. NDF and ADF for silage)
- Starch
- Colour



FOSS global ANN calibrations are comprised of thousands of samples from a large variety of raw materials.

Offers customers easy access to high performing calibrations without the need to spend a lot of money on building own calibrations and chemometrics competences



Smart data management

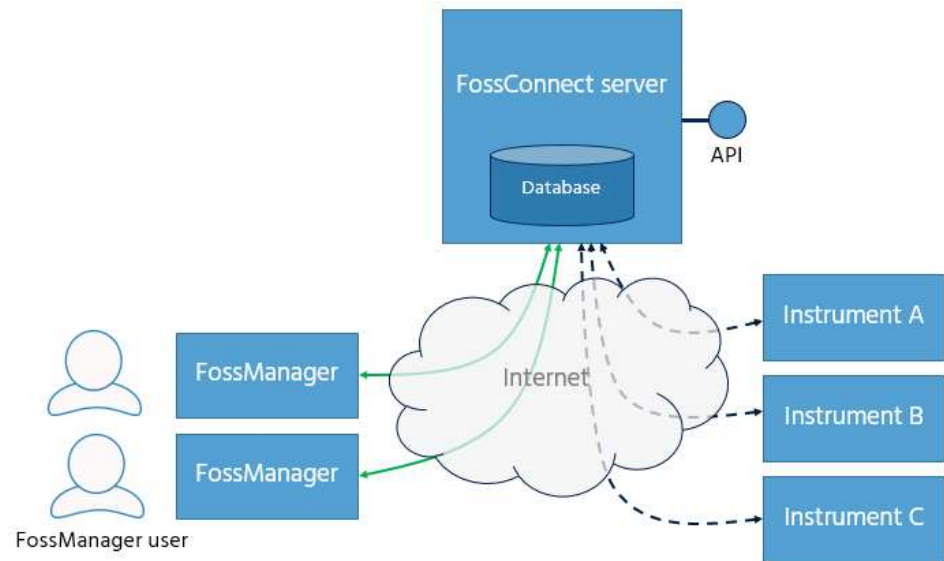
Optimal data handling Easily
accessible and integrated

CONNECTIVITY AND EASY INSTRUMENT MANAGEMENT WITH FOSSMANAGER™

FossManager™ is a centralised networking management solution that enables customers to manage, configure and monitor their instruments remotely from any internet-enabled computer and safeguard their data for whenever they need it.

Benefits

- **Remote** configuration of your instruments in compliance with standard operating procedures
- Access consolidated data from a **centralized** location
- **Safeguard** your data with automatic backups of your configuration and analytical results

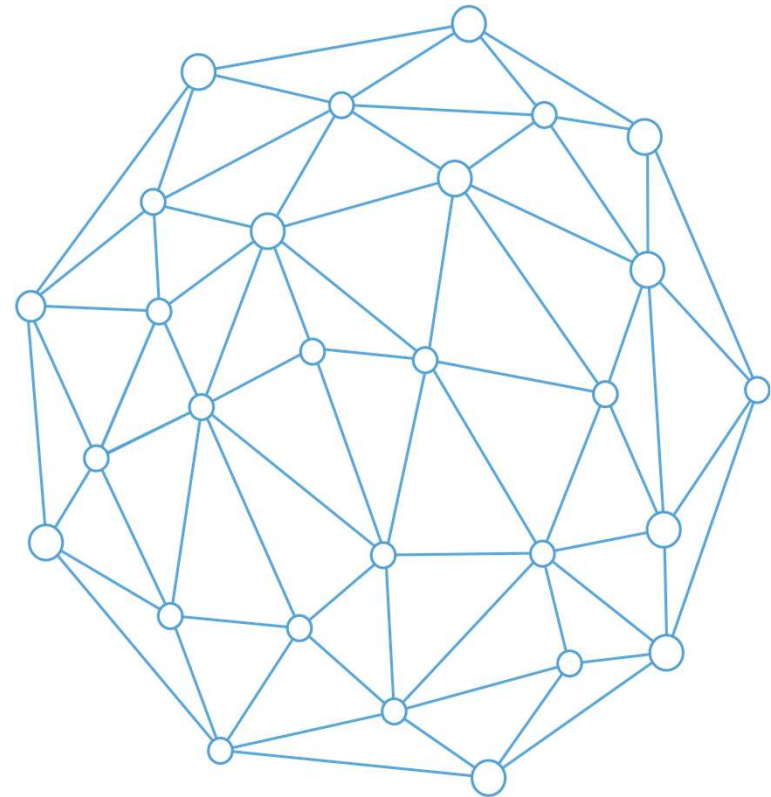


SEAMLESS DATA TRANSFER FOR EASE OF USE AND REDUCED RISK OF ERRORS

FOSS

Reduce work-load needed to transfer data between systems and eliminating potential manual errors in the process

- Seamless integration between FOSS solutions improve ease-of-use and simplify data transfer
- LIMS import/export functions to automatically transfer data between NIRS™ DS2500F and your LIMS
- FOSS API solutions for advanced data interfacing between systems

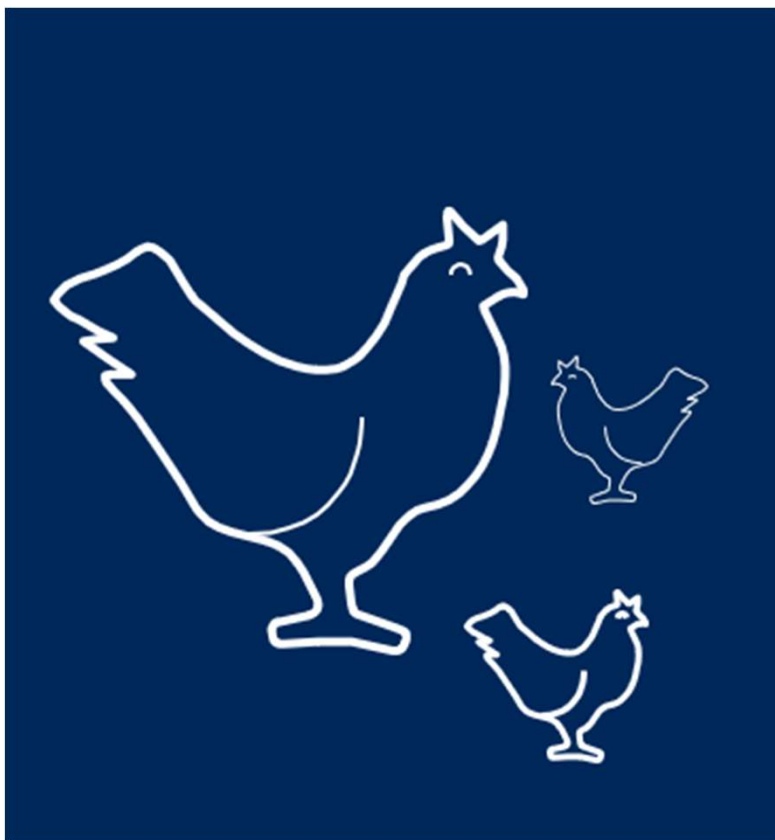


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WHY FOSS?

MORE THAN 60 YEARS OF INNOVATION

FOSS



- Strive to bring the advantages of new technology to our customers first and being pioneers in NIR Spectroscopy with a long legacy.
- More than 10% of turnover invested in R&D
- Trusted Global Brand with huge Installed base with more than 250 instruments in India and neighbouring countries.
- More than 60% market share in India
- Tightly woven network of technology partners and Global as well as local Feed Calibration Packages to suit all needs of poultry industry
- Customer driven innovation with advanced digital support tools

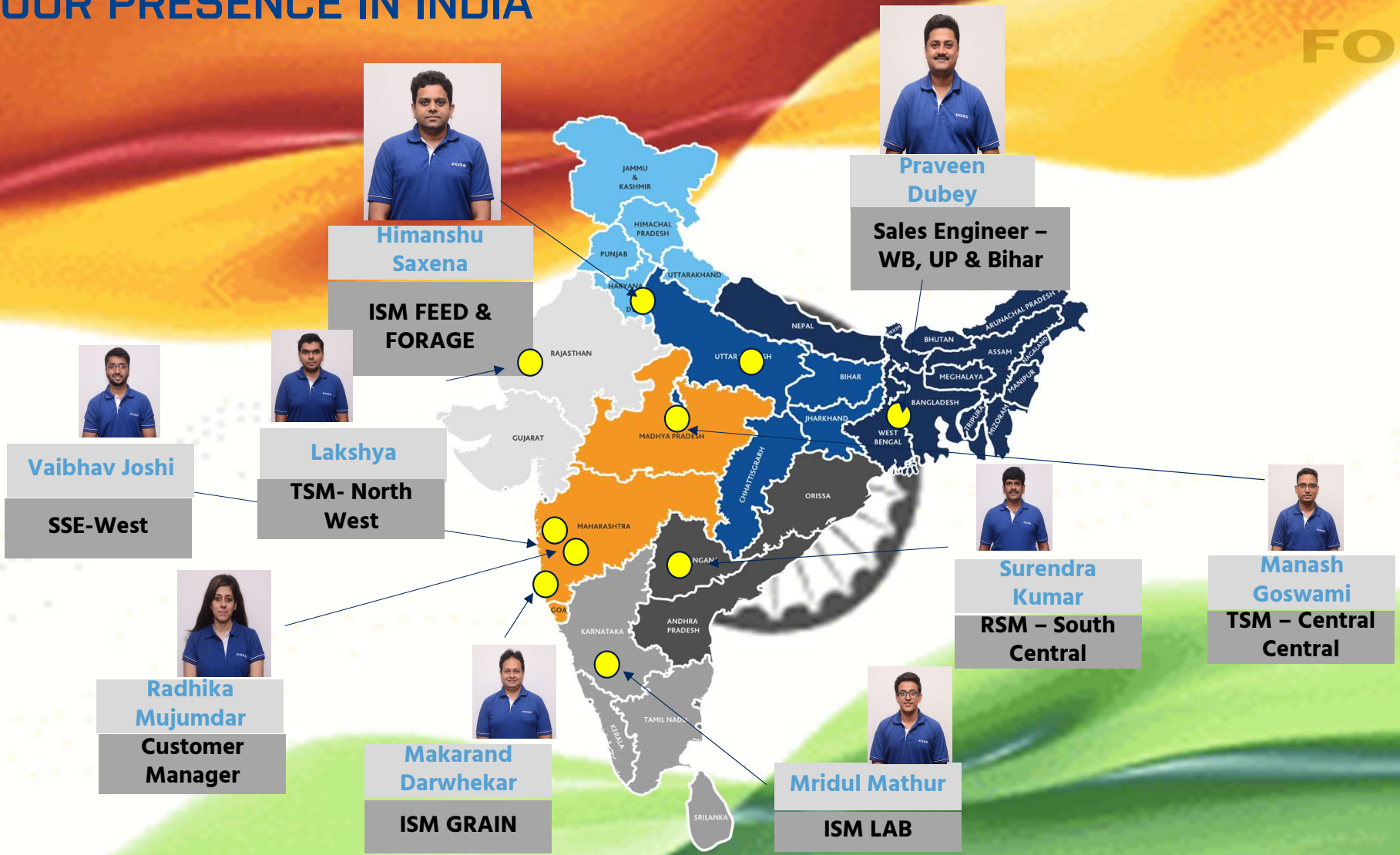
FOSS INNOVATION FACTS

- More than 100 patents
- More than 20 world first introductions
- First to integrate analysis directly in line

OUR PRESENCE IN INDIA

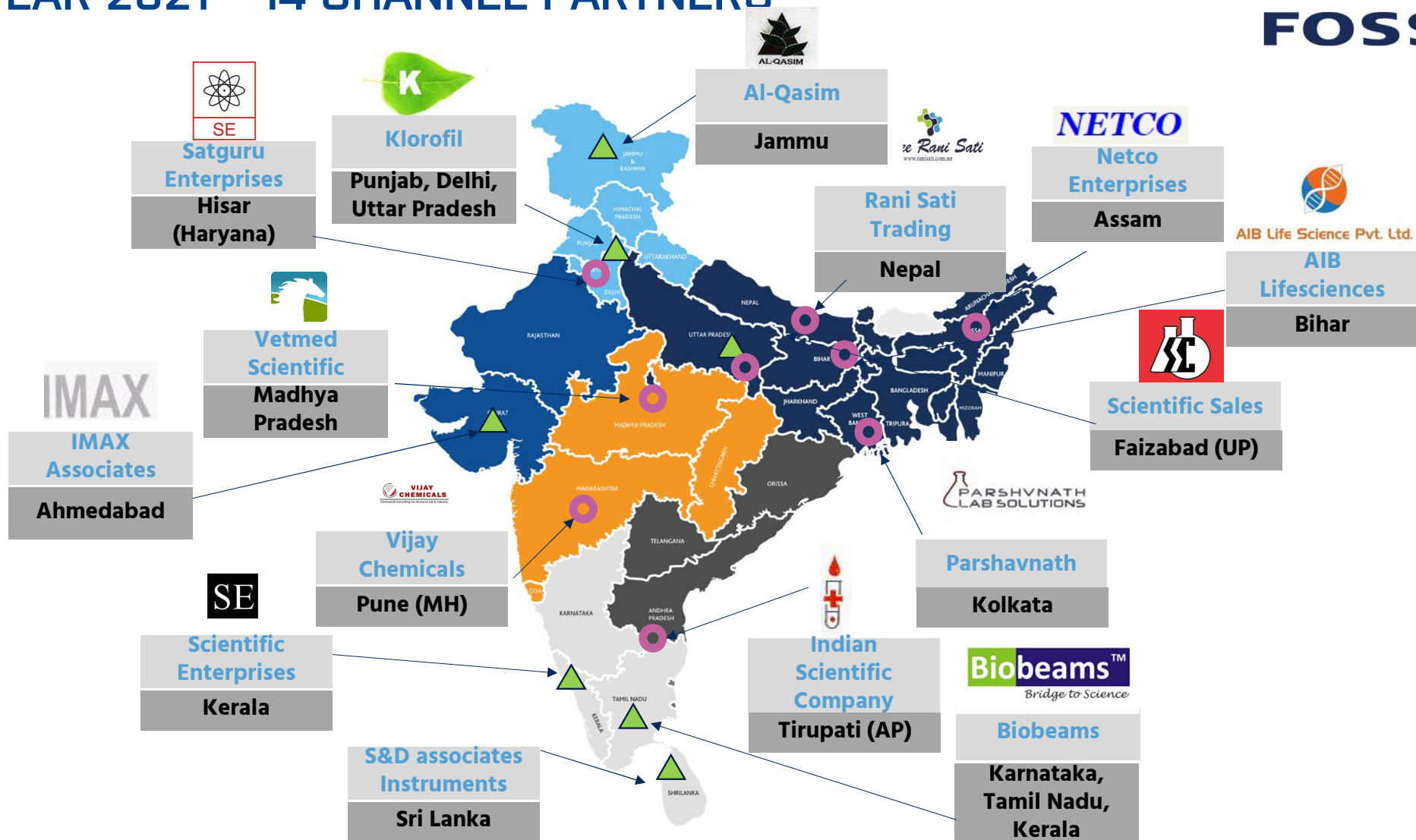
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ANALYTICS BEYOND MEASURE



YEAR 2021 – 14 CHANNEL PARTNERS

FOSS



ANALYTICS BEYOND MEASURE

EVOLUTION OF NIR (FOSS)

FOSS

ANALYTICS BEYOND M

NIRS5000



NIRS XDS



DS2500



DS2500F



DS3F & DS3



Infratec Grain Analyzer



InfraXact

1985

1996

2011

2015

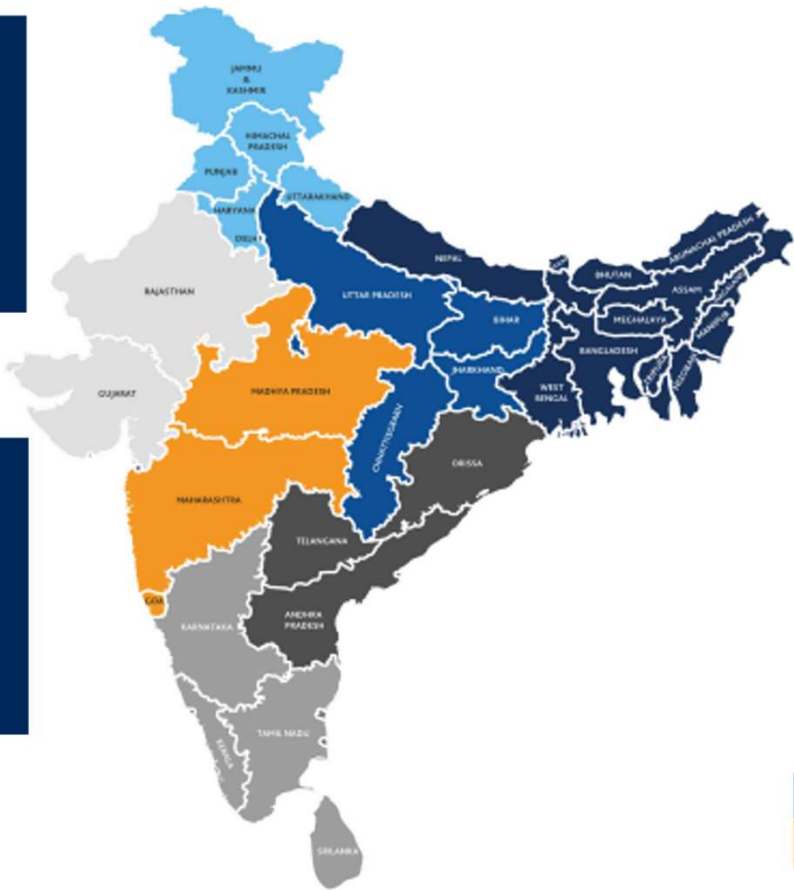
2022



HUGE INSTALLED BASE - "1500 INSTRUMENTS " ACROSS INDIA



CHEMICAL ANALYSIS INSTRUMENTS & NIRS



	North	26
	NW	17
	South	78
	SC	67
	East	10
	West	47
	245	

	North	07
	NW	10
	South	25
	SC	13
	East	07
	West	27
	89	

	North	12
	NW	06
	South	21
	SC	19
	East	08
	West	09
	75	

	North	28
	NW	143
	South	66
	SC	68
	East	1
	West	51
	377	

Total NIR Instruments:	535
Total CA Instruments:	746
Total Accessories:	199

ANALYTICS BEYOND MEASURE

FOSS PARTNERS WITH MAJOR FEED ADDITIVE SUPPLIERS TO OPTIMISE FEED ADDITIVE USAGE



- Improve utilization of feed additives and enhance the nutritional value of feed products by using NIR
- Advanced parameters such as amino acid profile and digestibility are available for NIRS™ DS2500 and NIRS™ DS2500 F through customers cooperation with feed additive suppliers

NIR USERS IN ANIMAL FEED

300+ INSTRUMENTS AND COUNTING

FOSS

ANALYTICS BEYOND MEASURE



HEAR IT FROM OUR CUSTOMERS

FOSS



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THANK YOU