

Q-Interline

NIR analysis

Workshop in Fishmeal and Fish oil
production and products

EU Fishmeal 2018/1115

Jakob Dan-Winther

Agenda

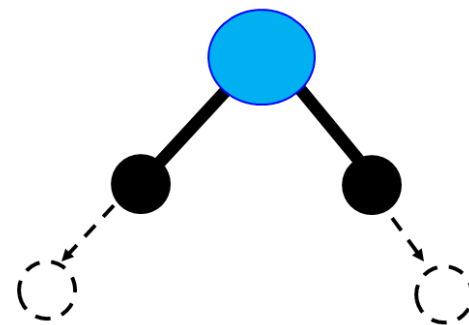
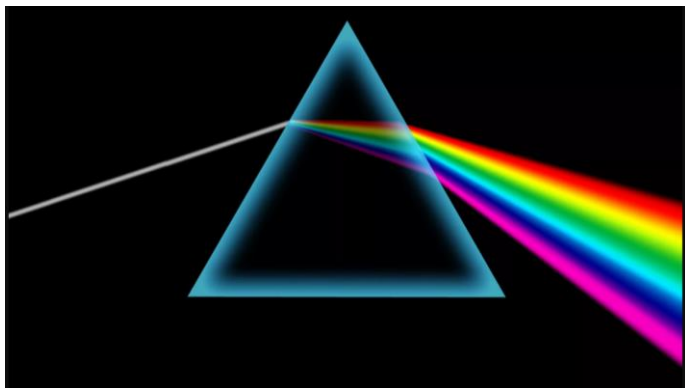
- Who are Q-Interline
- What is NIR spectroscopy
- NIR applications and parameters
- Quality Control or production optimization
- At-line or In-line NIR analysis
- Out look on NIR analysis

The very short version

Q-Interline operates internationally offering analytical FT-NIR solutions for process and quality optimization, generating value through insight



What is NIR spectroscopy?



symmetrical vibration H-O-H

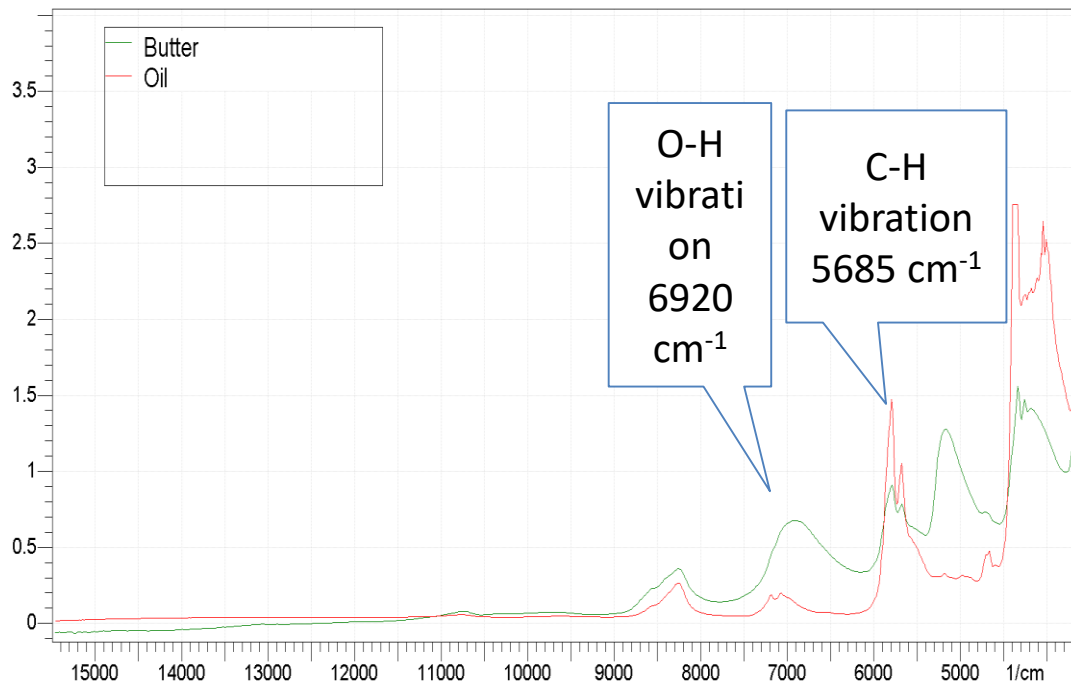


$$Absorbance = \log \left(\frac{I_0}{I_t} \right) = \epsilon lc$$

The analysis results in a spectra

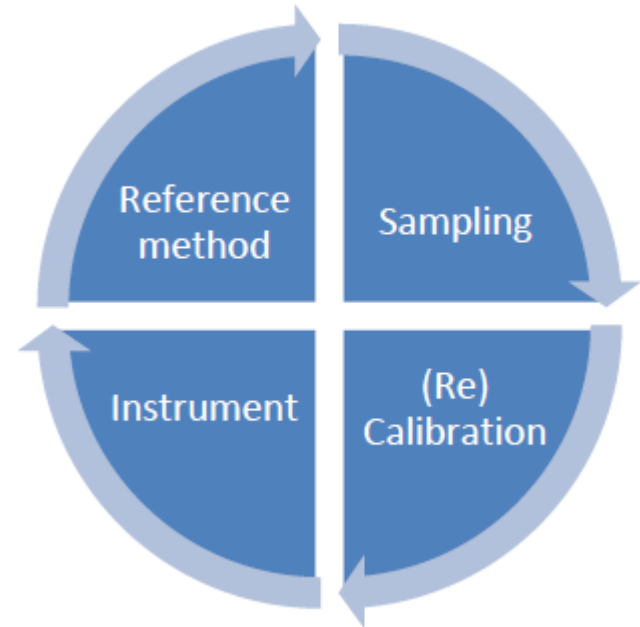
- **Primary spectral information**
 - Water
 - Fat
 - Protein
 - Carbohydrates

- **Secondary spectral information**
 - Freshness
 - Ash or salts
 - Particle sizes
 - Correlation between spectra and other chemical analysis



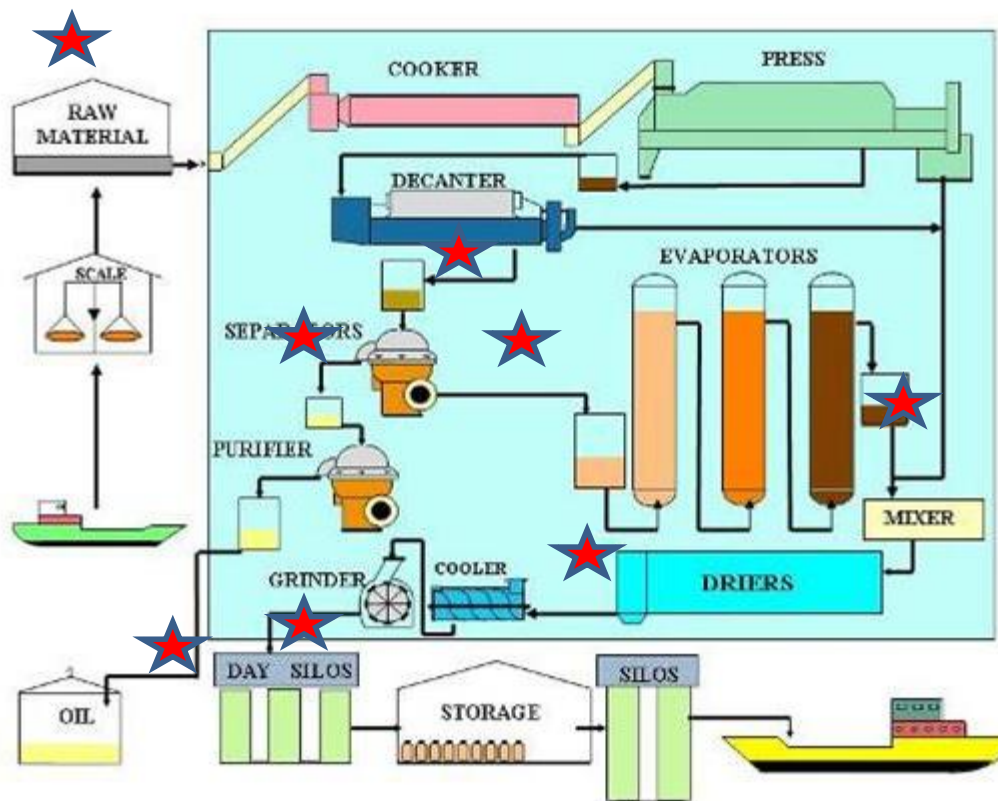
Analysis with Quant FT-NIR

- **It starts with the reference methods**
 - The better it gets the better the NIR analysis
 - What solvent is used, amount and temperature
 - Oven, halogen or microwave oven
 - Dumas/Kjeldahl
- **It depends on the sampling**
 - Being able to extract a representative samples
 - Presenting the sample correct
 - Stability of the sample
 - Educating the operators or users in the lab
 - How heterogenic are your process and samples
- **Instrumentation**
 - Instrument stability
 - Signal to noise ratio
 - Optimized product presentation
 - User friendly software
 - Direct transfer of calibration from at-line to in-line



Fish meal processing an overview

- Source: <http://www.iffco.net/production>



Example of type of samples and parameters

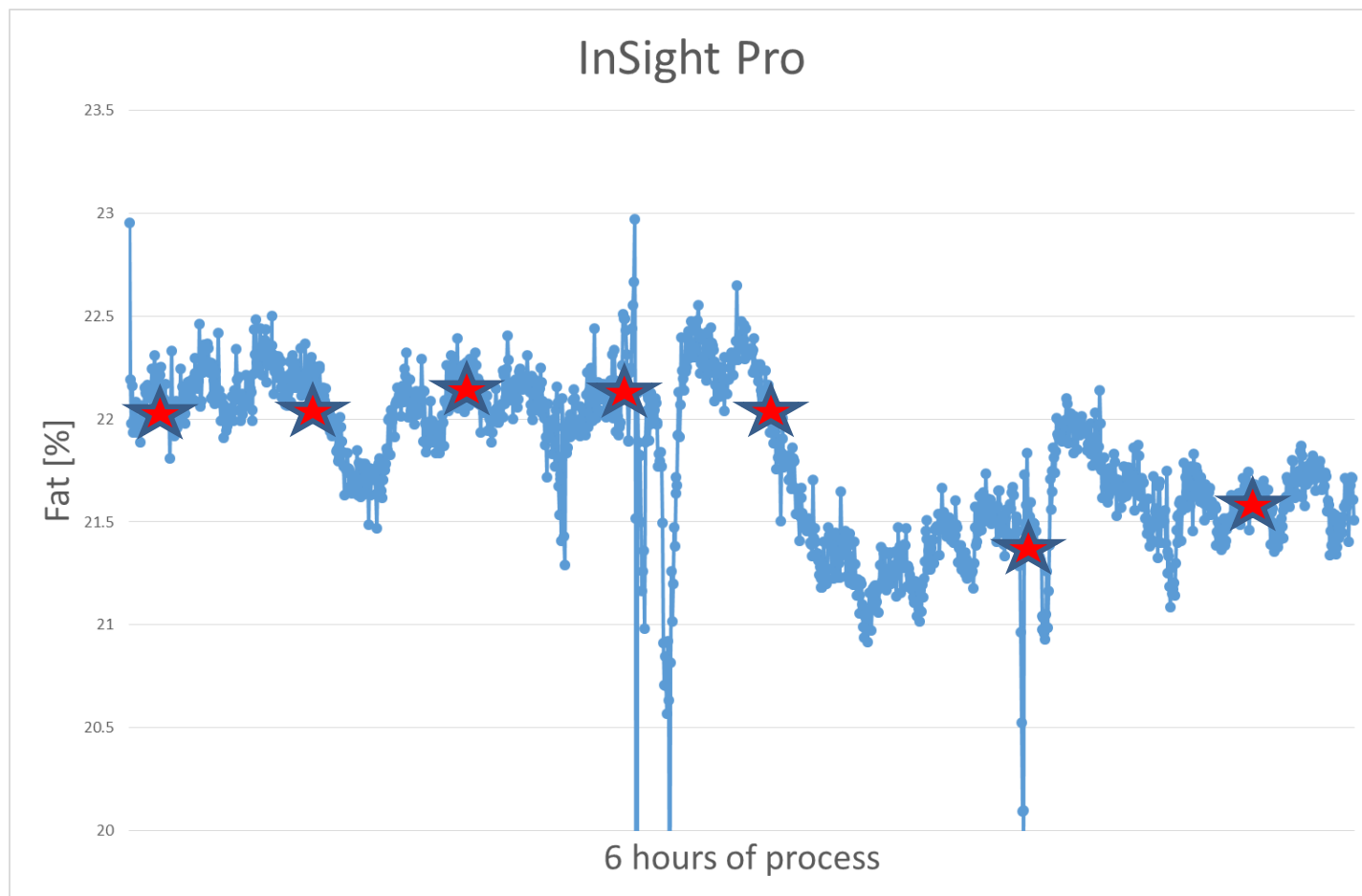
- **Powders**
 - Protein
 - Fat
 - DM
 - Ash
 - Ammonia, Salt, TVN ect
- **Blended fish**
 - DM
 - Fat
 - Salt? TVN?
- **Oils**
 - FFA
 - Moisture
 - IV
 - POV, fatty acid composition, methyl esters, phospho lipids ect
- **Stick water and other tricky liquid samples**
 - DM
 - lipids
 - Protein
 - ...

Two paths – Production optimization and Quality control

- Quality control
 - Reduce amount of samples for chemical analysis
 - Reduce personal errors
 - Increase the amount of analysis without increasing the costs
 - Estimate value and check raw materials and final products
- Production optimization
 - Keep the production within specifications
 - Optimize the use of raw materials and side streams
 - Verify stable production

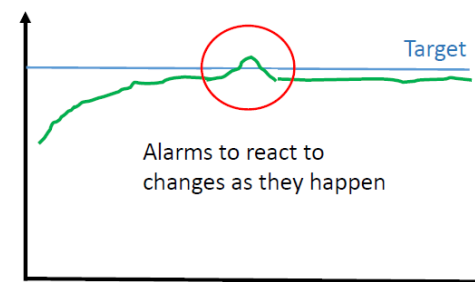
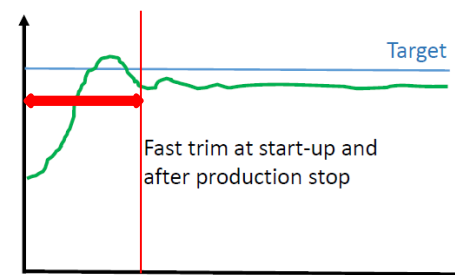


When to choose at-line or in-line



Fast trim and reaction to changes in the process

- Fast trim at start-up and after production stop
- Reaction to changes in the process
- Production closer to target



Common pitfalls with NIR analysis

- Not clearly defined how the NIR results will bring value
 - Is trends over time enough?
 - Do you want an average of production composition?
 - Are you at all able to react to small changes composition?
 - Very accurate agreement on a few samples?
- Lack of buy in from the management and operators
 - It does require resources to implement and maintain
- Lacking training
 - Calibration/validation samples are not representative
- In-line analysis is more complex than a benchtop analysis
 - The organisation is not ready for continuous results
- Non structured application monitoring
 - Operators distrust the results



Outlook –NIR in general

- Number of analysed samples will increase
- Need for assistance to monitor the application
 - People get promoted or change company
- In-line NIR analysis is the future
 - Less people to take samples
 - Better utilization of the raw materials
 - More stable production
 - Being able to react on changes in production
 - Detect process trends before they get serious

Thank you for your attention

