

FOSS

CONTROL YOUR QUALITY AND PROFIT

OIL • FAT • PROTEIN • MOISTURE • AQUEOUS SALT



ANALYTICS BEYOND MEASURE

A guide for analysis in the fish processing industry



A COMPANY ON A MISSION

Founded in 1956 by the innovative engineer Nils Foss, his ambition was to offer automated and cost-efficient alternatives to time-consuming analyses in the food and agriculture industry.

We are still family-owned and today we are the leading global provider of analytical solutions for the food and agricultural industry. We cover Feed and Forage, Grain, Flour Milling & Oilseed Processing, Laboratories, Raw Milk Testing, Wine, Beer, Meat and Fish.

Though much has changed during the last 60 years, our approach to business and development of innovative analytical solutions has not.

FOSS is a global company with 46 nationalities working together on a mission to improve food safety and accessibility for future generations. We are always on the lookout for sustainable solutions that will make food production better, and we're continuously developing new innovations supporting proven methods, and introducing new pioneering solutions to existing problems.



"Over the last six decades, FOSS has defined the standard of analytical solutions for the food and agricultural industry. This includes the fish processing industry, where our analytical solutions can help the industry with rapid and on the spot quality control"

- Poul Erik Simonsen
Head of Fish and Meat, FOSS



ON THE SPOT FISH AND SEAFOOD QUALITY ANALYSIS

Freshness, colour, oil content, fat content, texture, nutritional value, water retention – the list of quality parameters of fish and seafood goes on. But given the delicate and vulnerable nature of fish and seafood there are plenty of potential risks to quality.

Traditional analytical methods for fish and seafood quality analysis include various physicochemical, textural, sensory, and electrical methods. Despite the importance of these standard methods, they are expensive and time-consuming and susceptible to variation.

Analytical solutions based on near infrared (NIR) have therefore become popular due to speed of analysis, minimal sample preparation and high repeatability. Multiple parameters including moisture, fat, oils,

salt, pH and more can be delivered within in half a minute making NIR a versatile solution for different application areas from laboratories seeking a fast turnaround time, to analysis directly in the processing environment.

Advantages of fish and seafood quality analysis include optimal selection of raw material, exact matching of fat content specifications, production efficiency and ultimately, brand protection through compliance with end-product specifications and legal declarations.

Fast, accurate and easy to use instruments based on proven near infrared (NIR) technology are perfect for fish and seafood quality analysis, including analysis of raw and processed meat, rendered fish meal and fish oil.



What are your analytical needs?



Fat	5.5%
Moisture	76.2%
Protein	18.3%

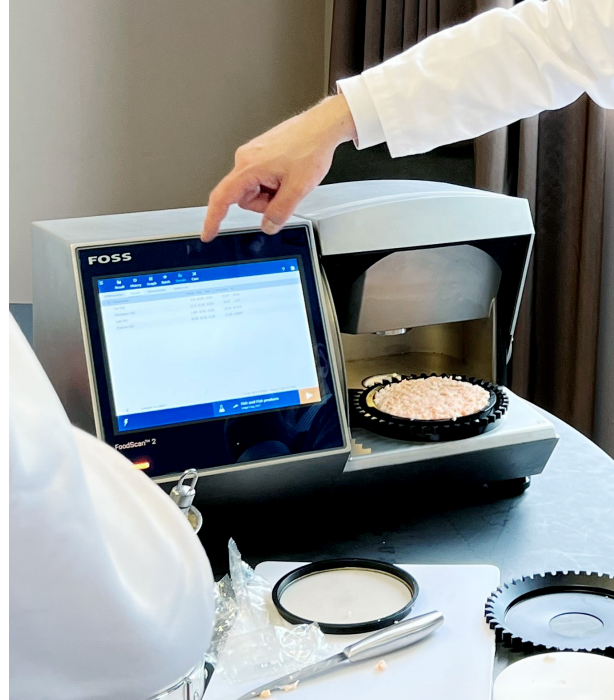
What are the advantages of NIR in the Fish industry?

An example from the surimi industry

New technologies allow new resources to be used as raw materials and better application for fisheries continues to strengthen conservation. This also includes introducing near infrared (NIR) as an analytical tool in the surimi industry as an easy way to secure quality control and optimization of the product.

Speaking with professor and surimi specialist Jae Park, who for nearly 30 years has implemented training programs for manufacturers of surimi and surimi seafood, it is clear that NIR is a technology the surimi seafood industry can have great advantage of including in their production. He explains "I was introduced to NIR 20 years ago and have since been interested in how NIR can help the surimi seafood industry in developing a reliable calibration model as an alternative to wet chemistry" he says and continues. "FOSS is globally known for their NIR, and I thought it would be a great idea to introduce their technology, in the surimi seafood industry. Using NIR could have a huge potential as it would minimize extensively the labor cost for securing top quality of surimi."

"As I see it, the optimal places to use the NIR technology is where the sample is homogeneous." Prof. Jae Park explains "For the raw material, the optimal use of NIR would be in the suppressing process as this is where, the moisture is removed



from the product. Both before and after suppressing the surimi product, measuring the moisture would be an important control point for manufacturing surimi. For surimi seafood, an important control point would be measuring the moisture of the paste when the heating is applied.

Speaking with Poul Erik Simonsen, head of the meat and seafood segment at FOSS, he agrees in there being a great potential in using the NIR technology in the surimi production. "I see benefits of using the NIR solution both inline for real-time monitoring of the production process and at the lab for quality control. The advantage of using our NIR solutions is that we have already developed an analytics package that can cover all aspects of the surimi and surimi seafood production", he says and continues, "I see great potential for using, both our ProFoss 2, our inline NIR solution, and FoodScan 2 in the surimi industry. ProFoss 2 is for measuring surimi product transported in pipe and analyzing the product content of fat, moisture, and protein to guide and optimize the production process to secure consistent final product quality. The FoodScan 2 is for quality control based on checking samples of the final products and delivers result for content of fat, protein, moisture, and salt as well as color". If a surimi producer has already a ProFoss 2 installed, the FoodScan 2 can also be used to validate the performance of the ProFoss 2."



Sales manager testing incoming fish sample on the spot

LEXICA FOR FISH ANALYSIS SOLUTIONS



Herring

The most important parameter to measure is the fat content of each shipload. The fat content in herring varies from approximately 10-12% up to 22-24% depending on the season and the size of the fish. Herring with a high fat percentage (22-24%) is in high demand in certain countries such as in the Netherlands and Germany, where the herring will be sold classified as Matjes Herring, which obtains a significantly higher price than herring with a lower fat content.

For each landing, the fish are sorted according to size, and analysed to determine the fat content in each size category (3-4 size categories). Generally, the fat content increases with the increasing size. Analysis is performed on both filets with skin and filets without skin, as some of the fat comes off as a result of the de-skinning. The FoodScan™ 2 is used to measure the fat content of herrings at landing and thereby to classify the quality of a herring shipload.

The fat content is also used to calculate the correct brine/pickle ratios for the cured product.

The pickled herrings are analysed to determine fat content (documentation needed to meet end-customer specifications) as well as salt, acidity or pH and total solids. One of the key reasons to apply rapid analysis methods is that traditional laboratory analysis has previously proven to be a bottleneck. At peak season, the number of analyses (six times fat per landing + analyses on end products) exceeds the analytical capability, and it is costly to employ more skilled staff. Another benefit is smoother production and less time wasted on waiting for results. This also leads to improved product quality, as fresh fish is a perishable product that depends on a short turnaround time.



Mackerel

The important parameter to measure is the oil/fat content of each shipload. The mackerel is a “group fish”, so normally the fish in the same load/landing will have approximately the same fat percentage. The fat percentage is used for segregation of the mackerels (for different processing). Assessing the oil content prior to smoking is very important as this will affect the smoking conditions to give an optimum product.

Normally, the mackerel has the highest fat content in spring and pre-summer; consequently, the price is higher at this time of the year. Some fishermen will store the mackerel until this season in order to sell the mackerel at a higher price. Therefore a test for fat percentage of the load will show if the load has the desired high fat percentage to match the high price.



Salmon [smoked salmon]

The important parameters to measure are content of oil/fat and salt (aqueous salt).

Salt is critical in the smoking and curing process – both for hot and cold smoking. Additionally, it is important for legal and food safety purposes, to calculate the amount of aqueous salt in the smoked salmon. A minimum level of aqueous salt is required to ensure that the food safety and shelf life of the product is not compromised. The fat percentage may be used for segregation of the salmon (for different processing) or as a simple intake check. Assessing the oil/fat content prior to processing is very important, as this will affect the smoking



conditions to ensure an optimum product, along with more consistent nutritional values, taste and texture. As samples are generally required to be taken from several sides throughout the smoking batch, rapid testing is important to ensure that further processing is not delayed. It may also be possible to test in a non-destructive way, thus avoiding high material waste costs. See further about this topic below.



Sardines

The important parameter to measure is fat content – but only for quality control purposes.



Surimi

There are many types of surimi made all over the world. A certain part is made using Alaska pollock, a white meat fish which mainly lives in the Bering Sea. After the fish is skinned and cleaned, the filets are frozen into blocks. The frozen block of filet is the raw material for pollock surimi. Most of the pollock surimi is made in Alaska, although Russia has started producing pollock surimi in recent years and small volumes are also being produced in China and Korea.

Moisture control is one area where pollock surimi manufacturers can potentially achieve savings. Analysis of moisture content should be made in production prior to freezing and the results can be used to adjust moisture levels in the product.

Fat control is also used for segregating the final products into different fat classes. The surimi manufacturer also needs to control the protein content of the raw fish meat to secure an optimal surimi production. If the protein content is too low, the manufacturer can add protein to reach the desired level. When the protein content is correct, the fish meat has the right binding ability, so it is possible to mix, form and cut the surimi. Also, pH and salt are of interest to check.

The FoodScan™ 2 can be used to analyse samples of the defrosted raw material, whereas the ProFoss™ is recommended for process control.




Tuna

In tuna processing the high-quality tuna are used for sashimi products (high value) and the lower quality are used for canned tuna (lower priced products).

The important parameters to measure are moisture and protein content. The process for producing canned tuna is usually as follows:

Whole frozen tuna is defrosted. The defrosted tuna is pre-cooked using steam (tuna hanging). The pre-cooked tuna is cut and de-boned and the tuna-meat is portioned and canned. The tuna cans are then filled with brine (either sunflower oil or water) and soya protein is often added (to bind water). Finally, the cans are heat treated.

The biggest challenge in the production process is to measure/predict the tuna meat's brine absorption ability. The more brine that can be absorbed, the bigger the "drain weight" of the product, which is the focus for the consumer.



*In less than 30
seconds
you can measure
key parameters
like fat, protein,
moisture, and salt*



FOSS fish analysers offer many advantages over alternative methods:

Proven accuracy and reliability

- Measure a range of key quality parameters
- Unique measuring principles and ANN calibrations offer the highest accuracy available

Robust construction for production area testing

- Instant results for rapid feedback on production
- Very easy to operate and maintain

Cost effective

- Pre-calibrated and ready to use – no calibration costs
- No extra costs from chemicals and consumables. Test as often as required

FOSS

FOSS
Nils Foss Allé 1
DK-3400 Hilleroed
Denmark

Tel.: +45 7010 3370
info@foss.dk

March 2023 GB

fossanalytics.com