

**FOSS**

# Routine analysis for fish farming and processing

FAT • PROTEIN • MOISTURE • AQUEOUS SALT



Dedicated Analytical Solutions

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# FOSS FoodScan: Typical Fish Processing Applications

## 1. Introduction

This document contains information about the typical analytical needs in the fish processing industry, and how the FOSS FoodScan is delivering customer benefits and value in today's fish processors. The document lists different user cases and describes how FoodScan is being used. The list is not complete and we recommend you contact your local FOSS representative for more information. The FOSS FoodScan is just one of many rapid analytical instruments available for a wide range of food analysis. In particular, we have other instruments delivering deeper oils, fat and pigments analysis on fish oils and flesh.

For more information, visit [www.foss.co.uk](http://www.foss.co.uk)

## 2. Typical user situations – and analytical needs

The main analytical need is registered during the processing of fat or oily fish (salmon, herring, mackerel etc.), but even when processing very lean fish (tuna, surimi etc.), a need for compositional analysis for process control remains.

### What are your analytical needs?



## 2.1 Herring

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

For each landing, sorting according to size is carried out and analysis of the fat content is determined on each size (3-4 sizes). Generally the fat increases with increasing size. Analysis is done on both the filets with skin and without, as some of the fat comes off as a result of the de-skinning.

The FoodScan 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 herring is analysed for Fat (documentation on meeting specifications to end customers) as well as Salt, Acidity and Total solids.

The key reasons to apply a rapid method has been the fact that traditional laboratory analysis previously has been a bottleneck - at peak season the number of analyses (six times fat per landing + analyses on end products) is exceeding the analytical capabilities, while it is costly to employ more skilled staff. Another benefit has been a more smooth production, as less time is wasted waiting for the result, which also mean a better quality product, as fresh fish is a perishable product.

## 2.2 Mackerel

The important parameter to measure is **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%. The fat% 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 and consequently the price is higher at this time of the year. Some fishermen will store mackerel to this season and try to sell the mackerel at the high price. Therefore a test for fat% of the load can also show if the load has the high fat% which results in the high price.

## 2.3 Salmon (smoked salmon)

The important parameters to measure are content of **oil/fat** and salt.

Salt is important in smoking and curing. In addition it is important to calculate the amount of Aqueous Salt in the Smoked Salmon. A minimum level of Aqueous Salt is required for the product to be classified as Smoked Salmon.

The fat% is used for segregation of the salmon (for different processing). Assessing the oil/fat content prior to processing is very important in that this will affect the smoking conditions to give an optimum product, along with more consistent nutritional values, taste and texture.

## 2.4 Sardines

The important parameter to measure is **fat** content – but only for QC purpose.

## 2.5 Surimi

Production of surimi (which can be considered as artificial crab meat) is normally based on Alaska Pollack, a white meat fish which mainly lives in the Barrens Sea. The fish is skinned, cleaned and filleted at factories in China, Korea, East Russia etc. The filets are block frozen. The manufacturer of surimi 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.

The FoodScan can be used to analyse samples of the defrosted raw material for protein content.

## 2.6 Tuna

The important parameters to measure are **moisture** and **protein** content.

The production process when manufacturing canned tuna is normally the following: Whole frozen tuna is defrosted. The defrosted tuna is pre-cooked using steam (tuna hanging). The pre-cooked tuna is cut & de-boned and the tuna-meat is portioned and put into cans. Either sunflower oil or water is filled into the cans. At the canning point, soya protein is often added (binds water). Finally the cans are heat treated.

The analytical needs in the above described process are:

- Sampling at landing point to check moisture content (provides information about the freshness of tuna)
- Sampling after pre-cooking to check protein content (if too low – protein to be added in process) and to check if the heating process is optimal (if correct protein content/moisture content, then less waste of meat in the cutting process). It is the assumption that there is a certain relation between the protein content in the pre-cooked tuna and the yield.

## 3. Manufacture of Processed and Coated Fish Products White Fish and Scampi

Raw Material Quality Assurance: assessment of the fish quality prior to processing. The main application of interest is **fish content**.

The fish content of a raw fish sample is calculated by determination of the **nitrogen** content (i.e. Protein/6.25), and then incorporating the nitrogen content into an industry standard equation. The fish industry has an agreed set of fish factors for each individual species of fish and in some cases of a cut of fish (i.e. fillet or loin etc). The fish content will then be used to determine which products that particular sample can be used for i.e. coated fillets, fish fingers, fish pies or ready meals.



#### **4. Detailed Analysis of Pigments and Fats in Fish Flesh (Salmon/Trout)**

Of interest to fish farms and processors alike, a different analyser is used (the FOSS XDS – already well known by fish meal processors) and more information can be found in the separate document – Analysis of Fish Flesh using the FOSS XDS RCA.

#### **5. Analysis of fish flesh using FOSS XDS RCA**

The FOSS FoodScan has been providing the fish processing industries with standard, routine analytical solutions for many years. However, requests from industry and fish farms for more detailed analysis of fish flesh for pigments and oils led to further work using an alternative analyser to the FoodScan which was not suitable due to its limited wavelength range.

The **Foss XDS RCA** NIR Analyser is a monochromator based scanning system using Reflectance measurements to generate the spectrum. The wavelength range is 400 – 2500 nm. This wavelength range covers both the visible and near infrared parts of the electromagnetic spectrum. This gives the potential for investigating and predicting a wide range of different parameters.

The XDS is suitable for the compositional analysis of the fish flesh. Recent work has been completed on determining the Fat content of Salmon flesh. In addition new development work has shown the potential for the rapid analysis of the Carotenoid pigments Astaxanthin and Canthaxanthin. The Carotenoid pigment Astaxanthin is the main source of colour of the flesh and has a very tight specification.

The next area for interest (currently under development) in the flesh of oily fish is in the Fatty Acid profile. The main focus will be on the Omega 3 and Omega 6 fatty acids. The reference analysis for both Pigments and Fatty Acids is both expensive and time consuming therefore rapid predictions have real benefits at the fish processing factories for rapid positive release of the finished product with much reduced analysis costs (thus allowing a much wider testing protocol covering more samples and providing better representation of values across and between batches.

The preferred sample presentation to the XDS is in the FOSS quarter Cup and ideally all samples should be homogenized prior to analysis. Multiple scans are taken during the analysis with results obtained within 50 seconds.

#### **6. About the FOSS FoodScan**

FOSS FoodScan Analyser is a fast, accurate and easy to use instrument for analysing all stages of fish production - from checking incoming raw material to final product control. It is pre-calibrated to analyse all key parameters including fat, moisture, protein; delivering results in just 50 seconds.

Officially approved for meat analysis - FoodScan has received AOAC approval for the analysis of moisture, fat, and protein in meat and meat products. The approval allows food producers to exploit the leading meat analytical solution with full confidence in an officially approved method.

Two versions of the foodScan are available, FoodScan lab, which needs to be connected to a PC, and FoodScan Pro, a touchscreen version which is IP65 rated, and can be sited in the production environment.

FOSS fish analysers offer many advantages over alternative methods

### Proven accuracy and reliability:

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

### Robust construction for production area testing

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

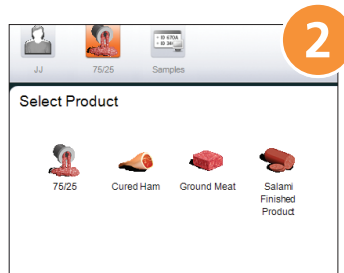
### Cost effective

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

## Just how easy to use



Fill the sample cup and place it in the instrument.



Choose product and press start.



The results for all parameters are displayed within 50 sec.

## 7. Conclusion

FOSS are a global leader in the design and manufacture of rapid analytical instruments for the Food and Agricultural Industries, and the processing of fish and shellfish is one sector where FOSS can deliver added value to the industry. For more information visit [www.foss.dk](http://www.foss.dk)

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