The principles of brining, salting and smoking fish and shellfish

Learner
Workbook

This level 3 learner Workbook addresses the two underpinning knowledge units, the principles of brining and salting, and the principles of smoking fish and shellfish.

Title	**Principles of brining and salting fish/shellfish**
Level	**3**
Credit value	**2**

Learning Outcomes	**Assessment Criteria**
The learner will:	**The learner can:**
1. Understand the impact of raw material on the brining and salting process	1.1 Explain how variations in process specifications can impact on brining operations 1.2 Describe how to assess that raw material is suitable for brining and salting 1.3 Summarise how raw material quality and temperature can impact on the process 1.4 Clarify how the impact of raw material quality and temperature can be monitored
2. Understand brines and how they are controlled	2.1 Describe how to assess the suitability of salt, water and other ingredients 2.2 Explain how to prepare brines of different strengths and make adjustments to achieve required concentrations 2.3 Describe how to measure brine strength and temperature using different methods 2.4 Explain how to establish what the most appropriate brining and curing times are 2.5 Summarise how the characteristics of brine changes during brining and how this impacts on product including; • Concentration • Temperature • Purity.
3. Understand brining and curing quality	3.1 Explain why fish/shellfish is allowed to rest after brining or salting 3.2 Summarise how to assess the quality of brined or cured fish/shellfish 3.3 Describe the impact of handling and storage on the condition and quality of brined or cured product 3.4 Describe how to change brining conditions to solve quality problems 3.5 Clarify the impact which brining and curing has on product yield.

4. Understand brining and curing methods and osmotic impacts	4.1 Describe the methods used to hold material in brine 4.2 Describe the methods used to apply and hold dry cures 4.3 Explain how flesh oil content and thickness/size of material impacts on brining or curing times 4.4 Summarise the process of osmosis and its impact in flesh during processing 4.5 Explain how to assess salt levels in processed fish/shellfish and the role this plays in ensuring food safety.

Title	**Principles of fish/shellfish smoking**
Level	**3**
Credit value	**4**
Learning Outcomes	**Assessment Criteria**
The learner will:	**The learner can:**
1. Understand the methods and factors impacting on smoking fish/shellfish	1.1 Describe the main methods, tools and equipment used to smoke fish/shellfish 1.2 Describe how smoking kilns operate 1.3 Explain what smoking does to fish/shellfish products so that it is a valid method for preserving fish/shellfish 1.4 Summarise how different preparation and smoking techniques produce different smoked fish/shellfish products 1.5 Summarise the main types of wood used in smoking and their impact on smoked products 1.6 Explain the factors affecting wood quality which impact on the smoking process.
2. Understand the preparation for smoking fish/shellfish	2.6 Describe how smoking kilns can be prepared and controlled 2.7 Explain the methods used to hold fish/shellfish in kilns 2.8 Describe how to assess the suitability of fish/shellfish ready for smoking 2.9 Explain the role of brining and salting in preparation for smoking.
3. Understand the control of the smoking process for fish/shellfish	3.4 Explain how the smoked product appearance and flavour will depend on smoking times, fuel types and fish/shellfish flesh oil content/size 3.5 Describe how to monitor and manage the smoking process to maintain specifications and deal with ongoing quality issues 3.3 Explain what the impact on the smoking process is of varying parameters including; • Temperature • Humidity • Air flow rates • Smoking times.

4. Understand the handling, testing and quality issues for smoking fish/shellfish	4.1 Explain how the smoking process can impact on yield and quality 4.2 Describe the impact of handling and storage on the quality of the smoked product 4.3 Explain the methods used for end product testing and what should be tested for 4.4 Summarise the accepted good manufacturing practices in fish/shellfish smoking.

Achieving the Unit

The following information will support you with the knowledge required to help you achieve this unit.

The combined topics of brining, salting and smoking fish and shellfish represent a large body of knowledge that has already been addressed by Seafish' eLearning programme and their resources on the Seafood Training Academy website.

It would serve little purpose to copy and paste that online content into this workbook. Instead, we have identified the appropriate parts of the online packages that cover each of the key learning aims of the occupational standards.

This is a very different approach to other fish and shellfish learner workbooks, but one which we feel is wholly appropriate.

We also recommend that you research information yourself via the internet or at your local library. Useful sources of information include the Sea Fish Industry Authority (www.seafish.org) – a search of their publications database for documents on brining and smoking will return some useful links.

There is also a dedicated webpage on the Seafood Training Academy website that you should look at.

Also available from FDQ are learner workbooks covering the units

- *Understand how to control brining of fish and shellfish,*
- *Understand how to control the curing of fish and shellfish,*
- *Understand how to control the smoking of fish and shellfish.*

- Seafish's open learning module on smoking fish, available as a pdf from the Seafood Academy website – see above weblink.

All the information you need to get started on this can be found on the *Seafood Training Academy Library Guide on Principles of Smoking*. Start by finding this page www.seafoodacademy.org/FDQMain.htm and then following the link to the FDQ learner workbook on smoking page.

Good Luck!

Lee Cooper
Seafish.

References in brackets such as this [section 5: page 3] refer to parts of the Seafish eLearning programme on seafood smoking, where additional and more advanced information on smoking can be found. Follow the links from the Home Page of www.seafoodacademy.org

Our advice is to work through the entire eLearning programme and then to refer to specific sections and pages when completing your assignments. A completed progress record must be included with your assignments and this will require you to work through the eLearning pack.

CONTENTS

SECTION ONE - INTRODUCTION

Sections two and three of this learner workbook will provide suggested 'reading' to address each of the learning points in the appropriate '*Principles*' Unit, along with suggestions for any other activities that will help you achieve the unit.

In order to achieve the two units you will be required to demonstrate your understanding of the underlying principles. The activities and exercises in this workbook are designed to help with this.

Before progressing to Section Two and using the eLearning package we suggest that you read the various chapters from the older Seafish publication, *Fish Smoking – open learning pack*. This older package can be found as a series of pdf files on the Seafood Academy site.

All the links given in this workbook are available from the following Guide on the Seafood Training Academy website.
www.seafoodacademy.org/fdq smoking.htm

ACTIVITY – read the six segments from the open learning pack and complete the table below.

Segment Title	Date completed
Segment 1 - Fish spoilage	
Segment 2 - Preservation action of salt and smoke	
Segment 3 - Raw material selection and preparation	
Segment 4 - The salting, brining and smoking processes	
Segment 5 - Smoking kilns	
Segment 6 - Product handling and packaging	

If required, printed copies of this open learning module may be purchased from training@seafish.co.uk

SECTION TWO - PRINCIPLES OF BRINING AND SALTING FISH AND SHELLFISH

QUALITY

The learner will:

Understand the impact of raw material on the brining and salting process

The learner can:

- Explain how variations in process specifications can impact on brining operations.

Review the following eLearning Content - Section 11: Appendix – Examples smoked products pages 1 to 4

ACTIVITY

For a range of four different smoked products, describe the differences in the salting/brining process that is characteristic of that process.

For example:

Bloaters – salted herring. Ungutted herring are packed in dry salt overnight before smoking. Dry salt is washed off before smoking. Water loss in the region of 6% is usual.

Product 1 =
Product 2 =

Product 3 =
Product 4 =

It would seem fairly obvious that different forms of smoked or cured products would need very different processing. But, even small changes in process specifications can result in significant changes in final product.

In brining (and salting) there are three main factors that can be varied by the operator. They are:

- Brine strength or salt/fish ratio for curing;
- Temperature of the brine or fish being cured;
- Duration of brine immersion or contact with salt.

ACTIVITY

In your own words please describe the impact varying the above parameters will have on the finished product. Please choose a single product that you are familiar with or which you have researched.

This page left blank for learner notes

Review the following eLearning Content - Section 3: Raw materials for smoking

See also segment 3 of the open learning module on smoking and Torry Advisory Note - practices for producers of smoked fish.

The learner can:

- Describe how to assess that the raw material is suitable for brining and salting

Traditionally smoking (and curing) was used to preserve fish and shellfish for later consumption. The quality of the raw material was of little importance as everything that was available was preserved until either the salt or space to cure/smoke was used up.

Today it is very different in the UK. We eat smoked fish and shellfish because we enjoy the taste and texture and we do not appreciate being sold something that is not consistently of good quality.

There are a number of ways of assessing the quality and safety of smoked products. Quality is best assessed using an appropriate sense-based assessment system such as the Torry Scoring schemes.

Most businesses will have a target quality standard for raw materials and also for the finished product, but how many assess the quality after brining/salting and before smoking?

ACTIVITY

After reviewing suitable references, please describe in your own words how you or your company would assess that the raw material is suitable for brining and salting.

- Summarise how raw material quality and temperature can impact on the brining or salting process

There are differences in the impact of salt uptake on previously frozen or chilled fish, or on high quality and lower quality fish. The temperature of the brine or fish during salting will also impact on the process.

Impacts will also affect the quality of the brine over time.

ACTIVITY

In your own words please summarise the impact of quality and temperature on the brining and salting process. You may wish to say something about salt uptake, textural changes, quality of the brine.

- Clarify how the impact of raw material quality and temperature can be monitored.

Monitoring – this is about the systematic collection and interpretation of information. An effective monitoring plan needs to describe what will be monitored, how it will be measured, how frequently it will be measured and how the results will be interpreted.

Often there are targets to be aimed for and factors that combine to bring about a particular result.

For example. There may be a target range for salt uptake in the finished product. Measurements may include brine strength, temperature, duration, fish quality, fillet thickness. The interpretation may result in

changes to duration of brining for different grades of fish or other adjustments.

ACTIVITY

In your own words, outline how you would go about monitoring the impact of quality and temperature. You may wish to include a brief description of what you would measure, how you would measure it, how often measurements would be taken and how you would expect to use your results.

PREPARATION OF BRINES AND SALT MIXTURES

Review the following eLearning Content - Section 5: salting and brining of the fish.

The learner will:

Understand brines and how they are controlled

The learner can:

- Describe how to assess the suitability of salt, water and other ingredients

Brines will contain salt and water. They may also contain colouring, additional flavours and other additives. Section 5, page 9 of the eLearning programme contains useful information on the types of colours used in brines.

Salt mixtures often contain additional flavours and occasionally other additives.

ACTIVITY

A quick search on the web for the phrase *recipes for brine for smoking fish* will unearth more than 60,000 links. Have a look at a few and see if there are any ingredients you can add to our list.

Ingredients for Brine may include:

- Salt
- Water
- Colours (list 3 common ones)
    - o
    - o
    - o
- Flavours (list 3 common ones)
    - o
    - o
    - o
- Others?

It is essential that all the ingredients used in the preparation of brines (or salt mixtures) are of food grade.

- Explain how to prepare brines of different strengths and make adjustments to achieve required concentrations
- Describe how to measure brine strength and temperature using different methods
- Explain how to establish what the most appropriate brining and curing times are
- Summarise how the characteristics of brine changes during brining and how this impacts on product including;
    - Concentration
    - Temperature
    - Purity.

CORRECT HANDLING OF BRINED/SALTED FISH OR SHELLFISH

The learner will:
Understand brining and curing quality

The learner can:

- Explain why fish/shellfish is allowed to rest after brining or salting
- Summarise how to assess the quality of brined or cured fish/shellfish
- Describe the impact of handling and storage on the condition and quality of brined or cured product
- Describe how to change brining conditions to solve quality problems
- Clarify the impact which brining and curing has on product yield.

THE PROCESS OF BRINING AND SALTING

The learner will:
Understand brining and curing methods and osmotic impacts

The learner can:

- Describe the methods used to hold material in brine
- Describe the methods used to apply and hold dry cures
- Explain how flesh oil content and thickness/size of material impacts on brining or curing times
- Summarise the process of osmosis and its impact in flesh during processing
- Explain how to assess salt levels in processed fish/shellfish and the role this plays in ensuring food safety

SECTION THREE - PRINCIPLES OF SMOKING FISH AND SHELLFISH

Title	Principles of fish/shellfish smoking
Level	3
Credit value	4

Learning Outcomes	Assessment Criteria
The learner will:	**The learner can:**
1. Understand the methods and factors impacting on smoking fish/shellfish	1.1 Describe the main methods, tools and equipment used to smoke fish/shellfish 1.2 Describe how smoking kilns operate 1.3 Explain what smoking does to fish/shellfish products so that it is a valid method for preserving fish/shellfish 1.4 Summarise how different preparation and smoking techniques produce different smoked fish/shellfish products 1.5 Summarise the main types of wood used in smoking and their impact on smoked products 1.6 Explain the factors affecting wood quality which impact on the smoking process.
2. Understand the preparation for smoking fish/shellfish	2.10 Describe how smoking kilns can be prepared and controlled 2.11 Explain the methods used to hold fish/shellfish in kilns 2.12 Describe how to assess the suitability of fish/shellfish ready for smoking 2.13 Explain the role of brining and salting in preparation for smoking.
3. Understand the control of the smoking process for fish/shellfish	3.6 Explain how the smoked product appearance and flavour will depend on smoking times, fuel types and fish/shellfish flesh oil content/size 3.7 Describe how to monitor and manage the smoking process to maintain specifications and deal with ongoing quality issues 3.3 Explain what the impact on the smoking process is of varying parameters including; • Temperature • Humidity • Air flow rates • Smoking times.
4. Understand the handling, testing and quality issues for smoking fish/shellfish	4.1 Explain how the smoking process can impact on yield and quality 4.2 Describe the impact of handling and storage on the quality of the smoked product 4.3 Explain the methods used for end product testing and what should be tested for 4.4 Summarise the accepted good manufacturing practices in fish/shellfish smoking.

RECORDING, TRACEABILITY, LIMITS ON AUTHORITY, WASTE

RECORDING, REPORTING AND COMMUNICATING

Recording, reporting and communicating are essential activities that take place every day while we are at work. They probably take place every hour of our working day, so just what are we recording, reporting and communicating about?

Here are a few of our ideas on general issues.

- Product, processing or packaging specifications;
  - You may be given a written **report** on a new process specification;
- Targets, schedules or deadlines;
  - You may verbally **communicate** to your supervisor that a scheduled task has been completed;
- Results, scheduled milestones, routine outcomes;
  - You may **record** the completion of each check of the metal detector;
- Health and Safety or Food safety issues;
  - This could include you **reporting** problems to your supervisor, or receiving **updates** on changes to policy;
- Impending operational problems;
  - **Verbal** reports on what might go wrong;
- On-going operational problems;
  - Usually **verbal** reports on what's being done to fix the problem;
- Task Handovers;
  - **Informing** those taking over from you at the end of your shift.

These are pretty general. Can you list below three different examples of a communication, a report and a record from a typical working day?

By way of a definition:

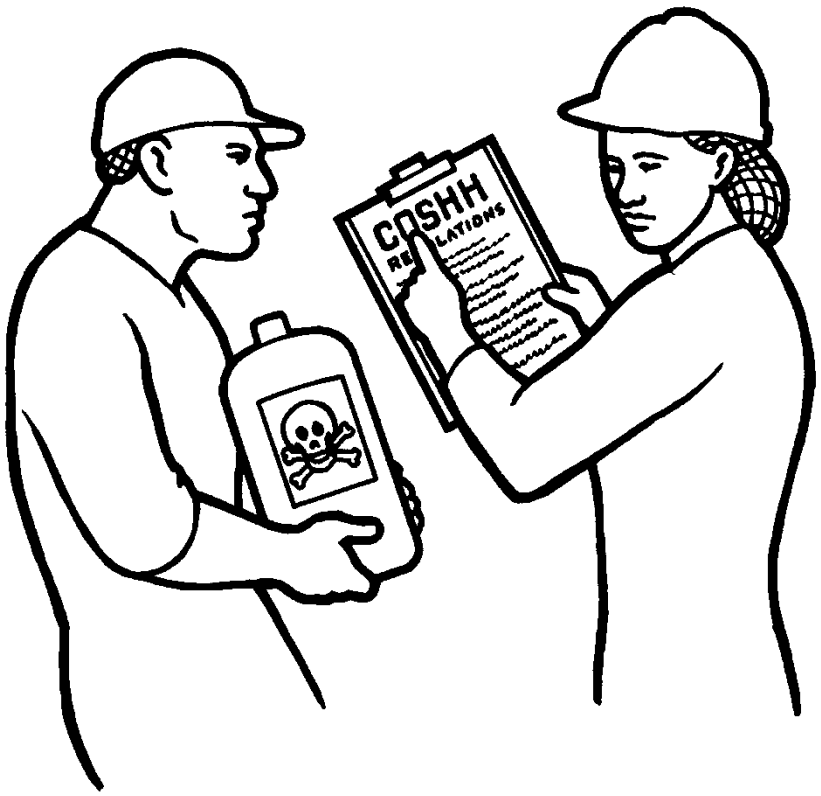
A report is usually one way – you report to someone, or they report to you.
Communications are usually two way – information is exchanged and may be discussed.

Records – a permanent or semi permanent record of an outcome – almost always written.

Examples of Records made	
Reports – verbal or written	
Communications – what were they about?	

THE IMPORTANCE OF COMMUNICATION AND REPORTING

What do you think may happen if communications and reporting were absent, delayed or inaccurate?



Think about this for a moment or two before looking at our list.

Perhaps even make your own list to compare to ours.

Communications and reports that are delayed, inaccurate, incomplete or absent may lead to:

- Misunderstandings and confusion;
- Poor working relationships between colleagues and team members;
- Drop in H&S or food safety performance;
- Production problems that may lead to increased waste or increased costs;
- Damage to equipment or machinery;
- Quality losses and perhaps even product recalls;
- Loss of sales / customers due to poor quality, out of specification products etc.

When communications and reports are on time, accurate and fit for purpose, what may be the results?

- A more efficient, effective and pleasant(er) workplace.

EFFECTIVE COMMUNICATION

How is this achieved?

1. Providing information

- Find somewhere appropriate to communicate – where the noise levels are suitable;
- Be precise and stick to the points;
- Use notes if appropriate;
- Maintain appropriate eye contact;
- Use polite gestures;
- Pay attention to the recipient's body language;
    a. Are they showing an interest?
    b. Have you 'lost them'?
    c. Are they taking notes?
- Ask occasional questions to check their understanding of the messages.

2. Receiving Information

- Listen carefully;

- Indentify the important points;
- Take notes if appropriate;
- Ask questions to confirm your understanding;
    a. Use open questions or paraphrase what is being said;
    b. Avoid closed questions unless you really want a Yes or No as the reply;
- Check all important information with the information provider;
- Show you are paying attention by:
    a. The way you stand;
    b. Making appropriate eye contact;
    c. Asking the right questions;
    d.

EFFECTIVE RECORDING

The main purpose of records are to provide:

- evidence of what happened during the work period;
    - evidence that certain steps were taken;
    - evidence of any problems, or the absence of problems;
    - a record of key data such as temperatures, quantities, batch numbers etc.
- confirmation that the people tasked with collecting and writing down data actually did so – that's why you have to sign and date forms;
- information for:
    - financial analysis;
    - problem solving and fault diagnosis;
    - traceability;

Many of the records we keep are routine, with the same data recorded batch after batch, day after day. The very routine nature of recording may make you assume it's not important and it doesn't really matter. IT DOES!

It's important to the customer, your bosses and you.

A wise woman once said "if it's not written down, it didn't happen" We can take that to mean, if you keep careful, accurate and honest records of what you do, as required by your employer, then should a problem arise they will be your best defence, and your bosses as well.

This only works though if you write down what actually happens, not what you think should have happened.

So:

- Write down the actual chiller temperature, the one you actually measured;
- Write down the actual time the metal detector was tested, not the time it was supposed to have been tested.
- And please, Don't fill in records in advance.

Recording what has happened is an important part of any seafood processing or handling operation. Almost everything you or your colleagues do will result in a record somewhere in the company.

Records and the accurate recording of data are essential if the business is to survive and prosper and your job is to be secure. We need to record all kinds of information during our working day. What kind of records do you need to complete to during a normal brining operation?

Document name	Describe its purpose

LIMITS ON AUTHORITY

We all have limits on our authority, even the Managing Director. Usually these limits are tested when something goes wrong. Do you know your limits? What you can and cannot do?

What do you do if there is something wrong with the equipment, services[1], raw material or paperwork? Describe the limit of your authority in case of a problem.

What do you think are the possible problems that may be caused if you do not stay within the limits of your authority?

List them here and then talk to your supervisor to see if you have listed everything.

As you become more experienced in your job, will the limits of your authority increase? Yes / No

If yes, how will they change?

[1] For example, water at the correct temperature, electricity, adequate lighting, sufficient ice.

WASTE

The smoking operation should have a minimal impact on the cost of waste disposal when considered on its own. However, the integrated operations of filleting, washing, brining and smoking can add up to a significant waste bill.

The two main waste products from the smoking operation, apart from a lot of CO_2 coming out of the flue, are a little ash from the smoke boxes and trimmings from the packing line.

Disposal of fish waste

Fish waste – heads, guts, bones etc must be kept segregated from non fish waste (boxes, paper, box ties etc). Fish waste must be disposed of in accordance with your Local Authority trade waste guidelines. It will be incinerated, composted or rendered. It MUST NOT be sent to landfill sites.

Disposal of non fish waste

All other waste generated by fish processing, boxes, paper etc. can be disposed of by normal means. It may be useful to contact your Local Authority to check any local bylaws governing the disposal of such waste.

SECTION FOUR: SUMMARY

Good Handling Practices

These five practices apply to almost any operation involving seafood.

Quick, Clean, Cool, Careful and Consistent.

Quick – without compromising quality or safety, carry out operations as quickly as possible as chilled seafood loses quality hour by hour.

Clean – all operations must be hygienic and food safe. It's not always possible to keep things clean – gutting operations for example, but regular cleaning as you go and careful attention to personal hygiene will go a long way.

Cool – chilled iced, frozen. How low can you go? Lower temperatures are a key weapon in the fight against lost quality and bacterial multiplication. During smoking there is this balance between warm dry air needed to evaporate water from the flesh, and the negative impact these higher temperatures will have on the quality of the smoked product.

Careful – fish and shellfish are fragile and should be treated with as much care as possible.

Consistent – work correctly and consistently. There's no room for arbitrary and inconsistent operations in the fish and shellfish industry.

ADDITIONAL RESOURCES

Online Resources

Seafood Training Academy – Smoking section

- Seafood Smoking
  - Fish smoking pdf files available to download
  - eLearning programme
    - Free of charge
    - No registration required
    - Text, photos and video available
  - www.seafoodacademy.org – follow the clear links to seafood smoking from the Home Page.

Sustainability

For information on Seafish's responsible fishing scheme, to download various sustainability and responsible sourcing guides and for guidance please visit www.seafish.org

General

Food Safety training courses from level 1 to level 3:
Available in various languages;
Available as taught courses, open learning programmes and by eLearning[2];
CIEH and REHIS approved.

Health and Safety training courses:
Level 1 taught course;
Level 2 as a taught course or open learning module.
CIEH and REHIS approved.

For information on all of these training resources and others, contact Seafish:

Seafish Training
Sea Fish Industry Authority
Humber Seafood Institute

[2] A free to study, level 2 course is available at www.seafoodacademy.org

Europarc
Grimsby
DN37 9TZ

Tel 01472 252300
Email training@seafish.co.uk

See also: www.seafish.org and www.seafoodacademy.org

For up to date information on resources please visit the Library on the Seafood Training Academy website www.seafoodacademy.org and download the Library Guide for FDQ Learner Workbooks, where you will find links to the above documents and much more.