



European Egg Processors Association

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GUIDE TO

GOOD MANUFACTURING PRACTICE FOR

"LIQUID, CONCENTRATED, FROZEN AND DRIED

EGG PRODUCTS"

USED AS FOOD INGREDIENTS

(NON-READY TO EAT EGG PRODUCTS)

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1 Introduction

1.1 EEPA – European Egg Processors Association

EEPA is a non profit organization which was founded in 1995 with the ambition to unify all egg processors within the European Union. Today EEPA counts ca 50 egg processing companies as its members from all over Europe.

EEPA offers its members first hand information on a variety of matters important to the European egg sector such as legislative matters, the market situation, refunds, measures being taken regarding food crises, etc.

There are 2-3 meetings organized each year in Brussels and a General Assembly together with the organizations EUWEP, EEPTA and EPGA. These meetings are a unique opportunity for egg processors to meet with their European colleagues in order to discuss the latest developments concerning their sector and businesses.

EEPA's Technical Committee "GUIDE GMP" : In 2002 EEPA set up a Technical Committee in order to draw up a Guide to Good Manufacturing Practice for the Egg Products Industry.

This Technical Committee, which was presided by David Cassin, worked very intensively on this guide and in April 2005 the final version was forwarded to the European Commission with the request to have it developed as a Community Guide in accordance with the relevant rules.

EEPA's Technical Committee "ABPR - ANIMAL BY-PRODUCTS"

In 2005 EEPA set up a Technical Committee in order to discuss the Regulation (EC) 1774/2002 on animal by-products and to try to work out a common point of view for the egg processing sector.

See website : <http://www.eepa.info>

1.2 Scope of the guide

This guide concerns egg processing **from delivery of shell eggs to the egg breaking plant to egg products shipment.**

It concerns liquid, concentrated, frozen and dried egg products.

This guide can be used by establishments carrying out at least one production stage described here.

Imports have to respect EC Regulations and this professional guide.

This guide includes egg products that are used as food ingredients and excludes ready to eat egg products, such as cooked and peeled eggs, poached eggs, omelettes, scrambled eggs and other cooked egg products.

1.3 Objectives of the guide

The guide to good manufacturing practices, which is a voluntary instrument, is written by EEPA's technical committee and is intended to be a guide for all European Union egg breaking plants.

This document aims to:

- to ensure the food safety of egg products available on the European market, in compliance with the European rules in force
- give competent authorities a complementary reference for their inspections
- provide a basis for any egg product's industry from another country of Europe, who want to export to the European Union
- enable food business operators to choose between different options depending on conditions in their establishments.

However, this guide doesn't replace the food business operator responsibilities, regarding food safety, in accordance with [Regulation \(EC\) 178/2002, laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety](#) :

Food and feed business operators at all stages of production, processing and distribution within the businesses under their control shall ensure that foods or feed satisfy the requirements of food law which are relevant to their activities and shall verify that such requirements are met.

For the sake of clarity, most of relevant parts of legislation are included in the beginning of each chapter.

2 HACCP : Definitions and principles

2.1 Definitions

Codex alimentarius CAC/RCP 1-1969, recommended international code of practice on general principles of food hygiene

- Control (verb)** : To take all necessary actions to ensure and maintain compliance with criteria established in the HACCP plan.
- Control (noun)** : The state wherein correct procedures are being followed and criteria are being met.
- Control measure** : Any action and activity that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level.
- Corrective action** : Any action to be taken when the results of monitoring at the CCP indicate a loss of control.
- Critical Control Point (CCP)** : A step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level.
- Critical limit** : A criterion which separates acceptability from unacceptability.
- Deviation** : Failure to meet a critical limit.
- Flow diagram** : A systematic representation of the sequence of steps or operations used in the production or manufacture of a particular food item.
- HACCP** : A system which identifies, evaluates, and controls hazards which are significant for food safety. Hazard Analysis and Critical Control Points
- HACCP plan** : A document prepared in accordance with the principles of HACCP to ensure control of hazards which are significant for food safety in the segment of the food chain under consideration.
- Hazard** : A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.

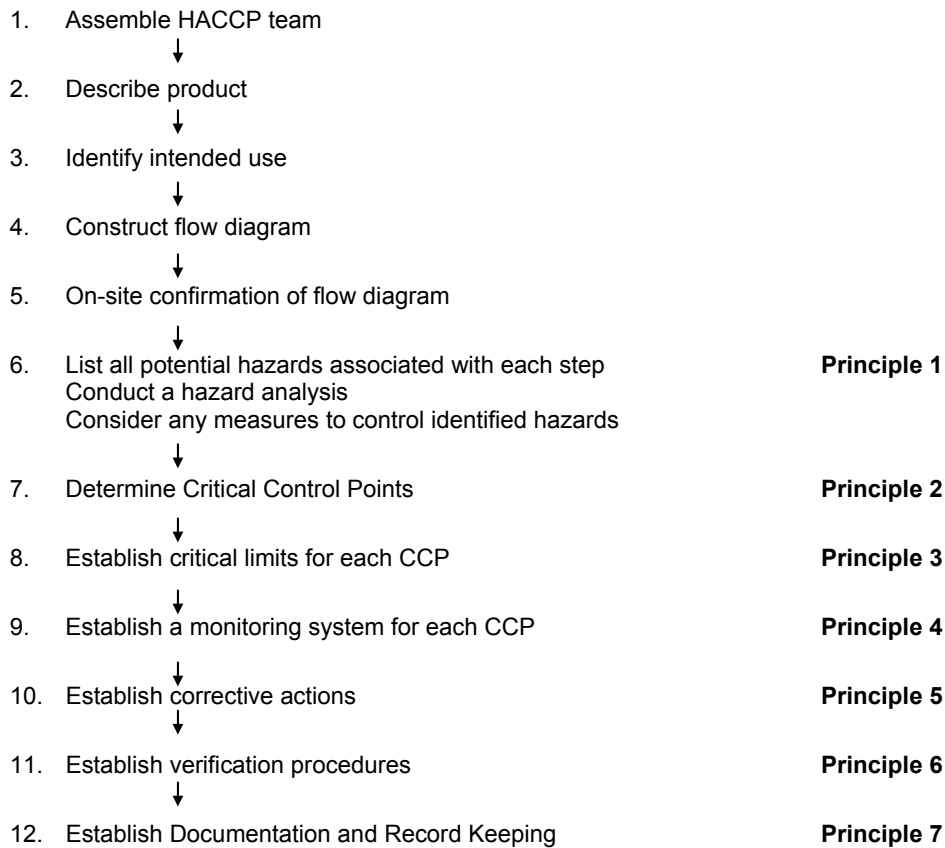
2.2 Principles

*Codex alimentarius : Recommended international code of practice - General principles of food hygiene
CAC/RCP 1-1969, Rev. 4-20031*

The codex general principles of food hygiene :

- identify the essential principles of food hygiene applicable throughout the food chain (including primary production through to the final consumer), to achieve the goal of ensuring that food is safe and suitable for human consumption;
- recommend a HACCP-based approach as a means to enhance food safety ;
- indicate how to implement those principles ; and
- provide a guidance for specific codes which may be needed for - sectors of the food chain ; processes; or commodities ; to amplify the hygiene requirements specific to those areas.

The HACCP system breaks down into 12 steps and 7 principles



3 Products and manufacturing process

3.1 Definitions

Regulation 852/2004 laying down specific hygiene rules for on the hygiene of foodstuffs

Food hygiene : the measures and conditions necessary to control hazards and to ensure fitness for human consumption of a foodstuff taking into account its intended use

Processing : any action that substantially alters the initial product, including heating, smoking, curing, maturing, drying, marinating, extraction, extrusion or a combination of those processes

Unprocessed products : foodstuffs that have not undergone processing, and includes products that have been divided, parted, severed, sliced, boned, minced, skinned, ground, cut, cleaned, trimmed, husked, milled, chilled, frozen, deep-frozen or thawed

Processed products : foodstuffs resulting from the processing of unprocessed products. These products may contain ingredients that are necessary for their manufacture or to give them specific characteristics

Regulation 853/2004 laying down specific hygiene rules for food of animal origin

Eggs : eggs in shell – other than broken, incubated or cooked eggs – that are produced by farmed birds and are fit for direct human consumption or for the preparation of egg products

Liquid egg : unprocessed egg contents after removal of the shell

Egg products : processed products resulting from the processing of eggs, or of various components or mixtures of eggs, or from the further processing of such processed products. In particular, they can be presented as liquid, or frozen, or dried or concentrated form.

Liquid egg products : processed liquid products resulting from the processing of eggs, or of various components or mixtures of eggs, or from the further processing of such processed products

Codex alimentarius CAC/RCP 15 – 1976 : code of hygienic practice for eggs and egg products

Cracked egg : an egg with a damaged shell, but with intact membrane

Dirty egg : an egg with foreign matter on the shell surface, including egg yolk, manure or soil

Incubator egg : an egg that has been set in an incubator

Breaking : the process of intentionally cracking the egg shell and separating its pieces to remove the egg contents

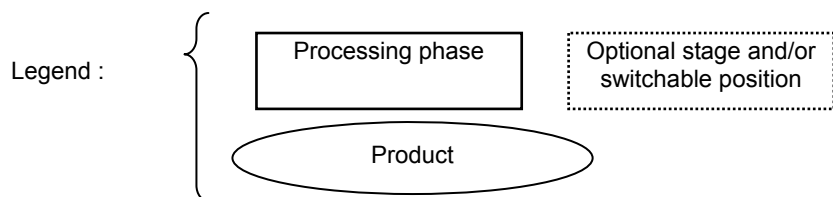
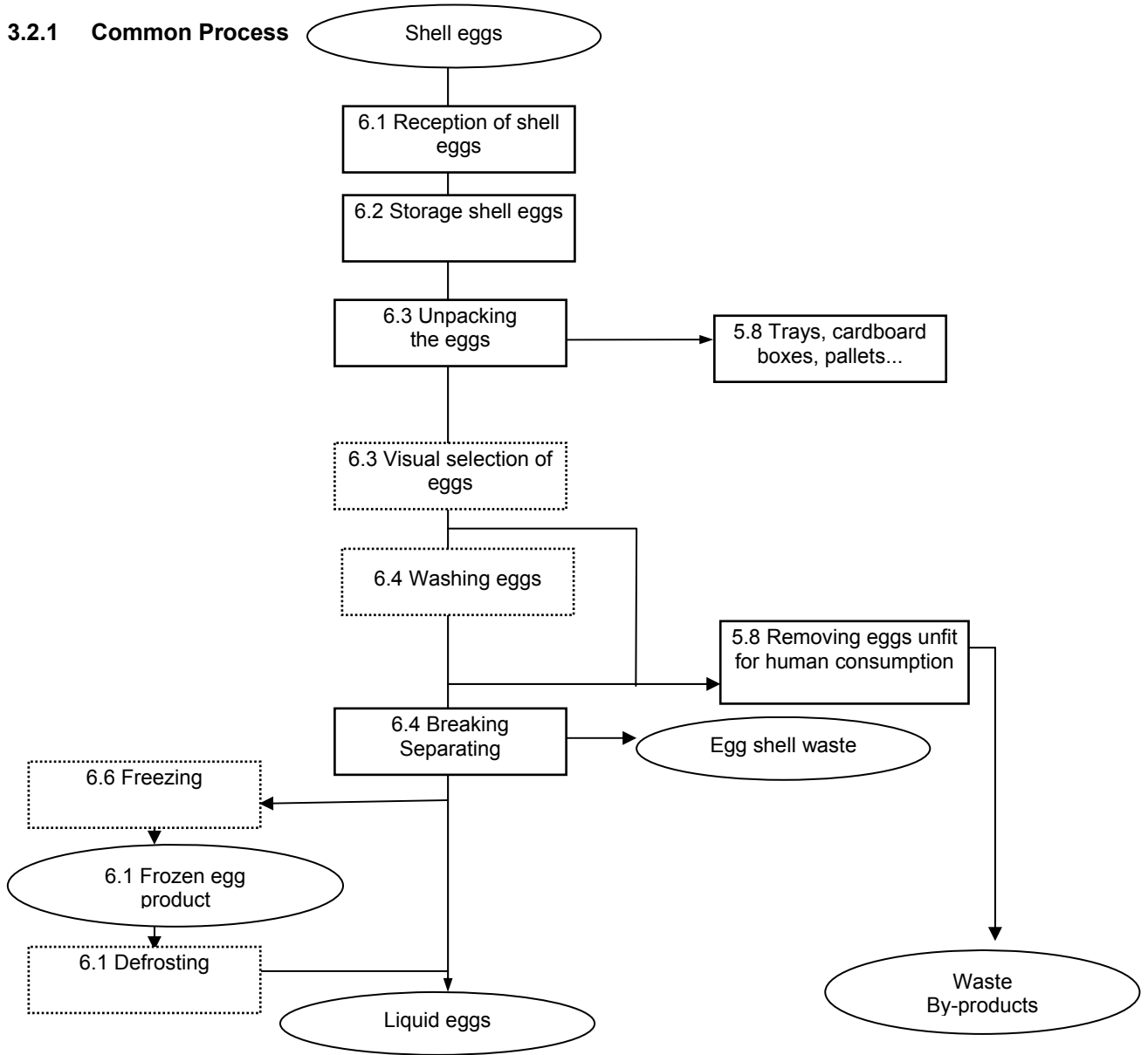
Microbiocidal treatment is a control measure that practically eliminates the number of microorganisms, including pathogenic microorganisms present in a food or reduces them to a level at which they do not constitute a health hazard

Pasteurization : a microbiocidal control measure where eggs or egg products are subjected to a process, using heat to reduce the load of pathogenic microorganisms to an acceptable level to ensure safety

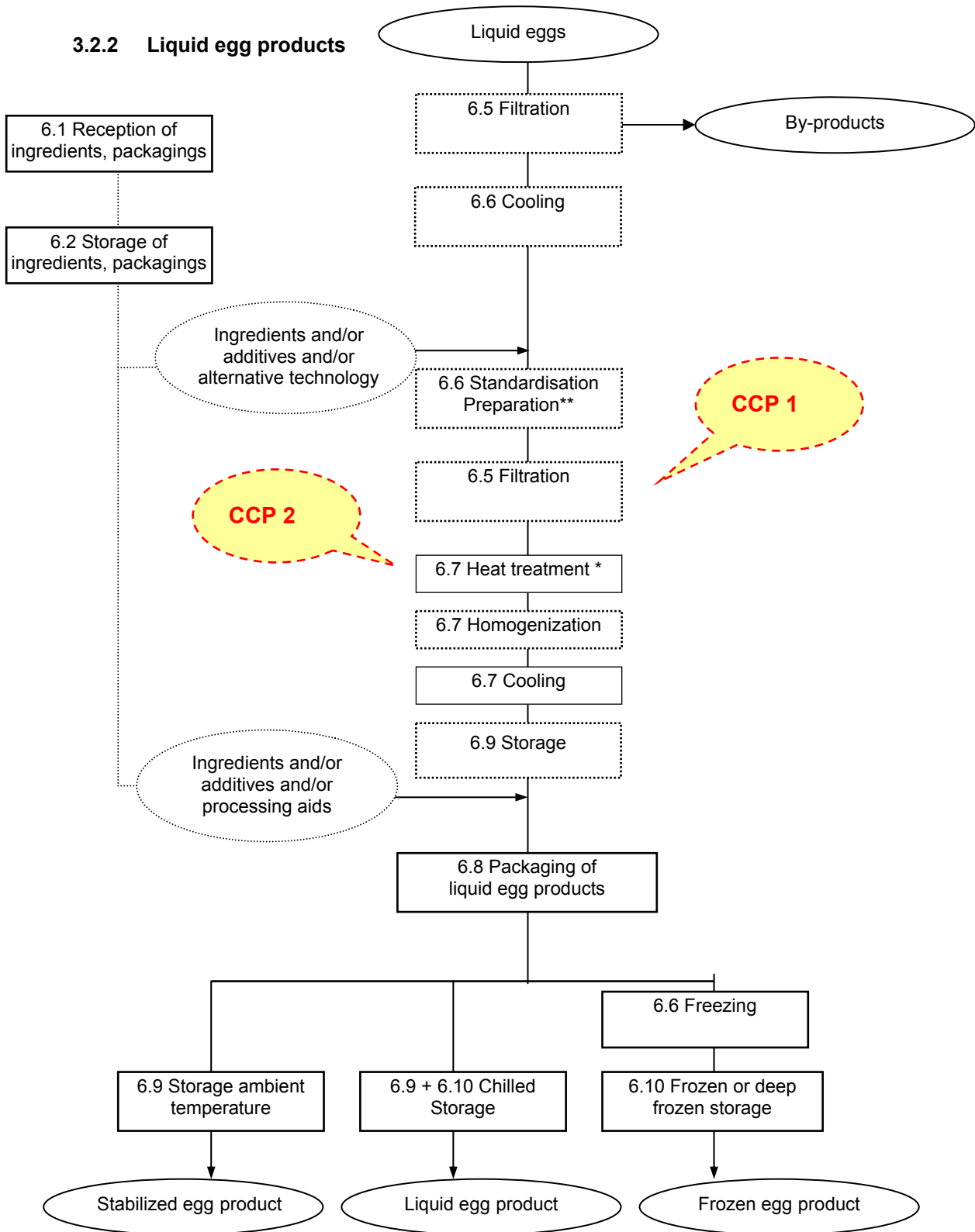
3.2 Manufacturing process

The diagrams hereafter are an indication.

3.2.1 Common Process

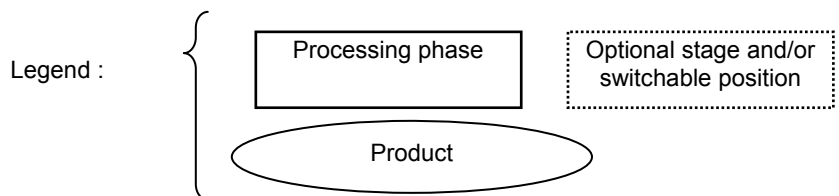


3.2.2 Liquid egg products

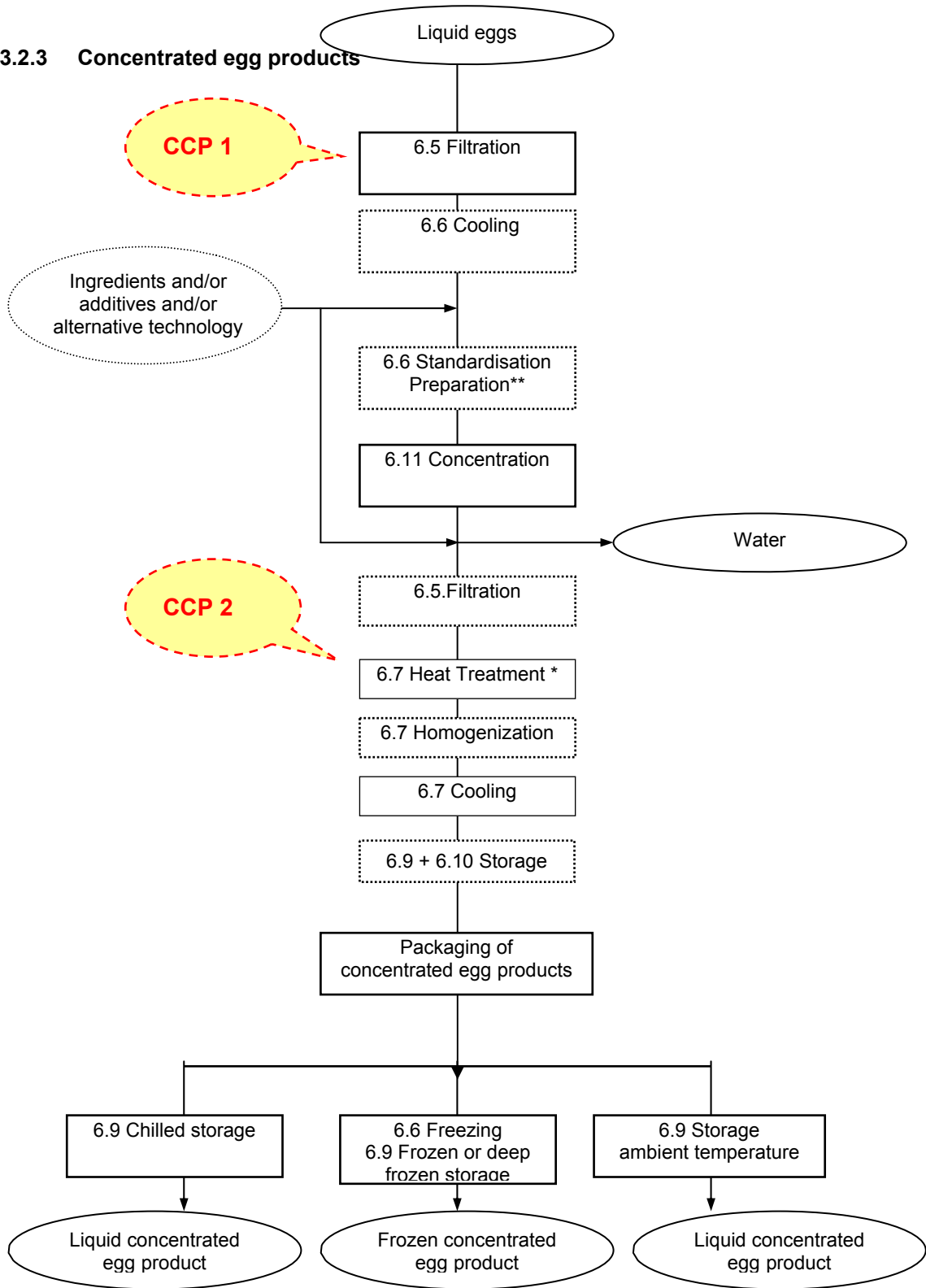


*Heat treatment or approved equivalent treatment

**Preparation : mix, addition, removal, ...

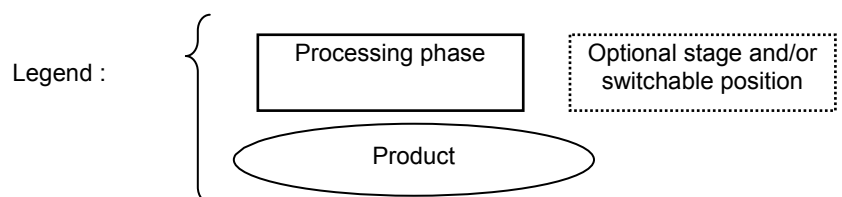


3.2.3 Concentrated egg products

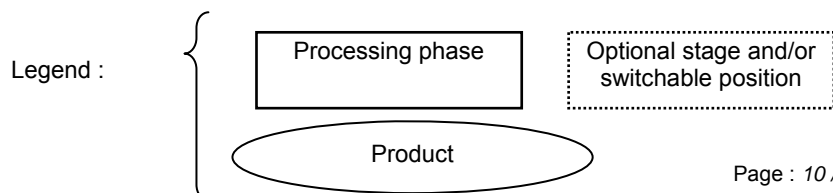
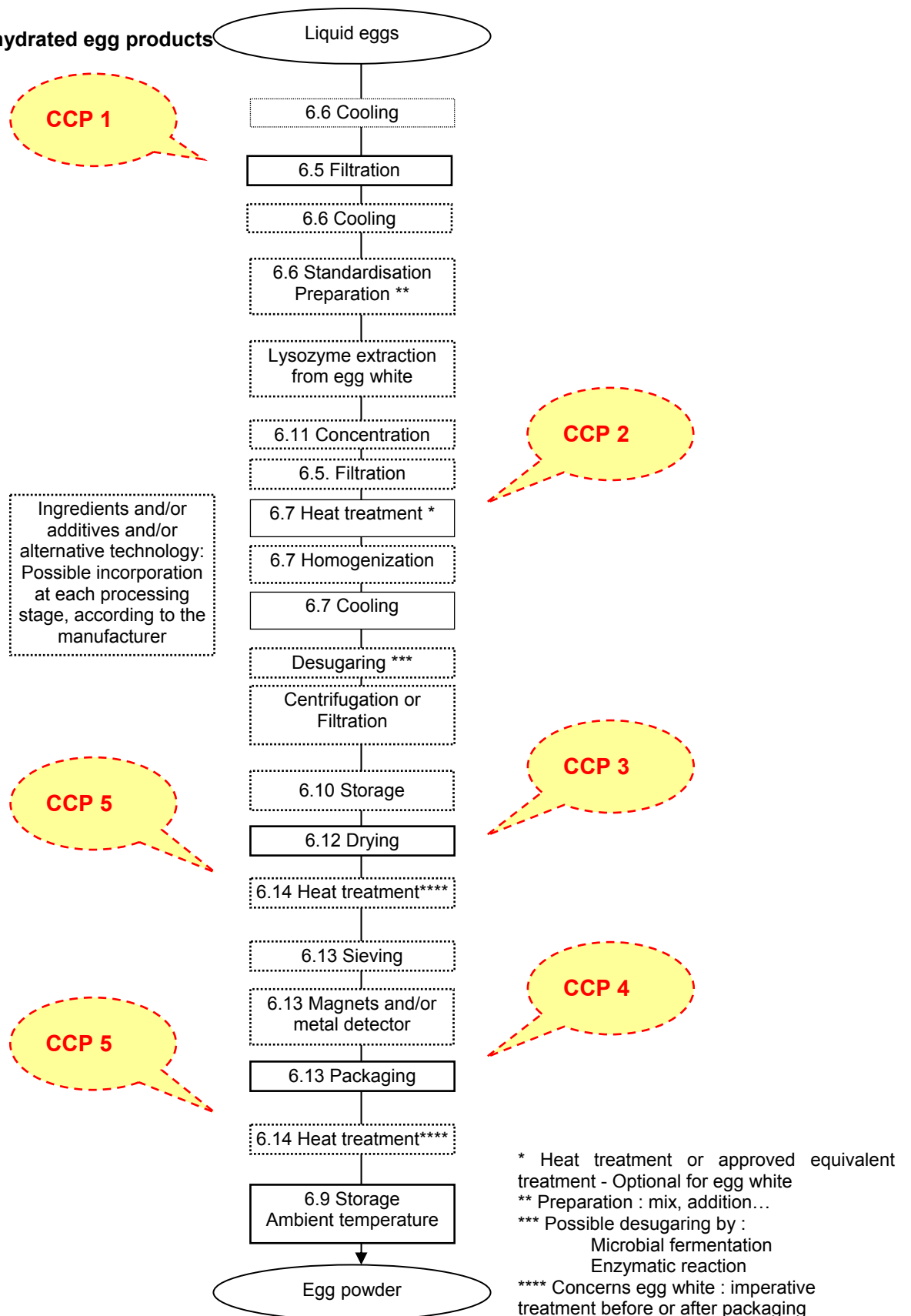


*Heat treatment or approved equivalent treatment

**Preparation : mix, addition, removal, ...



3.2.4 Dehydrated egg products



4 Hazards

4.1 Potential hazards

This guide is an aid for the egg products industry, in respect of food security standards.

Different types of hazards selected are:

- Microbiological
- Foreign bodies
- Chemicals
- Allergens
- GMO

4.1.1 Microbiological safe products

Regulation (EC) 2073/2005 (and Regulation EC 1141/2007) :

- That means free from pathogens e.g. : Salmonella (none /25g), due to the frequency of this bacteria in the poultry branch and prevalence of *Salmonella* infections where eggs have been implicated
- And which allows for limited contamination with non-pathogenic micro flora : refer to recommended specifications attached
- Microbiological criteria as follows:

PARAMETER	CRITERIA	ACTION IN CASE OF INSATISFACTORY RESULTS
Mesophilic aerobic bacteria *	$m = 10^4 - M = 10^5$ ufc in 1g (n=5, c=2)	Checks on the efficiency of the heat-treatment and prevention of recontamination
Enterobacteria **	$m = 10 - M = 10^2$ ufc in 1g (n=5, c=2)	
Salmonella ***	Absence in 25g (n=5, c=0)	The batch shall not be placed on the market or it shall be withdrawn from the market

* This criteria is not in the regulation 2073/2005, but is considered an indicator of heat-treatment efficiency

** Hygiene criteria

*** Food safety criteria

4.1.2 Foreign bodies

e.g. : egg shells, insects, glass, plastics, metals, wood, etc

4.1.3 Chemical

Cleaning and disinfection products

Fluids : cooling liquid, steam, warm water, compressed air

Grease

Pesticides, heavy metals, medicine residues, mycotoxins

4.1.4 Allergens

[Directive 2003/89/EC, amending Directive 2000/13/EC as regards indication of the ingredients present in foodstuffs](#)

(3) When used in the production of foodstuffs and still present, certain ingredients or other substances are the cause of allergies or intolerances in consumers, and some of those allergies or intolerances constitute a danger to the health of those concerned.

(4) The Scientific Committee on Food set up by Article 1 of Commission Decision 97/579/EC (5) has stated that the incidence of food allergies is such as to affect the lives of many people, causing conditions ranging from very mild to potentially fatal.

(11) In order to provide all consumers with better information and to protect the health of certain consumers, it should be made obligatory to include in the list of ingredients all ingredients and other substances present in the foodstuff. In the case of alcoholic beverages, it should be mandatory to include in the labelling all ingredients with allergenic effect present in the beverage concerned.

(10) The list of allergenic substances should include those foodstuffs, ingredients and other substances recognised

[Directive 2007/68/EC of 27 November 2007, amending Annex IIIa to Directive 2000/13/EC of the European Parliament and of the Council as regards certain food ingredients](#)

Annex IIIa :

Ingredients referred to in Article 6(3a), (10) and (11)

1. Cereals containing gluten (i.e. wheat, rye, barley, oats, spelt, kamut or their hybridised strains) and products thereof,

Except :

- (a) wheat-based glucose syrups including dextrose (1);

- (b) wheat-based maltodextrins (1);
 - (c) glucose syrups based on barley;
 - (d) cereals used for making distillates or ethyl alcohol of agricultural origin for spirit drinks and other alcoholic beverages.
2. Crustaceans and products thereof.
 3. Eggs and products thereof.
 4. Fish and products thereof, except:
 - (a) fish gelatine used as carrier for vitamin or carotenoid preparations;
 - (b) fish gelatine or Isinglass used as fining agent in beer and wine.
 5. Peanuts and products thereof.
 6. Soybeans and products thereof, except:
 - (a) fully refined soybean oil and fat (1);
 - (b) natural mixed tocopherols (E306), natural D-alpha tocopherol, natural D-alpha tocopherol acetate, natural D-alpha tocopherol succinate from soybean sources;
 - (c) vegetable oils derived phytosterols and phytosterol esters from soybean sources;
 - (d) plant stanol ester produced from vegetable oil sterols from soybean sources.
 7. Milk and products thereof (including lactose), except:
 - (a) whey used for making distillates or ethyl alcohol of agricultural origin for spirit drinks and other alcoholic beverages;
 - (b) lactitol.
 8. Nuts, i.e. almonds (*Amygdalus communis* L.), hazelnuts (*Corylus avellana*), walnuts (*Juglans regia*), cashews (*Anacardium occidentale*), pecan nuts (*Carya illinoensis* (Wangenh.) K. Koch), Brazil nuts (*Bertholletia excelsa*), pistachio nuts (*Pistacia vera*), macadamia nuts and Queensland nuts (*Macadamia ternifolia*), and products thereof, except:
 - (a) nuts used for making distillates or ethyl alcohol of agricultural origin for spirit drinks and other alcoholic beverages.
 9. Celery and products thereof.
 10. Mustard and products thereof.
 11. Sesame seeds and products thereof.
 12. Sulphur dioxide and sulphites at concentrations of more than 10 mg/kg or 10 mg/litre expressed as SO₂.
 13. Lupin and products thereof.
 14. Molluscs and products thereof.

Egg is allergenic.

Investigations have to be done to identify allergen sources (technical specifications from suppliers).

Allergen certificate can be declared regarding this first study.

4.1.5 G.M.O.

Egg products are not covered by the :

[Regulation 1829/2003 on genetically modified food and feed](#) :

Whereas (16) : "Thus, products obtained from animals fed with genetically modified feed or treated with genetically modified medicinal products will be subject neither to the authorisation requirements nor to the labelling requirements referred to in this Regulation."

Nevertheless, the factory should ensure for each ingredient if it's covered or not.

4.2 Hazards analysis

Hazard evaluation includes an evaluation of each hazard whether they represent a CCP.

The following provides one example for each kind of hazard.

Microbiological hazards

Salmonella	
Hazard	Pathogen bacteria, possible to lead to human death Contamination of egg products
Origin of hazard	<ol style="list-style-type: none"> 1. Internal endogenous contamination: upstream emergence of hazard 2. External exogenous contamination (cracked eggs): possible emergence all along production from egg to egg product 3. Resistance of the bacteria during heat treatment (or equivalent) 4. Recontamination after heat treatment (or equivalent)
Control means	<ol style="list-style-type: none"> 1. Good practices 2. Heat treatment control
Selected hazard	YES Impact on food safety Imperative preventive measures, and control of the hazard

Physical hazard

Foreign bodies	
Hazard	Ingestion by a customer: egg shell, glass, insect, plastic, wood, metal (ferrous or not ferrous), hair... Damage of equipment in food factory
Origin of hazard	Emergence of the hazard, particularly: At breaking In tank During heat treatment During filling and packaging
Control means	Good practices & specific measures: Filtrations Magnet, seaver
Selected hazard	YES Impact on food safety Imperative preventive measures and control of the hazard

Chemical hazards

Cleaning and disinfection products	
Hazard	Ingestion by a customer: egg products contaminated by cleaning or disinfection products, during production by contact with surfaces
Origin of hazard	Contact with surfaces during process, after cleaning and disinfection
Control means	Good practices: Efficient rinsing after cleaning operations Use of allowed cleaning and disinfection products for food contact
Selected hazard	YES Imperative preventive measures, control of the hazard, and qualification of cleaning and disinfection process

Other hazards

Allergens	
Hazard	Customer health
Origin of hazard	Hazard emergence when using allergenic ingredients or additives
Control means	Suppliers specifications for ingredients, additives, packaging, tank Specific measures only in case of contamination Personal training (no eating in production areas) and every external workers
Selected hazard	YES, only for producers concerned by contamination with other ingredients or additives

GMO	
Hazard	Customer health unknown
Origin of hazard	Hazard emergence when using GMO ingredients or additives
Control means	Suppliers assessment Specific measures only in case of contamination
Selected hazard	NO if only eggs used on the plant No case known on egg product YES, only for producers concerned by contamination with other ingredients or additives

4.3 Risks evaluation

The evaluation per hazard is determined by the combination of severity, frequency and detectability. It is a means to see if a hazard is significative or not (MAJOR or minor).

The table below is a help for decision, which estimates the level of each hazard.

One mark is given to each hazard for each parameter (severity, frequency, detectability), regarding its level, according to the following rules :

Severity

- 1 = Negligible → No known consequence to customer health
- 2 = Low → No significant Impact on customer health, but could lead to dissatisfaction
- 3 = Moderate → Reversible effects on customer health, requiring a treatment
- 4 = High → Irreversible effects to customer health (physical damages, death)

Frequency

- 1 = Negligible → No known case
- 2 = Low → Could appear, some case known in bibliography, but not met in the factory
- 3 = Moderate → Isolated cases met in the factory
- 4 = High → High frequency in the factory

Detectability

- 1 = High → Detectable in the factory, and stopping the product
- 2 = Moderate → Detectable in the factory, with a risk of delivery of the failure product
- 3 = Low to Negligible → Very low or not detectable by the factory

	Severity	Frequency	Detectability	Result = GxFxD	
Microbiological hazards					
<i>Salmonella</i>	4	2	2	16	MAJOR
Enterobacteria	2	3	2	12	minor
<i>Staphylococcus aureus, Clostridium perfringens, Bacillus cereus, Listeria monocytogenes</i> and other pathogenic or spoilage bacteria	3	2	2	12	minor
Bacteriological toxins	3	1	3	9	minor
Viruses	3	1	3	9	minor
Yeast & moulds	2	2	2	8	minor
Mesophilic aerobic bacteria (TPC)	2	2	2	8	minor
Influenza	Unknown : 1	1	3	3	minor
Physical hazards					
Foreign bodies	3	3	2	18	MAJOR
Radioactivity	4	1	3	12	minor
Chemical hazards					
Cleaning and disinfection products	2	2	3	12	minor
Ink and glue for packaging and labels	2	2	3	12	minor
Fluids	2	2	3	12	minor
Grease	2	2	3	12	minor
PCB, dioxines and furans	4	1	3	12	minor
Pesticide residues	4	1	3	12	minor
Heavy metals	4	1	3	12	minor
Mycotoxins	4	1	3	12	minor
Pest control products	3	1	3	9	minor
Medicines residues	3	1	3	9	minor
Materials in contact	3	1	3	9	minor
Allergens					
Allergens (other than eggs)	4	(1 or) 2	3	12 or 24	Minor or MAJOR
GMO					
GMO in eggs	Unknown : 1	1	3	3	minor
GMO in ingredients or additives	Unknown : 1	2	3	6	minor

Hazards evaluation :

If result is ≤ 12 → minor hazard

If result > 12 → MAJOR hazard

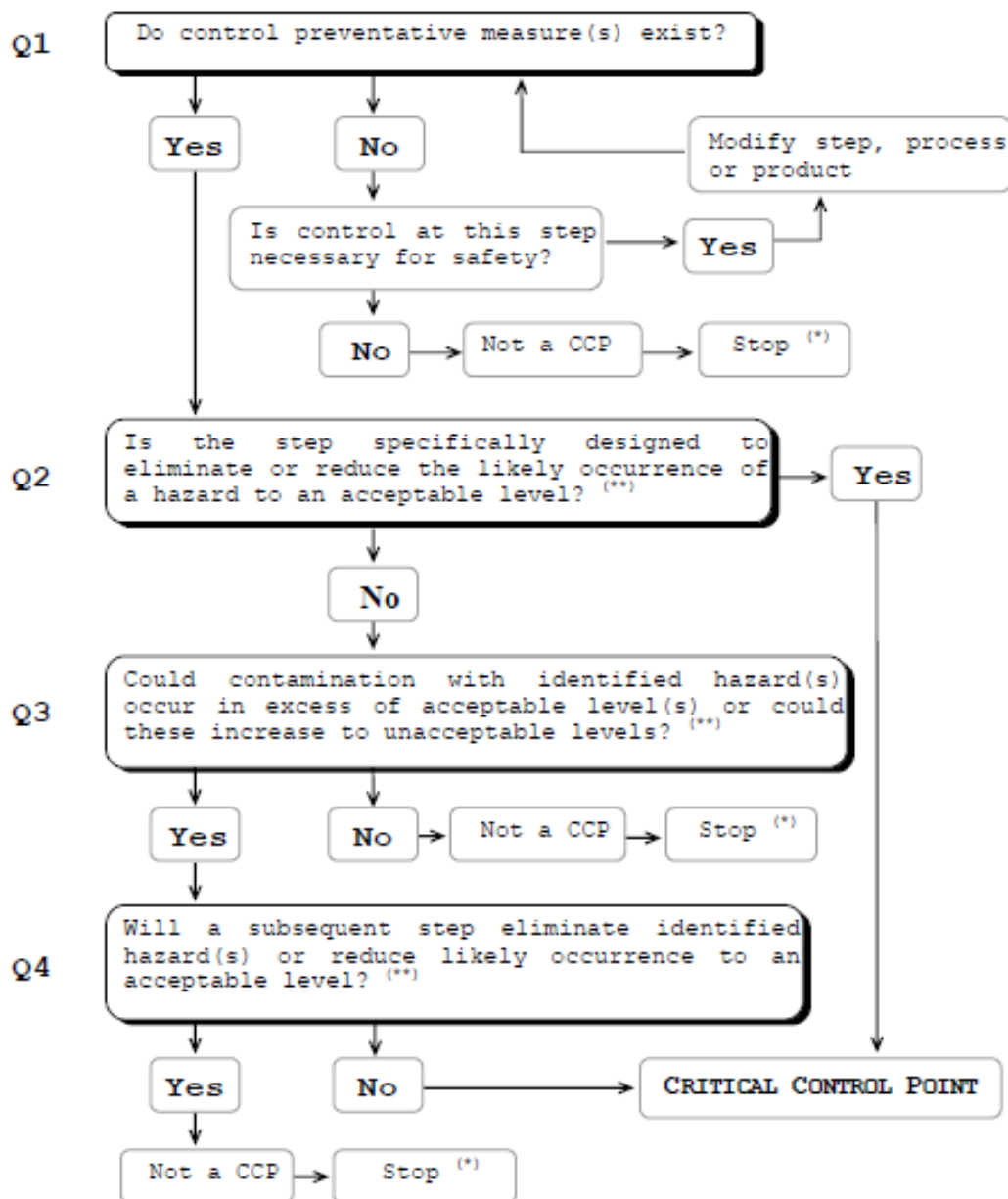
Consequences :

- If minor, the step considered has to be under control by preventive measures
- If MAJOR, the step considered can be CCP or not, depending on decision tree (see below)

4.4 CCP determination

Decision tree of Codex alimentarius (appendix CAC/RCP 1-1969, Rév. 4,2003) is relevant to identify CCP at each step of production for MAJOR hazards.

Conclusions with this binary approach must be cautious and qualified. So it can be completed by other means, like decision tree in quality management.



(*) Proceed to the next identified hazard in the described process.

(**) Acceptable and unacceptable levels need to be defined within the overall objectives in identifying the CCPs of HACCP plan.

5 "Horizontal" (or additional) measures

5.1 Factory Environment

5.1.1 Reminder of existing regulations and recommendations

Codex Alimentarius CAC/RCP 1 – 1969 : recommended international code of practice on general principles of food hygiene: section IV

The establishment should be such as can be kept reasonably free of objectionable odours, smoke, dust or other contamination and in an area which is not subject to floodings.

5.1.2 How to Comply

Aims	Mandatory requirements	Good Practice
Control of personnel entry	<ul style="list-style-type: none"> ▪ Control of the entrances to the production area 	<ul style="list-style-type: none"> ▪ Fenced in perimeter and a barrier at the entrance
Management of waste	<ul style="list-style-type: none"> ▪ Installing a sufficient number of closed dustbins or garbage cans regularly emptied 	
Control of the effluent	<ul style="list-style-type: none"> ▪ Water treatment (purification station, controlled distribution, ...) ▪ Access roads kept clean ▪ Filters to airborne pollutants, regularly cleaned ▪ Keeping doors and windows closed 	<ul style="list-style-type: none"> ▪ Respecting a minimum distance to the pollution sources
Pest Control	<ul style="list-style-type: none"> ▪ Protection plan against pests ▪ Drainage of the areas with stagnant water ▪ The perimeter of the premises kept well maintained ▪ Appropriate storage of unused material outside the buildings 	

5.2 Infrastructural and equipment requirements, maintenance, calibration

5.2.1 Reminder of existing regulations and recommendations

Regulation 852/2004 on the hygiene of foodstuffs (Annex II – Chapter I)

Food premises are to be kept clean and maintained in good repair and condition.

The layout, design, construction, siting and size of food premises are to :

- (a) permit adequate maintenance, cleaning and/or disinfection, avoid or minimise air-borne contamination, and provide adequate working space to allow for the hygienic performance of all operations;
- (b) be such as to protect against the accumulation of dirt, contact with toxic materials, the shedding of particles into food and the formation of condensation or undesirable mould on surfaces;
- (c) permit good food hygiene practices, including protection against contamination and, in particular, pest control; and
- (d) where necessary, provide suitable temperature-controlled handling and storage conditions of sufficient capacity for maintaining foodstuffs at appropriate temperatures and designed to allow those temperatures to be monitored and, where necessary, recorded.

There is to be suitable and sufficient means of natural or mechanical ventilation. Mechanical airflow from a contaminated area to a clean area is to be avoided. Ventilation systems are to be so constructed as to enable filters and other parts requiring cleaning or replacement to be readily accessible.

Sanitary conveniences are to have provided with adequate natural or mechanical ventilation.

Food premises are to have adequate natural and/or artificial lighting.

Drainage facilities are to be adequate for the purpose intended. They are to be designed and constructed to avoid the risk of contamination. Where drainage channels are fully or partially open, they are to be so designed as to ensure that waste does not flow from a contaminated area towards or into a clean area, in particular an area where foods likely to present a high risk to the final consumer are handled.

Where and as necessary, adequate changing facilities for personnel are to be provided.

Cleaning agents and disinfectants are not to be stored in areas where food is handled.

Regulation 852/2004 on the hygiene of foodstuffs (Annex II – Chapter II)

In rooms where food is prepared, treated or processed (excluding dining areas and those premises specified in Chapter III but including compartments in vehicles) the design and layout are to permit good food hygiene practices, including protection against cross-contamination between and during operations, and in particular:

- (a) floor surfaces are to be maintained in a sound condition and be easy to clean and, if necessary, disinfect. This will require the use of impervious, non absorbent, washable and non-toxic materials unless food business operators can satisfy the competent authority that other materials used are appropriate. Where appropriate, floors are to allow adequate surface drainage;
- (b) wall surfaces are to be maintained in a sound condition and be easy to clean and, if necessary, disinfect. This will require the use of impervious, non absorbent, washable and non-toxic materials and require a smooth surface up to a height appropriate for the operations unless food business operators can satisfy the competent authority that other materials used are appropriate;
- (c) ceilings, overhead structures and the inner surfaces of roofs are to be constructed to prevent the accumulation of dirt and reduce condensation, the growth of undesirable moulds and the shedding of particles;
- (d) windows and other openings are to be constructed to prevent the accumulation of dirt. Those which can be opened to the outside environment are where necessary be fitted with insect-proof screens which can be easily removed for cleaning. Where open windows would result in contamination of foodstuffs, windows are to remain closed and fixed during production;
- (e) doors are to be easy to clean and, where necessary, disinfect. This will require the use of smooth and non-absorbent surfaces unless food business operators can satisfy the competent authority that other materials used are appropriate;

Codex alimentarius : Code of hygienic practice for eggs and egg products CAC/RCP 15 – 1976

4 Establishment : design and facilities

Section 4 of the Recommended International Code of Practice: General Principles of Food Hygiene applies to both the processing of eggs for the table egg market and the processing of egg products.

The following guidelines are supplemental to Section 4 of the Recommended International Code of Practice : General Principles of Food Hygiene for establishments that produce egg products.

Where practicable, separate areas should be allocated for :

- Storage of egg and untreated egg product;
 - Breaking and microbiocidal treatment of eggs;
 - Packing of microbiocidally treated egg product;
 - Storage of microbiocidally treated liquid and frozen egg products and other liquid or frozen ingredients as appropriate;
 - Storage of microbiocidally treated dried egg product and other dry ingredients as appropriate; and
 - Storage of cleaning and sanitising materials.
- Work areas for raw and treated product should be separated via physical barriers.

Regulation (EC) N° 853/2004 , laying down specific hygiene rules for on the hygiene of foodstuffs

Section X : Eggs and egg products

Chapter II: egg products

I. Requirements for establishments

Food business operators must ensure that establishments for the manufacture of egg products are constructed, laid out and equipped so as to ensure separation of the following operations :

- 1) washing, drying and disinfecting dirty eggs, where carried out ;
- 2) breaking eggs, collecting their contents and removing parts of shells and membranes ; and
- 3) operations other than those referred to in points 1 and 2.

Codex alimentarius

CAC/GL 50-2004 : General guidelines on sampling

COUNCIL DIRECTIVE N° 90/384 of 20 June 1990 on the harmonization of the laws of the Member States relating to non-automatic weighing instruments

Article 1

1. A weighing instrument is defined as a measuring instrument serving to determine the mass of a body by using the action of gravity on that body. A weighing instrument may also serve to determine other mass-related magnitudes, quantities, parameters or characteristics.

A non-automatic weighing instrument is defined as a weighing instrument requiring the intervention of an operator during weighing.

This Directive applies to all non-automatic weighing instruments, hereinafter referred to as 'instruments'.

2. A distinction is made in this Directive between two categories of instrument use:

- (a) 1. determination of mass for commercial transactions;

COUNCIL DIRECTIVE N° 76/211/EEC of 20 January 1976 on the approximation of the laws of the Member States relating to the making-up by weight or by volume of certain prepackaged products

Article 3

1. The prepackages which may bear the EEC sign specified in section 3.3 of Annex I are those which comply with this Directive and with Annex I thereto.

2. They shall be subject to metrological control under the conditions defined in Annex I, section 5 and in Annex II.

Article 4

1. All prepackages referred to in Article 3 must, in accordance with Annex I, bear an indication of the weight or volume of the product, known as 'nominal weight' or 'nominal volume', which they are required to contain.

ANNEX II

This Annex lays down the procedures of the reference method for statistical checking of batches of prepackages in order to meet the requirements of Article 3 of the Directive and of Section 5, Annex I thereto.

1. Requirements for measuring the actual contents of prepackages

The actual contents of prepackages may be measured directly by means of weighing instruments or volumetric instruments or, in the case of liquids, indirectly, by weighing the prepacked product and measuring its density. Irrespective of the method used, the error made in measuring the actual contents of a prepackage shall not exceed one-fifth of the tolerable negative error for the nominal quantity in the prepackage. The procedure for measuring the actual contents of a prepackage may be the subject of domestic regulations in each Member State.

2. Requirements for checking batches of prepackages

The checking of prepackages shall be carried out by sampling and shall be in two parts:

- a check covering the actual contents of each prepackage in the sample,
- another check on the average of the actual contents of the prepackages in the sample.

A batch of prepackages shall be considered acceptable if the results of both these checks satisfy the acceptance criteria.

For each of these checks, there are two sampling plans:

- one for non-destructive testing, i.e., testing which does not involve opening the package,
- the other for destructive testing, i.e., testing which involves opening or destroying the package.

For economic and practical reasons, the latter test shall be limited to the absolutely essential minimum; it is less effective than the non-destructive test.

Destructive testing shall therefore be used only when non-destructive testing is impracticable. As a general rule it shall not be applied to batches of fewer than 100 units.

5.2.2 How to Comply

Infrastructural and equipments requirements :

Aims	Mandatory requirements	Good Practice
Control of the product flow to avoid cross contaminations	<ul style="list-style-type: none"> ▪ The raw material has to follow a "one way" circuit. The product must never go backward ▪ Separation between "clean / treated product" area and "dirty / raw product" area (hygiene junctions, separate changing rooms, ...) ▪ Identification of personnel, packaging, product and waste routings ▪ Separation of the different flows by room and /or in time 	<ul style="list-style-type: none"> ▪ Separation between breaking step and unpacking step, or closed breaking machine ▪ Identification of the "clean" area (treated product) and the "dirty" area (raw material, packaging, waste...), distinction of the sectors using for instance colour codes and separation of these zones
Design of production rooms	<ul style="list-style-type: none"> ▪ Smooth walls, floors and ceilings..., floor with rounded corners and slope on floor, allowing a good flow of water ▪ Limitation of stagnant water on the floor ▪ Limitation of openings eliminating the ones which give directly to the outside ▪ Identification of the different kinds of services (e.g. potable and non-potable water, gas, steam, ...) ▪ Plastic protection for lighting, limited use of glass ▪ Ventilation of the rooms ▪ Drains with grates and a maintenance of the drain traps ▪ Room for the personnel to store and consume food, outside of production areas and the changing rooms 	<ul style="list-style-type: none"> ▪ Installation of hygiene junctions between the outside and the production areas ▪ Preference of automatic door closures, restricting air movements
Hygiene conception of equipments	<ul style="list-style-type: none"> ▪ Hazard analysis has to lead to written specifications regarding hygiene conception of equipments: ▪ Characteristics of equipments, in particular: technical description of each component, ability to be removed and to be cleaned ▪ Compliance with safety requirements, eg: foreign bodies hazard, cleanliness (kind of materials used, easy flow...), chemical hazards (grease...) ▪ Guidance for cleaning ▪ Safety requirements during installation of equipments 	<p>Hazard analysis has to lead to written specifications regarding hygiene conception of equipments:</p> <ul style="list-style-type: none"> ▪ performance of equipment, security for workers and ergonomics ▪ food contact agreement ▪ personnel training in cleaning step ▪ commissioning of each new equipment ▪ Procedure for control glass and hard plastics, particularly : glass minimization, check-list, immediate action in case of broken glass or hard plastic

Maintenance requirements :

Aims	Mandatory requirements	Good Practice
To avoid damage of surfaces which are in contact with liquid eggs or egg products	Preventive maintenance plan to cover all processing equipment on CCP, particularly heat treatment equipment : <ul style="list-style-type: none"> check integrity of surfaces in contact with product remove and check valve seals Preventive maintenance plan to cover all processing equipment for cooling	<ul style="list-style-type: none"> Preventive maintenance plan for all equipment
To avoid contamination of surfaces which are in contact with liquid eggs or egg products, after maintenance operation	<ul style="list-style-type: none"> Cleaning of all equipment that is in contact with liquid eggs or egg products after maintenance operation 	
Free from chemical residues	<ul style="list-style-type: none"> Use of only food approved chemicals for equipment which could be in contact with liquid eggs or egg products : lubricant, cooling fluids, oil... Compressed air used for food contact should be dry and filtered to remove mineral oils 	<ul style="list-style-type: none"> Use of only food approved chemicals for all plant and equipment
Free from foreign bodies	<ul style="list-style-type: none"> Steam filtration whether or not it is for direct product contact surfaces Inspection after cleaning following maintenance operation 	

Calibration requirements :

Aims	Mandatory requirements	Good Practice
Ensure that weight or volume is correct Ensure measurements are reliable	<ul style="list-style-type: none"> Adapted sampling plan for prepackaged products Calibration of monitoring equipment on the CCP : e.g. temperature, pressure Calibration of equipment that measures holding time (e.g. flow meter, chronometer) Calibration of weighing equipment Procedure of calibration must : <ul style="list-style-type: none"> distinguish between internal and external means take in account frequency regarding rules in force, regarding use range plan external calibration particularly for calibration equipment (eg temperature, weigh) In internal laboratory, this procedure is the same for equipments 	<ul style="list-style-type: none"> Calibration frequency : at least once a year for all critical monitoring equipment Internal check between two calibrations with a calibrated instrument Internal or external laboratory must use validated and / or official methods In internal laboratory, a procedure should be done for microbiological methods : by ring test for example
Traceability back to national reference equipment	<ul style="list-style-type: none"> Calibration with equipment certified to a National Standard. Guaranty of traceability back to the National Standard (certificate) 	

5.3 Toilet facilities

5.3.1 Reminder of existing regulations and recommendations

Regulation 852/2004 on the hygiene of foodstuffs (Annex II – Chapter I)

An adequate number of flush lavatories are to be available and connected to an effective drainage system. Lavatories are not to open directly into rooms in which food is handled.

An adequate number of washbasins is to be available, suitably located and designated for cleaning hands. Washbasins for cleaning hands are to be provided with hot and cold running water, materials for cleaning hands and for hygienic drying. Where necessary, the facilities for washing food are to be separate from the hand-washing facility.

Sanitary conveniences are to have adequate natural or mechanical ventilation.

5.3.2 How to Comply

Aims	Mandatory requirements	Good Practice
Properly designed and cleanable changing rooms and toilet facilities to avoid contaminations by personnel	<ul style="list-style-type: none"> ▪ Wash basins with potable water and non hand-operable taps should be provided. There should be a sufficient number of washbasins close to the locations where a regular washing of hands is necessary (toilet facilities, production areas) ▪ The dispensers for hand washing and disinfection should be easy to dismantle and clean ▪ Single use hand drying system ▪ Toilets avoiding contamination of feet ▪ Changing rooms with individual lockers for the staff with physical separation of workwear from personal clothing ▪ Regular cleaning and disinfection of the toilet facilities and changing rooms 	<ul style="list-style-type: none"> ▪ Provision of bins with a non manually opening lid located near the washbasins

5.4 Recommendations applicable to personnel

5.4.1 Reminder of existing regulations and recommendations

Regulation 852/2004 on the hygiene of foodstuffs (Annex II – Chapter VIII)

Every person working in a food-handling area is to maintain a high degree of personal cleanliness and is to wear suitable, clean and, where necessary, protective clothing.

No person suffering from, or being a carrier of a disease likely to be transmitted through food or afflicted, for example, with infected wounds, skin infections, sores or diarrhoea is to be permitted to handle food or enter any food-handling area in any capacity if there is any likelihood of direct or indirect contamination. Any person so affected and employed in a food business and who is likely to come into contact with food is to report immediately the illness or symptoms, and if possible their causes, to the food business operator.

Regulation 852/2004 on the hygiene of foodstuffs (Annex II – Chapter XII)

Food business operators have to ensure :

1. that food handlers are supervised and instructed and/or trained in food hygiene matters commensurate with their work activity;
2. that those responsible for the development and maintenance of the procedure referred to in Article 5(1) of this Regulation or for the operation of relevant guides have received adequate training in the application of the HACCP principles; and
3. compliance with any requirements of national law concerning training programmes for persons working in certain food sectors.

5.4.2 How to Comply

Aims	Mandatory requirements	Good Practice
To avoid contaminations by personnel	<ul style="list-style-type: none"> ▪ Hygiene training, appropriate to the type of work and the hazards level ▪ Setting up hygienic procedures, with body and facial hygiene ▪ The wearing of specified clothing : blouse / trousers or an overall : no buttons nor outside pockets ▪ Hygiene of the hands, with potable water ▪ Head covers : must cover the hair completely ▪ Boots/shoes dedicated to productions areas ▪ Personal health : personnel should not show risk of contamination to the product ▪ Setting up a hygiene control plan ▪ Specific measures during filling of egg products (see chapters concerned) ▪ Permit eating, ban smoking at plant only in dedicated place(s) and prohibit eating at work post ▪ Head covers, gloves, mask have to be disposable or cleaned after use 	<ul style="list-style-type: none"> ▪ Display hygiene instructions : particularly in toilets, changing rooms, production areas ▪ Hygiene of forearms ▪ Frequency of changing clothing adapted to each production area : daily change in high care areas, like filling area ▪ Use of beard cover ▪ Prohibit visible jewelleryes ▪ Cover piercing ▪ Mouth-nose mask : in appropriate production areas, particularly on breaking, packaging areas ▪ Gloves : in appropriate production areas, particularly on breaking, packaging areas ▪ Use of gloves don't substitute to washing hands ▪ Colour coded and disposable hairnets, masks, gloves, beard covers, hand towels ▪ Declaration of pathogen illness at work ▪ Prohibit smoking on the plant

Aims	Mandatory requirements	Good Practice
		<ul style="list-style-type: none"> ▪ Sub-contractors and visitors screening ▪ Prohibit use of medicines at work post ▪ Prohibit introduction of allergens products at work post

5.5 Personal training

5.5.1 Reminder of existing regulations and recommendations

Regulation 852/2004 on the hygiene of foodstuffs (Annex II – Chapter XII)

Food business operators have to ensure :

1. that food handlers are supervised and instructed and/or trained in food hygiene matters commensurate with their work activity;
2. that those responsible for the development and maintenance of the procedure referred to in Article 5(1) of this Regulation or for the operation of relevant guides have received adequate training in the application of the HACCP principles; and
3. compliance with any requirements of national law concerning training programmes for persons working in certain food sectors.

5.5.2 How to Comply

Aims	Mandatory requirements	Good Practice
To avoid contaminations by personnel, and bad practices	<ul style="list-style-type: none"> ▪ Suitable training policy and program must be in place ▪ Deliver appropriate training to the job activity, particularly on: <ul style="list-style-type: none"> • HACCP application • Personnel and waste flow respect • Personnel hygiene • Cleaning ▪ List needs of training ▪ Plan trainings ▪ Record trainings after be done (people who have been trained have to sign) 	<ul style="list-style-type: none"> ▪ Deliver appropriate training to the job activity, particularly on : Legislation ▪ Train once a year all personnel, particularly workers concerned by food safety at their post ▪ Estimate training efficiency

5.6 Cleaning and disinfection and cleaning in place (CIP)

5.6.1 Reminder of existing regulations and recommendations

Regulation 852/2004 on the hygiene of foodstuffs (Annex II – Chapter II)

Floor surfaces are to be maintained in a sound condition and be easy to clean and, where necessary, to disinfect. This will require the use of impervious, non-absorbent, washable and non-toxic materials unless food business operators can satisfy the competent authority that other materials used are appropriate. Where appropriate, floors are to allow adequate surface drainage

Adequate facilities are to be provided, where necessary, for the cleaning, disinfecting and storage of working utensils and equipment. These facilities are to be constructed of corrosion-resistant materials, be easy to clean and have an adequate supply of hot and cold water.

Adequate provision is to be made, where necessary, for washing food. Every sink or other such facility provided for the washing of food is to have an adequate supply of hot and/or cold potable water consistent with the requirements of Chapter VII and be kept clean and, where necessary, disinfected.

Annex II - Chapter VII : water supply

There is to be an adequate supply of potable water, which is to be used whenever necessary to ensure that foodstuffs are not contaminated.

Where non-potable water is used, for example for fire control, steam production, refrigeration and other similar purposes, it is to circulate in a separate duly identified system. Non-potable water is not to connect with, or allow reflux into, potable water systems.

Regulation 852/2004 on the hygiene of foodstuffs (Annex 11 - Chapter I) :

General requirements for food premises (other than those specified in chapter III)

10. Cleaning agents and disinfectants are not to be stored in areas where food is handled.

5.6.2 How to Comply

The products used for cleaning and disinfection must be chosen with regard to their use.

The following should be taken into account in the selection of the cleaning product :

- Nature and level of soiling

- Water quality / hardness
- Type of fabric being cleaned
- Method of cleaning
- Food contact agreement

The following should be taken into account in the selection of the disinfecting product :

- The effective spectrum of the disinfectant (bacterial, fungicidal, sporicidal and/or antiviral)
- The contact time for effectiveness
- The level and type of soiling
- The risk of corrosion of the fabrications
- The stability (to storage, to heat, to light...)
- The residues after rinsing (for food and/or environment)
- The safety for the user (low toxicity, easy handling)
- Food contact agreement

Cleaning in Place is a system for cleaning and disinfecting closed circuits without dismantling or manual washing.

Example of cleaning and disinfecting techniques:

Cleaning-disinfection of :	Applied technique(s)	Cleaning	Advised active disinfecting materials
<ul style="list-style-type: none"> ▪ Floors, walls, ceilings, surfaces in contact with foodstuffs, the surface of the machinery 	<ul style="list-style-type: none"> ▪ Low spray or medium pressure, ▪ Foam sprayer 	Sodium hydroxide, Chlorinated alkalines (+ acid)	<ul style="list-style-type: none"> ▪ Chlorinated alkalines, quaternary ammoniums (+ possibly aldehyde), iodophores, hydrogen peroxide + peracetic acid, amphoteric, sodium hypochlorite...
<ul style="list-style-type: none"> ▪ Closed circuits, pipes, tanks... 	<ul style="list-style-type: none"> ▪ Cleaning In Place (CIP), or manual if possible 		<ul style="list-style-type: none"> ▪ hydrogen peroxide + peracetic acid, quaternary ammoniums (+ possibly aldehyde), amines, ...
<ul style="list-style-type: none"> ▪ Atmosphere in the room 	<ul style="list-style-type: none"> ▪ Thermospraying, fumigation 		<ul style="list-style-type: none"> ▪ Glutaraldehyde, formaldehyde, quaternary ammoniums, ...
<ul style="list-style-type: none"> ▪ Small parts, flexibles, fittings, gaskets, tools, ... 	<ul style="list-style-type: none"> ▪ Prolonged soaking ▪ Fast acting sprays (<30 secs) 		<ul style="list-style-type: none"> ▪ quaternary ammoniums ▪ quaternary ammoniums + biguanidine, hydrogen peroxide + peracetic acid

Note : The frequency of the cleaning and disinfection procedures is determined according to the installations, the organisation of the company and the risk factor determined by each company.

Aims	Mandatory requirements	Good Practice
Non contaminating product contact surfaces, by effective cleaning and disinfection	<ul style="list-style-type: none"> ▪ Definition of a cleaning and disinfection plan, including the following parameters and regard for the chemical manufacturer's instructions for use <ul style="list-style-type: none"> ▪ temperature ▪ mechanical action ▪ concentration ▪ time required ▪ Control and / or validation of cleaning and disinfection parameters by physical and microbiological measures after CIP or after open cleaning and disinfection of surfaces in contact with products ▪ Checking records of cleaning and disinfection parameters, and correction in case of problem ▪ Cleaning and disinfection training for staff ▪ Validation of the cleaning and disinfection ▪ Managing the stock, supervising the time and conditions of storage to ensure the manufacturers of chemical products instructions are followed ▪ Restrict cleaning and disinfecting close to exposed products during production to protect the food from risk of chemical contamination ▪ Specific for CIP : <ul style="list-style-type: none"> ▪ Means of dosage / monitoring the chemical concentration (conductivity) ▪ Continuous temperature measuring ▪ Continuous flow and/or pressure measuring at entrance and exit of CIP ▪ Checking and regulation of the concentrations of recycled products ▪ Installation and maintenance of monitoring and 	<ul style="list-style-type: none"> ▪ Setting up a cleaning procedure, preferably separate from the disinfecting procedure. If this is not possible, disinfecting products should be used which have the characteristics of a detergent (tensioactive)

Aims	Mandatory requirements	Good Practice
	<ul style="list-style-type: none"> recording instruments : eg temperature probe, flowmeter, conductivity probe Validation of the cleaning and disinfection parameters, periodic checking of the CIP efficiency 	
Efficiency of disinfection product	<ul style="list-style-type: none"> Follow manufacturer's instructions 	<ul style="list-style-type: none"> Change disinfection product in case of problem
Absence of chemical and physical residues in the product	<ul style="list-style-type: none"> Sufficient rinsing after cleaning and sanitising with potable water or use approved product which does not require a rinse Use of food contact agreed chemical products Specific for CIP : filtration of the recycled solutions Cleaning agents and disinfectants are not to be stored in areas where food is directly handled or have to be protected by closed system 	<ul style="list-style-type: none"> Validation of rinsing by specific controls of rinsing solution : pH measurement or conductivity probe (for CIP) Be ensure that conformity of chemical products is taken in account in suppliers specifications, particularly regarding REACH Regulation
To avoid contamination by corroded surfaces	<ul style="list-style-type: none"> The method and type of cleaning and disinfecting products used must be compatible with the equipment, according to manufacturer's instructions There should be regular checks on the condition of the equipment 	
To avoid contamination by water	<ul style="list-style-type: none"> Use of potable water : be ensure of that with regular analysis, according with rules in force in each member state Water supply has to be specified and water analysed Separated system for non potable water 	

5.6.3 Following the CCP

Each company can consider this step as a CCP or not, but has to justify its choice, regarding its preventive measures, risks level, and control plan.

5.7 Hygiene of mobile materials and equipments

5.7.1 How to Comply

All mobile equipments and tools could cross-contaminate the liquid eggs or egg products. They should only be used for specifically defined operations and there should be defined hygiene procedures for their use and operation.

Aims	Mandatory requirements	Good Practice
To avoid contaminations and cross contaminations by mobile materials and equipments (piping, spoons (ladles) used for sampling, scrapers used for cleaning, ...)	<ul style="list-style-type: none"> Identification of the equipment and defining them to a specific work station, per production area Storing small tools, which have been cleaned in a bowl containing a regularly renewed disinfecting substance The tools should be rinsed before being used. Use of hygienically designed equipment (washable, smooth...), with a non food colour (blue) in preference Cleaning and disinfection of flexible piping which then has to be sealed or connected At every shift change, verifying that no tools, mobile materials or equipment are missing according the risk level 	<ul style="list-style-type: none"> Use of colour to identify the area and materials that belong to Prefer disposable materials

5.8 Management of used trays, waste and animal by-products

5.8.1 Reminder of existing regulations and recommendations

Regulation 852/2004 on the hygiene of foodstuffs (Annex II)

Chapter III :

Adequate arrangements and/or facilities for the hygienic storage and disposal of hazardous and/or inedible substances and waste (whether liquid or solid) are to be available;

Chapter VI :

Food waste, non-edible by-products and other refuse are to be removed from rooms where food is present as quickly as possible, so as to avoid their accumulation.

2. Food waste, non-edible by-products and other refuse are to be deposited in closable containers, unless food business operators can demonstrate to the competent authority that other types of containers or evacuation systems

used are appropriate. These containers are to be of an appropriate construction, kept in sound condition, be easy to clean and, where necessary, to disinfect.

3. Adequate provision is to be made for the storage and disposal of food waste, non-edible by-products and other refuse. Refuse stores are to be designed and managed in such a way as to enable them to be kept clean and, where necessary, free of animals and pests.

4. All waste is to be eliminated in a hygienic and environmentally friendly way in accordance with Union legislation applicable to that effect, and is not to constitute a direct or indirect source of contamination.

Chapter 1 :

Drainage facilities are to be adequate for the purpose intended. They are to be designed and constructed to avoid the risk of contamination. Where drainage channels are fully or partially open, they are to be so designed as to ensure that waste does not flow from a contaminated area towards or into a clean area, in particular an area where foods likely to present a high risk to the final consumer are handled.

5.8.2 How to Comply

The buildup of waste and other animal by-products around the conveyer belt, poses a risk not to be neglected for contamination of the foodstuffs : cross contamination risk.

Aims	Mandatory requirements	Good Practice
To avoid contamination by shells (liquid by-product)	<ul style="list-style-type: none"> ▪ Installation of equipment to enable an immediate removal and separate storage of empty shells ▪ Storage of the empty shells in a closed room kept clean ▪ Denaturing of the products unfit for human consumption (inedible liquid) 	<ul style="list-style-type: none"> ▪ Recommendation of using colouring agents or substances adding an odour to the by-product
To avoid contamination by solid waste	<ul style="list-style-type: none"> ▪ Using closed, cleaned, disinfected containers regularly cleaned ▪ Storage of waste in identifiable containers which have been defined to a work station ▪ Frequent removal of waste, stored in the production areas 	
To avoid contamination by liquid waste	<ul style="list-style-type: none"> ▪ Ensure that waste water does not flow from a contaminated area towards or into a clean area 	
Removal of waste from the production areas	<ul style="list-style-type: none"> ▪ An area outside the buildings provided for the removed waste, separate from the production rooms and regularly tended to 	
To avoid contamination (in breaking plant and in farm) by used trays	<ul style="list-style-type: none"> ▪ Clean plastic trays before return to farms or not re-use cellulose trays (except efficient approved treatment) 	<ul style="list-style-type: none"> ▪ Safety storage of used trays

5.9 Pest control system

5.9.1 Reminder of existing regulations and recommendations

Codex alimentarius : code of hygienic practice for eggs and egg products - CAC/RCP 15 – 1976

3.2.3 General Hygienic Practice

3.2.3.3 Pest control

Pests should be controlled using a properly designed pest control program as they are recognized as vectors for pathogenic organisms. Any pest control measures should not result in unacceptable levels of residues, such as pesticides, in or on eggs. Pests such as insects and rodents are known vectors for the introduction of human and animal pathogens into the production environment. Improper application of chemicals used to control these pests may introduce chemical hazards into the production environment.

A properly designed pest control program should be used, that considers the following:

- Before pesticides or rodenticides are used, all efforts should be made to minimize the presence of insects, rats and mice and reduce or remove places which could harbour pests.

- As cages/pens/enclosures/coops (if used) attract such pests, measures such as proper design, construction and maintenance of buildings (if applicable), effective cleaning procedures and removal of faecal waste should be used to minimize pests.

- Mice, rats and wild birds are attracted to stored feed. Any feed stores should be located, designed, constructed and maintained so as to be, where practicable, inaccessible to pests. Feed should be kept in pest proof containers.

- Bait should always be placed in “bait stations” so that they are obvious, cannot be accessed by animals or insects they are not intended for and can be identifiable and found easily for checking.

- If it is necessary to resort to chemical pest control measures, the chemicals should be approved for use in food premises and used in accordance with the manufacturer’s instructions.

- Any pest control chemicals should be stored in a manner that will not contaminate the laying environment. Such chemicals should be stored in a safe manner. They should not be stored in wet areas or close to feed stores or be accessible by birds. It is preferable to use solid baits, wherever possible.

Codex alimentarius : Recommended international code of practice-General principles of food hygiene CAC/RCP 1-1969, Rev. 4-20031

6.3 Pest control systems

6.3.1 General

Pests pose a major threat to the safety and suitability of food. Pest infestations can occur where there are breeding sites and a supply of food. Good hygiene practices should be employed to avoid creating an environment conducive to pests. Good sanitation, inspection of incoming materials and good monitoring can minimize the likelihood of infestation and thereby limit the need for pesticides.

6.3.2 Preventing access

Buildings should be kept in good repair and condition to prevent pest access and to eliminate potential breeding sites. Holes, drains and other places where pests are likely to gain access should be kept sealed. Wire mesh screens, for example on open windows, doors and ventilators, will reduce the problem of pest entry. Animals should, wherever possible, be excluded from the grounds of factories and food processing plants.

6.3.3 Harbourage and infestation

The availability of food and water encourages pest harbourage and infestation. Potential food sources should be stored in pest-proof containers and/or stacked above the ground and away from walls. Areas both inside and outside food premises should be kept clean. Where appropriate, refuse should be stored in covered, pest-proof containers.

6.3.4 Monitoring and detection

Establishments and surrounding areas should be regularly examined for evidence of infestation.

6.3.5 Eradication

Pest infestations should be dealt with immediately and without adversely affecting food safety or suitability. Treatment with chemical, physical or biological agents should be carried out without posing a threat to the safety or suitability of food.

5.9.2 How to Comply

Pests (rodent, insects, birds...) and particularly rodent (mice,) are a contamination source not to be neglected and furthermore they damage foods and raw material.

Aims	Mandatory requirements	Good Practice
To avoid contamination by vermin	<ul style="list-style-type: none"> ▪ Protection of accesses ▪ Protection from flying insects : use of insectocutors with protective glass tubes / fly trap... ▪ Protection from crawling insects; solid baits / insect-sprays, - all chemicals must be food compatible ▪ Protection from rodents : traps, ultrasonic sound transmitters / solid baits ▪ Protection from birds ▪ Means of protection could be identified, determined, adapted, maintained and verified 	<ul style="list-style-type: none"> ▪ Specifications which recommend a pest control system in henhouses : flies and mice particularly ▪ Fixed and impregnable box baits ▪ Non toxic baits (mechanical or glue)

6 Stages of manufacture

6.1 Reception of shell eggs, ingredients, and packagings

6.1.1 Reminder of existing regulations and recommendations

Regulation 852/2004 on the hygiene of foodstuffs (Annex II – Chapter IX)

A food business operator is not to accept raw materials or ingredients, other than live animals, or any other material used in processing products, if they are known to be, or might reasonably be expected to be, contaminated with parasites, pathogenic microorganisms or toxic, decomposed or foreign substances to such an extent that, even after the food business operator had hygienically applied normal sorting and/or preparatory or processing procedures, the final product would be unfit for human consumption.

Regulation 1935/2004 on materials and articles intended to come into contact with food

Art 1 :

The purpose of this Regulation is to ensure the effective functioning of the internal market in relation to the placing on the market in the Union of materials and articles intended to come into contact directly or indirectly with food, whilst providing the basis for securing a high level of protection of human health and the interests of consumers.

Art 17 :

The traceability of materials and articles shall be ensured at all stages in order to facilitate control, the recall of defective products, consumer information and the attribution of responsibility.

Regulation 852/2004 on the hygiene of foodstuffs (Annex II Chapter X)

Wrapping and packaging operations are to be carried out so as to avoid contamination of the products. Where appropriate and in particular in the case of cans and glass jars, the integrity of the container's construction and its cleanliness is to be assured.

Wrapping and packaging material re-used for foodstuffs is to be easy to clean and, where necessary, to disinfect.

Regulation 1907/2006 : of the european parliament and of the council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency

Title I : General issues

Chapter 1 : Aim, scope and application

Article 1 : Aim and scope

1. The purpose of this Regulation is to ensure a high level of protection of human health and the environment, including the promotion of alternative methods for assessment of hazards of substances, as well as the free circulation of substances on the internal market while enhancing competitiveness and innovation.

2. This Regulation lays down provisions on substances and preparations within the meaning of Article 3. These provisions shall apply to the manufacture, placing on the market or use of such substances on their own, in preparations or in articles and to the placing on the market of preparations.

3. This Regulation is based on the principle that it is for manufacturers, importers and downstream users to ensure that they manufacture, place on the market or use such substances that do not adversely affect human health or the environment. Its provisions are underpinned by the precautionary principle.

Chapter 2 : Definitions and general provision

Article 3 : Definitions

For the purposes of this Regulation:

1) Substance: means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition;

Regulation 853/2004, laying down specific hygiene rules for food of animal origin (Annex III, section X, Chapter II, TitleII)

II. Raw materials for the manufacture of egg products :

Food business operators must ensure that raw materials used to manufacture egg products comply with the following requirements.

1. The shells of eggs used in the manufacture of egg products must be fully developed and contain no breaks. However, cracked eggs may be used for the manufacture of egg products if the establishment of production or a packing centre delivers them directly to a processing establishment, where they must be broken as soon as possible.

2. Liquid egg obtained in an establishment approved for that purpose may be used as raw material. Liquid egg must be obtained in accordance with the requirements of points 1, 2, 3, 4 and 7 of Part III.

Codex alimentarius CAC/RCP 15 – 1976 : Code of hygienic practice for eggs and egg products

3.3 : Collection, handling, storage and transport of eggs :

Methods used to collect, handle, store and transport eggs should minimize damage to the shell, and avoid contamination and practices should reflect the following points:

- Cracked and/or dirty eggs should be directed to a processing or packing establishment, as appropriate, as soon as possible after collection (see Section 5.1)
- Hygienic practices, which take into account time and temperature factors, should be used to protect the egg from surface moisture in order to minimize microbial growth
- Broken eggs and incubator eggs should not be used for human consumption and be disposed of in a safe manner.

6.1.2 How to Comply

Aims	Mandatory requirements	Good Practice
Handling of non contaminated raw material	<ul style="list-style-type: none"> ▪ Check against the supplier specifications (raw materials and transport) for target levels ▪ Transport in the best conditions of temperature and cleanliness ▪ Control at purchase / at the reception of goods : product, label, documents and delivery vehicle ▪ Setting up an internal system to make sure that the eggs are fit for human consumption ▪ Refusing non conforming goods or treating the non conforming products internally (down-grading) ▪ Identification and recording of raw material batches ▪ Setting up an alert procedure 	<ul style="list-style-type: none"> ▪ Supplier specifications regarding temperature : preference 15°C on average, to avoid big difference of temperature during transport (except eggs intended to a prolonged storage at 5°C eg.) ▪ Prefer isothermal transport (covered trucks not accepted)

	<ul style="list-style-type: none"> In case of eggs coming from infected farms, see chapter "Traceability" 	
Food contact of packaging	<ul style="list-style-type: none"> Be ensure that packagings respect regulation 1935/2004, by specifications or conformity agreement from suppliers Traceability measures for all packagings in contact Cleaning and disinfection of re-used packaging (e. g. stainless steal containers) directly in contact with egg products 	<ul style="list-style-type: none"> REACH regulation could require to be ensure of conformity of second packagings, labels, ink, ... to be taken in account in suppliers specifications Use of plastic pallets for egg, and egg products
Handling of specified and controlled ingredients	<ul style="list-style-type: none"> Food grade ingredients : microbiological and chemical quality on suppliers specifications In case of incorporated water : potable water Allergen risk has to be taken in account at this stage Traceability measures for all ingredients Labelling each ingredient 	
No contamination by frozen egg products	<ul style="list-style-type: none"> Defrosting to avoid temperature increase : It must be practiced as quickly as possible in order to reduce microbiological pathogenic increase Those products have to be filtered after defrosting 	<ul style="list-style-type: none"> In a refrigerated room, or with a system using increase of temperature during short time (few minutes) Use of dedicated machine that elevates temperature of the egg product very quickly, in order to defreeze and cools the liquid product obtained
No contamination by liquid egg	<p>Labelling :</p> <ul style="list-style-type: none"> date and time of breaking, in order to ensure that this product is used before 48 hours at 4°C maximum "non pasteurized liquid egg" Storage at 4°C This product has to be treated in a factory agreed by veterinarian authorities 	

6.2 Storage of raw materials

6.2.1 Reminder of existing regulations and recommendations

Regulation 852/2004 on the hygiene of foodstuffs (Annex II – Chapter IX)

Raw materials and all ingredients stored in a food business shall be kept in appropriate conditions designed to prevent harmful deterioration and protect them from contamination.

Raw materials, ingredients, intermediate products and finished products likely to support the reproduction of pathogenic micro-organisms or the formation of toxins are not to be kept at temperatures that might result in a risk to health. The cold chain is not to be interrupted. However, limited periods outside temperature control are permitted, to accommodate the practicalities of handling during preparation, transport, storage, display and service of food, provided that it does not result in a risk to health. Food businesses manufacturing, handling and wrapping processed foodstuffs are to have suitable rooms, large enough for the separate storage of raw materials from processed material and sufficient separate refrigerated storage.

6.2.2 How to Complyl

Aims	Mandatory requirements	Good Practice
To avoid deterioration of the raw material	<ul style="list-style-type: none"> Eggs must be stored in a dedicated room Ingredients and packagings must be stored in a dedicated room Ensure stock control Ensure and maintain raw material identification 	<ul style="list-style-type: none"> Eggs should be stored in a dedicated room at controlled temperature : average 15°C for short storage and average 5°C for long storage (more than 1 month) Humidity control in storage room at 5°C After storage at low temperature, process eggs quickly, in order to avoid condensation

6.3 Unpacking of eggs

6.3.1 Reminder of existing regulations and recommendations

Regulation 853/2004, laying down specific hygiene rules for food of animal origin (Annex III – Section X – Chapter II)

Food business operators must ensure that establishments for the manufacture of egg products are constructed, laid out and equipped so as to ensure separation of the following operations:

- washing, drying and disinfecting dirty eggs, where carried out;
- breaking eggs, collecting their contents and removing parts of shells and membranes; and

3) operations other than those referred to in points 1 and 2.

6.3.2 How to Comply

Unpacking eggs is an important stage in the manufacture of egg products - abnormalities not discovered at the eggs reception stage can be identified.

Aims	Mandatory requirements	Good Practice
Handling of non contaminated raw material	<ul style="list-style-type: none"> ▪ Visual checking when unpacking eggs and adequate treatment of any non conforming eggs ▪ Production schedule ▪ Regular cleaning and disinfection of the suction pads and conveyer belts of the breaking machine ▪ Adequate ventilation of the room 	<ul style="list-style-type: none"> ▪ Segregation and separate processing of eggs of different qualities

6.4 (Washing) and Breaking of eggs

6.4.1 Reminder of existing regulations and recommendations

Regulation 853/2004, laying down specific hygiene rules for food of animal origin (Annex III – Section X – Chapter II)

I. Food business operators must ensure that establishments for the manufacture of egg products are constructed, laid out and equipped so as to ensure separation of the following operations:

- 1) washing, drying and disinfecting dirty eggs, where carried out ;
- 2) breaking eggs, collecting their contents and removing parts of shells and membranes ; and
- 3) operations other than those referred to in points 1 and 2.

III. Special hygiene requirements for the manufacture of egg products :

Food business operators must ensure that all operations are carried out in such a way as to avoid any contamination during production, handling and storage of egg products, in particular by ensuring compliance with the following requirements.

1. Eggs must not be broken unless they are clean and dry.
2. Eggs must be broken in a manner that minimises contamination, in particular by ensuring adequate separation from other operations. Cracked eggs must be processed as soon as possible.
3. Eggs other than those of hens, turkeys or guinea fowl must be handled and processed separately. All equipment must be cleaned and disinfected before processing of hens', turkeys' and guinea fowls' eggs is resumed.
4. Egg contents may not be obtained by the centrifuging or crushing of eggs, nor may centrifuging be used to obtain the remains of egg whites from empty shells for human consumption.

Codex alimentarius CAC/RCP 15 – 1976 : Code of hygienic practice for eggs and egg products

5.2.2.2 Egg product processing

Eggs for processing should be visibly clean prior to breaking and separating.

Cracked eggs may be processed. Broken eggs should not be processed and should be disposed of in a safe manner.

Dirty eggs should be disposed of in a safe manner or may be cleaned

Separating the egg contents from the shell should be done in a manner that will, as far as possible, avoid cross-contamination between the shell and egg contents, avoid contamination by personnel or from equipment, and that permits examination of egg contents.

6.4.2 How to Comply

During the egg breaking process, shells and foreign bodies can contaminate the liquid eggs.

Aims	Mandatory requirements	Good Practice
To obtain a non contaminated egg product (microbiological or physical hazards)	<ul style="list-style-type: none"> ▪ Individual breaking of eggs (prohibiting centrifuging or crushing the eggs) ▪ Centrifuging (by crushing shell eggs) to obtain the remains of egg white from empty shells is not permitted for human food ▪ Regular removal of shell waste ▪ Eliminate very dirty eggs and crashed eggs 	<ul style="list-style-type: none"> ▪ Separation between breaking step and unpacking step, or closed breaking machine ▪ Regular verification of the setting up of the breaker with regard to the quality and size of the eggs being broken ▪ Adequate ventilation of the breaking area to avoid contamination from unpacking area. If possible, slightly higher pressure in the breaking area compared to the adjacent unpacking area ▪ Washing dirty eggs (1) based on the level dirtiness of eggs

		<ul style="list-style-type: none"> Washing dirty eggs (2), in a separated room or in a closed machine to avoid cleaning solutions spatter
To avoid chemical contamination of eggs by washing	<ul style="list-style-type: none"> Avoid storage of eggs between washing and breaking steps Be ensure that eggs are not cracked before washing Be ensure that eggs do not drain cleaning solution at breaking stage Remove cleaning solutions as soon as necessary (to be qualified) 	<ul style="list-style-type: none"> In case of washing eggs, method has to avoid chemical contamination (2)
To avoid microbiological growth during freezing	<ul style="list-style-type: none"> See Chapter 6.6 	

(1) A dirty egg is an egg which profile is changed by droppings. This dirty egg must be washed before breaking on machines or must be broken by an approved manual method.

(2) To prevent contamination with washing liquid, the residual washing liquid must not drip from shell.

6.5 Filtration and transfer

6.5.1 Reminder of existing regulations and recommendations

Regulation 853/2004, laying down specific hygiene rules for food of animal origin (Annex III Section X Chapter II)

III. Special hygiene requirements for the manufacture of egg products :

Food business operators must ensure that all operations are carried out in such a way as to avoid any contamination during production, handling and storage of egg products, in particular by ensuring compliance with the following requirements.

5. After breaking, each particle of the egg product must undergo processing as quickly as possible to eliminate microbiological hazards or to reduce them to an acceptable level.

A batch that has been insufficiently processed may immediately undergo processing again in the same establishment, if this processing renders it fit for human consumption. When a batch is found to be unfit for human consumption, it must be denatured so as to ensure that it is not used for human consumption.

IV. Analytical specifications

3. The quantity of eggshell remains, egg membranes and any other particles in the processed egg product must not exceed 100 mg/kg of egg product.

Codex alimentarius : Recommended international code of practice-General principles of food hygiene

CAC/RCP 1-1969, Rev. 4-20031

Section V – Control of operation

5.2.5 Physical and chemical contamination

Systems should be in place to prevent contamination of foods by foreign bodies such as glass or metal shards from machinery, dust, harmful fumes and unwanted chemicals. In manufacturing and processing, suitable detection or screening devices should be used where necessary.

6.5.2 How to Comply

Aims	Mandatory requirements	Good Practice
To prevent physical contamination (shells, foreign bodies) and to limit a microbial buildup	<ul style="list-style-type: none"> A preferable use of closed reception tanks and closed pipes Regular removal of shell waste from the filters, regular cleaning and disinfection of the filters Avoiding the stagnation of the egg product before cooling 	<ul style="list-style-type: none"> Use of grills in the reception tanks Using filters (or anything equivalent), preferably self-cleaning Filters with a mesh size of max 1mm (diameter) Use of magnet Procedure for control glass and hard plastics, particularly : glass minimization, check-list, immediate action in case of broken glass or hard plastic Place filter for liquid egg products at the end, just as the product is filled into packaging. This position ensures any contamination from pump, seals... is captured. It will need to be checked daily for damage prior to cleaning.

6.5.3 Following of the CCP

Stage :	Filtration after breaking, if only one single filter And / or filter before pasteurization	CCP 1 :	Physical		
Characteristics or parameters to control	Critical limits – Target values	Modalities of supervision			Corrective Actions
		Method	Frequency	Check point	
Presence of shells in the product or other foreign particles : product free from foreign bodies and shells < 100 mg/kg of egg products (1)	Presence and integrity of the filter (preliminary qualified)	Visual	After each cleaning or before each day of production	Filter	Immediate actions : Change of the filter Treatment of the non conformity : Stop the batch and new filtration Corrective actions Re-qualification of the filtration (material, maintenance...)

(1) The presence of organic matters (coagulated proteins) can alter the analysis results. So, before analysing the product, it is necessary to carry out a technical method to remove this organic matters (organic digestion, for example)

6.6 Cooling and intermediate storage of liquid eggs (standardisation & preparation)

6.6.1 Reminder of existing regulations and recommendations

Regulation 853/2004, laying down specific hygiene rules for food of animal origin (Annex III Section X chapter II)

III Special hygiene requirements for the manufacture of egg products :

7. If processing is not carried out immediately after breaking, liquid egg must be stored either frozen or at a temperature of not more than 4 °C. The storage period before processing at 4 °C must not exceed 48 hours. However, these requirements do not apply to products to be de-sugared, if de-sugaring process is performed as soon as possible.

In the case of liquid eggs, the label referred to in paragraph 1 must also bear the words : "non-pasteurised egg products - to be treated at place of destination" and indicate the date and hour of breaking.

6.6.2 How to Comply

Aims	Mandatory requirements	Good Practice
To limit microbiological growth in liquid eggs	<ul style="list-style-type: none"> ▪ In case of liquid eggs, refer to the egg products supplier's product data sheet, with control at reception ▪ Cooling of the product after breaking to 4 °C : <ol style="list-style-type: none"> 1. if the product has to be transferred to another agreed establishment 2. or if treatment is delayed ▪ Cooling before treatment can be avoided : <ol style="list-style-type: none"> 1. if the factory has validated the microbial risks, by fixing a maximum temperature and time period before treatment (less than 48 hours) 2. or if the product is stabilized (salt as an example) 3. or if the product is to be de-sugared ▪ Ensure that the maximum delay between breaking and pasteurisation is within the legislative 48 hours maximum 	<ul style="list-style-type: none"> ▪ If products are not cooled before treatment, tests must be practiced to record bacteriological growing, depending on temperature and time of storage of liquid egg, eggs quality, hot season, etc ▪ Recommend time of storage of liquid egg, case by case (particularly depending on composition of product, initial contamination, temperature)
To avoid product contamination by other materials	<ul style="list-style-type: none"> ▪ Design a system to prevent product contamination by the refrigerant medium (check the plate integrity, have higher pressure of the product compared to the refrigerant medium, by using a "food safe " refrigerant) ▪ Keep tank man-holes closed 	
To avoid contamination by ingredients (microbiological, foreign bodies)	<ul style="list-style-type: none"> ▪ Standardisation with traced liquid eggs and/or egg products (recycling of egg products also) ▪ In case of incorporated water : use of potable water 	<ul style="list-style-type: none"> ▪ Filtration of ingredients ▪ Magnet to collect metallic foreign body coming from ingredients ▪ Record recycling of egg product in order to guarantee traceability

Aims	Mandatory requirements	Good Practice
To avoid contamination (chemical and microbiological) by the cooling system	<ul style="list-style-type: none"> ▪ Regular checking of surface integrity (plates, gaskets...) ▪ Use of only food approved chemicals for equipment which could be in contact with liquid eggs or egg products : lubricant, cooling fluids, oil... 	<ul style="list-style-type: none"> ▪ Ban on the use of certain disinfectants (too corrosive) ▪ Use of freeze water instead of chemical additives

Freezing liquid egg :

- At production plant (farm or packing centre, agreed as a breaking plant)
- At breaking plant, in case of technical problems

Aims	Mandatory requirements	Good Practice
To limit microbiological growth in liquid eggs before and during freezing	<ul style="list-style-type: none"> ▪ This practice is possible in case of problem, like breakdown of pasteurizer ▪ Respect short time between breaking and freezing to avoid waiting period at room temperature, in maximum 48hours after breaking ▪ Product must be stored in a room at -12°C maximum 	<ul style="list-style-type: none"> ▪ Room at temperature that permits to achieve -12°C in the middle of each package in 72 hours
To avoid microbiological growth before and during freezing	<ul style="list-style-type: none"> ▪ Filter liquid egg before freezing or/and after defrosting 	
To limit microbiological growth in liquid eggs during defrosting	<ul style="list-style-type: none"> ▪ See chapter 6.1 ▪ Defrosting of liquid eggs must be practiced only in plant agreed for treatments of egg products 	

6.7 Heat treatment and cooling

6.7.1 Reminder of existing regulations and recommendations

Regulation 853/2004 laying down specific hygiene rules for food of animal origin (Annex III Section X chapter II)

III Special hygiene requirements for the manufacture of egg products :

Food business operators must ensure that all operations are carried out in such a way as to avoid any contamination during production, handling and storage of egg products, in particular by ensuring compliance with the following requirements.

5. After breaking, each particle of the egg product (liquid eggs) must undergo processing as quickly as possible to eliminate microbiological hazards or to reduce them to an acceptable level.

A batch that has been insufficiently processed may immediately undergo processing again in the same establishment, if this processing renders it fit for human consumption. When a batch is found to be unfit for human consumption, it must be denatured so as to ensure that it is not used for human consumption.

6. Processing is not required for egg white intended for the manufacture of dried or crystallised albumin destined subsequently to undergo heat treatment.

8. Products that have not been stabilised so as to be kept at room temperature must be cooled to not more than 4 °C. Products for freezing must be frozen immediately after processing.

Regulation 852/2004 on the hygiene of foodstuffs (Annex II – Chapter XI)

The following requirements apply only to food placed on the market in hermetically sealed containers:

1. any heat treatment process used to process an unprocessed product or to process further a processed product is:
 - (a) to raise every party of the product treated to a given temperature for a given period of time; and
 - (b) to prevent the product from becoming contaminated during the process.

Codex alimentarius CAC/RCP 15 – 1976 : Code of hygienic practice for eggs and egg products

5.2.2.2 Egg product processing

Treatments :

Egg products should be subjected to a microbiocidal treatment to ensure the products are safe and suitable.

All operations subsequent to the treatment should ensure that the treated product does not become contaminated.

Hygienic manufacturing and personnel practices should be in place to manage the risk of contamination from the food contact surfaces, equipment, and personnel, packaging material and between raw egg and processed egg products.

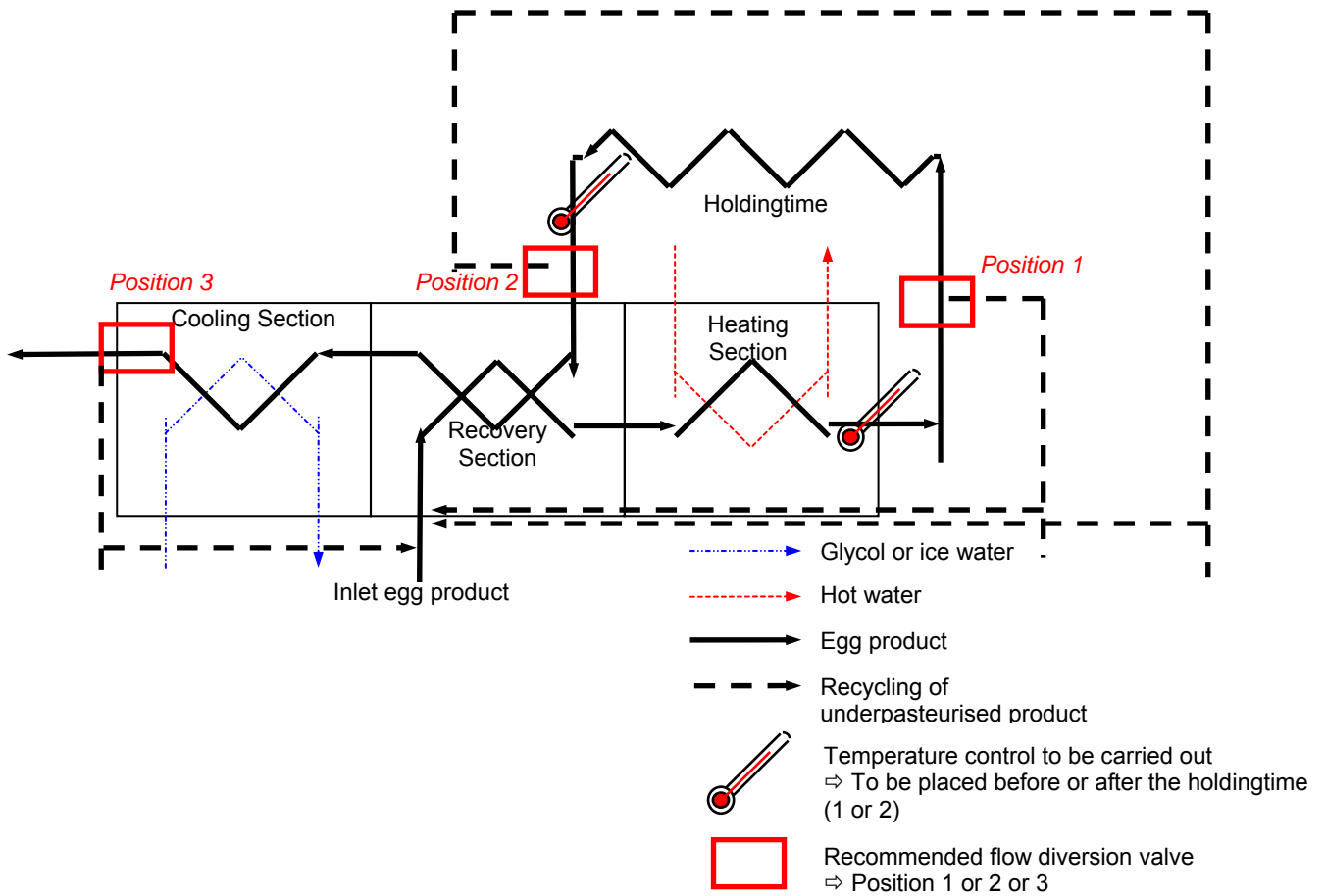
Microbiocidal treatments, including heat treatment, should be validated to show they achieve the desired reduction in the number of pathogenic microorganisms and result in a safe and suitable product.

Where heat treatment is used, consideration should be given to time and temperature combinations.

Pasteurized liquid egg products should be cooled rapidly immediately after pasteurization and maintained under refrigeration.

6.7.2 How to Comply

The principle of a thermal exchanger with a heat recovery system : *as indication*



Aims	Mandatory requirements	Good Practice
To avoid contamination by the treatment system (heating, recovery and cooling sections)	<ul style="list-style-type: none"> ▪ Regular checking of surface integrity (plates, gaskets...) ▪ Use of only food approved chemicals for equipment which could be in contact with liquid eggs or egg products : lubricant, cooling fluids, oil... 	<ul style="list-style-type: none"> ▪ Ban on the use of certain disinfectants (too corrosive)
To avoid the recontamination by non treated product	<ul style="list-style-type: none"> ▪ Continue safety device preventing insufficient heating 	<ul style="list-style-type: none"> ▪ Installing an automatic flow diversion valve regularly tested and calibrated temperature probe ▪ Setting up a compulsory CIP procedure where there has been insufficient pasteurization, in case of valve diversion in position 3 ▪ Applicable to plate pasteurisers : treated product to have higher pressure compared to the non heat treated product ▪ Applicable to plate pasteurisers : treated product to have higher pressure compared to heating or chilling fluid ⇒ Particularly recommended for new equipment ▪ Adequate safety system preventing the cross contamination of pasteurized egg products with raw liquid egg and an continue safety recording device preventing the aforementioned cross contamination
To decrease the microbial levels and eliminate possible pathogenic bacteria	<ul style="list-style-type: none"> ▪ The use of previously established and validated heating regimes taking into account the nature and properties of the treated product ▪ Calibration of the equipment for heat treatment (temperature and pressure for instance) ▪ Recycling of inadequately treated product ▪ Thermal insulation of the holding tubes, to limit the heat loss ▪ Continuous control of temperature and flow rate 	<ul style="list-style-type: none"> ▪ Frequency of calibration of the temperature probes used for the heat treatment : at least once a year ▪ Homogenization recommended in order to improve efficiency of pasteurization ▪ Regular checking of the flow diversion valve efficiency ▪ Continue record of temperature and flow rate or continue record of pasteurization value ▪ Alpha amylase analysis on whole egg product is a easy test correlated to <i>Salmonella</i> destruction
To avoid microbiological growth during cooling	<ul style="list-style-type: none"> ▪ Factory has to validate microbiological risks to determinate appropriate period of time to achieve 4°C ▪ This period of time must be as fast as possible 	

6.7.3 Following of the CCP

Stage :	Heat treatment		CCP 2 :	Microbiological :; survival of the pathogenic germs, microbiological growth	
Characteristics or parameters to control	Critical limits – Target values	Modalities of supervision			Corrective Actions
		Method	Frequency	Check point	
Time/temperature chart of the heat treatment	T° of pasteurization ^(*) = ... ± ... °C	Recording thermometer	Continuously	Probe on product	Recycling of product Adjustment of hot water temperature
	Time of pasteurization ^(*) = ... ± ... min.	Flowmeter or chronometer	Continuously (each pasteurization)	treatment equipment or quality control inspector	Insulation, treating again or removing the non-conforming egg products
	Output T° cold product = 0 ± 4 °C	Recording thermometer	Continuously	treatment equipment outlet or quality control inspector	Recycling of product Complementary cooling or re-treatment of the products

(*) internal determination, for each product (for example : see table below) in order to obtain **at least 7 log₁₀ reductions** for egg yolk and whole egg product (recommendation AFSSA France)

As a rough guide : heat treatment to reduce *Salmonella enteritidis* :

Product	T ₀ (°C)	DT ₀ (mn)	z (°C)
Referent egg white	57	2,1	5,1
Referent whole egg	64,4	0,013	3,1
Referent egg Yolk	64,4	0,002	2,4

<u>Examples of practices</u>	t (mn) time of treatment	T temperature of treatment (°C)	DT (mn)	N log 10 reduction
Example of whole egg	5,0	65,0	0,0083	600,6
Example Egg white	5,0	56,0	3,2984	1,5 *
Example egg Yolk	5,0	65,0	0,0011	4 445,7

z : Needed difference of temperature to obtain a reduction of 1 log₁₀ (°C) of *Salmonella enteritidis*

t : applied holding time of treatment (min.)

T : applied temperature of treatment (°C)

DT₀ and DT : time (min.) to obtain a reduction of 1log 10 at temperature T₀ and T

N : Number of reduction of 1log 10 (= pasteurization value)

$$DT = DT_0 \times 10^{(T_0 - T) / z}$$

* Egg white presents a risk of coagulation from 56°C, that is why it's not possible to exceed 56°C during heat treatment, but bactericidal proteins contained in egg white, its low nutritive composition and its high pH permit to defend it self.

6.8 Packaging of liquid egg products

6.8.1 Reminder of existing regulations and recommendations

Regulation 852/2004 on the hygiene of foodstuffs (Annex II Chapter X)

Provisions applicable to the wrapping and packaging of foodstuffs

1. Material used for wrapping and packaging are not to be a source of contamination.
2. Wrapping materials are to be stored in such a manner that they are not exposed to a risk of contamination.
3. Wrapping and packaging operations are to be carried out so as to avoid contamination of the products. Where appropriate and in particular in the case of cans and glass jars, the integrity of the container's construction and its cleanliness is to be assured.
4. Wrapping and packaging material re-used for foodstuffs is to be easy to clean and, where necessary, to disinfect.

6.8.2 How to Comply

Aims	Mandatory requirements	Good Practice
Avoid contamination by the packaging	<ul style="list-style-type: none"> ▪ Use of cleaned and suitable packaging ▪ Packaging that is re-used should be cleaned & disinfected on return and kept sealed until point of use ▪ A flow order of the packaging ▪ Store clean packaging in a dedicated room in hygienic conditions for a defined limited time ▪ There should be specifications for packaging suppliers ▪ All packaging used should be identifiable and traceable 	<ul style="list-style-type: none"> ▪ Keep packaging closed prior to use
Avoid contamination by packing conditions	<ul style="list-style-type: none"> ▪ Adequate (clean and hygienic conditions) packaging storage room and packing room ▪ Verification of the state of the packaging/containers before use ▪ Storage after filling as soon as possible in appropriate conditions 	<ul style="list-style-type: none"> ▪ Separated packing room ▪ Temperature and air quality appropriate to the product being packed : installation of a constant flow if needed, even a pressure gradient between the packing room (or packing machine) and other rooms
Prevent foreign bodies in egg product	<ul style="list-style-type: none"> ▪ Limited opening of the packaging 	<ul style="list-style-type: none"> ▪ A limited quantity of material and tools near the packing room
Avoid contamination by persons	<ul style="list-style-type: none"> ▪ Limited access to the packing rooms to the persons concerned with this work ▪ Target specific training to those persons 	
Avoid microbiological growth		<ul style="list-style-type: none"> ▪ Vacuum during or after packaging ▪ Incorporate food grade gas (eg nitrogen, carbon dioxide...), in order to preserve product during its shelf life

6.9 Storage of wrapped liquid egg products

6.9.1 Reminder of existing regulations and recommendations

Codex alimentarius : Code of hygienic practice for eggs and egg products - CAC/RCP 15 – 1976

5 Control of operation

5.2.2.2 Egg product processing

(iii) Storage and distribution

Egg products should be stored and transported under conditions that will not adversely affect the safety and suitability of the product.

Egg products, including those that can be stored at ambient temperatures, should be protected against external agents and contamination, e.g. direct sun light, excessive heating, moisture, external contaminants, and from rapid temperature changes which could adversely affect the integrity of the product packaging or the safety and suitability of the product.

6.9.2 How to Comply

Aims	Mandatory requirements	Good Practice
To avoid the contamination of treated product	<ul style="list-style-type: none"> ▪ Defining a waiting time before dispatching ▪ Storage at appropriate temperature : <ul style="list-style-type: none"> • between 0 and +4°C for fresh product • < - 12°C for frozen product • ambient for stabilised product ▪ Separated room for storage ▪ Shelf life validation per product, taking in account size of packaging, kind of retailing : industry or catering 	<ul style="list-style-type: none"> ▪ For catering products, shelf life validation should be conducted at 4°C for 2/3 of time and 1/3 of time at 6-8°C ▪ For industrial packagings, tests could be done at different temperatures to simulate cooling breakdown

6.10 Storage of egg products after treatment and before drying or wrapping

6.10.1 Reminder of existing regulations and recommendations

Regulation 853/2004 laying down specific hygiene rules for food of animal origin (Annex III – Section X)

8. Products that have not been stabilised so as to be kept at room temperature must be cooled to not more than 4 °C. Products for freezing must be frozen immediately after processing.

6.10.2 How to Comply

Aims	Mandatory requirements	Good Practice
To avoid microbiological growth	<ul style="list-style-type: none"> ▪ Define a maximum time between heat treatment and use ▪ Storage between 0 and +4°C, except for stabilised products (eg. concentrated or salted or sugared...) 	<ul style="list-style-type: none"> ▪ In case of cooling breakdown, practice an immediate corrective action of cooling in order to decrease temperature of product
To limit the re-contamination by materials	<ul style="list-style-type: none"> ▪ Using adequately cleaned and disinfected tanks 	<ul style="list-style-type: none"> ▪ Aseptic tanks before drying

6.11 Concentration of liquid egg products

6.11.1 How to Comply

Aims	Mandatory requirements	Good Practice
To avoid contamination by membranes and filters	<ul style="list-style-type: none"> ▪ Regular cleaning and disinfection of membranes and filters ▪ Use of cleaning and disinfection products compatibles with membranes ▪ Regular removal of membranes to control and maintain 	
To avoid microbiological growth	<ul style="list-style-type: none"> ▪ Continue control of temperature and flow rate during concentration 	<ul style="list-style-type: none"> ▪ Examine both products after concentration : dry matter for concentrated product and visual aspect for liquid ▪ Use of soft water to avoid microbiological growth on scale ▪ Use of enzymatic cleaning products

This step of concentration is not CCP because of pasteurisation after.

6.12 Drying of egg powders

6.12.1 How to Comply

Desugaring process

Aims	Mandatory requirements	Good Practice
Avoid development of microbiological toxins	<ul style="list-style-type: none"> ▪ Temperature and pH control according to an internal procedure that permits to be ensure of desugaring monitoring ▪ Use of renewed yeast and/or bacteria 	

Drying process

Aims	Imperative means of control	Recommended means of control
Remove water of liquid egg product in order to achieve $a_w < 0,7$	<ul style="list-style-type: none"> ▪ The use of previously established and validated processes taking into account the nature and properties of the treated product 	
Avoid contamination by equipment	<ul style="list-style-type: none"> ▪ The drying equipment must be cleaned and disinfected (tubes and towers) ▪ Regular inspection program of tower and other parts (cracked parts and cool parts) 	
Avoid contamination by air	<ul style="list-style-type: none"> ▪ Inlet air filtration ▪ Regular cleaning program for filters 	

Aims	Imperative means of control	Recommended means of control
Avoid cross contamination	<ul style="list-style-type: none"> ▪ Cleaning of towers after drying non-pasteurised egg products (liquid eggs) ▪ Cleaning of outlet filter after drying non-pasteurised egg products (liquid eggs) 	
Avoid growth in microbial levels	<ul style="list-style-type: none"> ▪ Avoid humidity during powder transfer 	
Avoid chemical contamination (NO _x)	<ul style="list-style-type: none"> ▪ Where there is direct combustion heating, there must be regular verification that the combustion is good 	<ul style="list-style-type: none"> ▪ Carry out indirect combustion

6.12.2 Following of the CCP

Stage:	Drying and packaging of the egg powders			CCP 3 :	Microbiological : contamination, survival of the pathogenic microorganisms
Characteristics or parameters to control	Critical Limits – Target values	Monitoring procedures		Check point	Corrective Actions
		Method	Frequency		
Humidity of the powder	<u>Dry Matter</u> = ... % min. (*) <u>Humidity</u> = ... % max. (*)	Dryer (infrared or equivalent method)	Each batch or more	Outlet of the dryer	Adjust the outlet air temperatures and/or egg product flow Have defined procedures for treating non-conforming products Repair the drying equipment if defective

(*) internal determination

6.13 Packaging of egg powders

6.13.1 How to Comply

Aims	Mandatory requirements	Good Practice
Avoid foreign objects in the powder	<ul style="list-style-type: none"> ▪ Installation of a sieve at the product outlet, regular checks on integrity ▪ Installation of a metal detector and/or magnet, regular checks on their efficiency ▪ Limiting the number of small objects and tools near the dryer outlet and powder packing area. ▪ No use of metallic or plastic attach 	<ul style="list-style-type: none"> ▪ Inventory of all objects near the powder outlet, verifying their presence or checking on the list at each shift change ▪ No use of attach that could become a foreign body
Avoid contamination by equipment	<ul style="list-style-type: none"> ▪ The transfer and storage equipment must be cleaned and disinfected 	<ul style="list-style-type: none"> ▪ Packing the powder directly at the outlet of the dryer in dedicated rooms
Avoid cross contamination	<ul style="list-style-type: none"> ▪ Separated rooms for pasteurized egg powder and for non pasteurized egg powder ▪ Different packing equipment for pasteurized egg powder and for non pasteurized egg powder or disinfection after packing of non pasteurized egg powder 	<ul style="list-style-type: none"> ▪ Higher pressure in the pasteurized egg powder room compared to non pasteurized egg powder room
Avoid contamination by personnel	<ul style="list-style-type: none"> ▪ Restricting the movements of personnel and vehicles used for transferring the product 	<ul style="list-style-type: none"> ▪ Specific clothes for persons who pack pasteurised egg powder

6.13.2 Following of the CCP

Stage:	Drying and packing of the egg powders		CCP 4 :	Physical : foreign bodies	
Characteristics or parameters to control	Critical Limits – Target values	Monitoring procedures			Corrective Actions
		Method	Frequency	Check point	
Foreign bodies	Absence	Sieve	Continuously	Outlet of the dryer	Cleaning and maintenance of the drying tower Cleaning, maintenance of the air inlet filters. Repair or change of the sieve
	Absence	Metal Detector or magnet	Continuously	From every packed batch	Isolation / quarantining of the non-conforming batches, identification of the origin of the foreign bodies, possible re-treatment or disposal of contaminated batches

6.14 Heat treatment of powder

6.14.1 How to Comply

Aims	Mandatory requirements	Good Practice
To avoid cross contamination	<ul style="list-style-type: none"> Different visual identification between non pasteurized powder and pasteurized powder 	<ul style="list-style-type: none"> Using two different rooms for pasteurized and non pasteurized powder
To decrease the microbial levels and eliminating possible pathogens bacteria	<ul style="list-style-type: none"> The use of previously established and validated processes ; room temperature, room humidity and holding time Calibration of the equipment for heat treatment (temperature and humidity) Adequate ventilation to ensure an homogeneous temperature in the hot room Approved box distribution / stacking to ensure an homogeneous temperature in the product 	<ul style="list-style-type: none"> The frequency of calibrating the temperature probes used for the heat treatment : at least once a year

6.14.2 Following of the CCP

Stage :	<i>Heat treatment</i>		CCP 5 :	Microbiological : survival of the pathogenic organisms	
Characteristics or parameters to control	Critical limits – Target values	Modalities of supervision			Corrective Actions
		Method	Frequency	Check point	
Time/temperature chart of the heat treatment	T° of powder (*) In case of discontinuous system	Recording thermometer	Continuously	Probe on product	Correction of the hot room temperature
	T° of air (*) In case of continuous system	Recording thermometer	Continuously	Probe on air	Correction of the temperature control system
	Holding time	Date recording	Each batch	Hot room or equivalent system	Complementary treatment of the powder

(*) internal determination, for each product (for example : 68°C – 2 weeks : egg white)

7 CCP list

In this guide, 5 steps are described in CCP :

Liquid egg products :

- CCP 1 : Filtration and transfer (after breaking and / or before pasteurization and / or before packaging)
- CCP 2 : Heat treatment and cooling

Dried egg products :

- CCP 3 : Drying of egg products
- CCP 4 : Packing of egg powders
- CCP 5 : Heat treatment of powders

See manufacturing process

8 Traceability

8.1.1 Reminder of existing regulations and recommendations

Regulation 178 / 2002, laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety (article 3)

Traceability means the ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution.

Regulation 1237 / 2007, as regards the placing on the market of eggs from Salmonella infected flocks of laying hen

Annex 1 : Eggs originating from flocks with unknown health status, that are suspected of being infected or that are infected with Salmonella serotypes for which a target for reduction has been set or which were identified as the source of infection in a specific human foodborne outbreak, may be used for human consumption only if treated in a manner that guarantees the destruction of all Salmonella serotypes with public health significance in accordance with Union legislation on food hygiene.

8.1.2 How to Comply

Aims	Mandatory requirements	Good Practice
Traceability for each batch	<ul style="list-style-type: none">▪ Record country of origin and egg supplier▪ Record batches of each ingredient▪ Record destination of each liquid eggs and egg product's batch	<ul style="list-style-type: none">▪ Record origin to farm▪ Keep data during 5 years
Avoid contamination of egg products by eggs from infected farms (Salmonella)	<ul style="list-style-type: none">▪ Ensure that eggs coming from infected farms, are pasteurized and traced	

9 References of regulations

9.1 Regulations classified by subject

General

- Codex Alimentarius CAC/RCP 1 – 1969 : recommended international code of practice on general principles of food hygiene
- Codex alimentarius CAC/RCP 15 – 1976 : code of hygienic practice for eggs and egg products
- Directive 2003/89/EC, amending Directive 2000/13/EC as regards indication of the ingredients present in foodstuffs
- Directive 2007/68/EC of 27 November 2007, amending Annex IIIa to Directive 2000/13/EC of the European Parliament and of the Council as regards certain food ingredients
- Regulation (EC) n°1829/2003 on genetically modified food and feed

Market

- Commission Regulation (EC) No 1237/2007 of 23 October 2007 amending Regulation (EC) No 2160/2003 of the European Parliament and of the Council and Decision 2006/696/EC as regards the placing on the market of eggs from Salmonella infected flocks of laying hens

Hygiene and traceability

- Regulation (EC) No 1441/2007 of 5 December 2007, amending Regulation (EC) No 2073/2005 on microbiological criteria for foodstuffs

- Regulation (EC) No 2073/2005 of 15 November 2005, on microbiological criteria for foodstuffs
- Regulation (EC) N° 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs (OJ L139, 30.4.2004)
- Regulation (EC) N° 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origin (OJ L139, 30.4.2004)
- Regulation (EC) N° 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety (OJ L31, 1.2.2002)

Food contact

- Regulation (EC) n°1935/2004 on materials and articles intended to come into contact with food
- Regulation (EC) N° 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

Weight

- Council Directive N° 76/211/EEC of 20 January 1976 on the approximation of the laws of the Member States relating to the making-up by weight or by volume of certain prepackaged products
- Codex alimentarius CAC/GL 50-2004 : General guidelines on sampling
- Council Directive N° 90/384 of 20 June 1990 on the harmonization of the laws of the Member States relating to non-automatic weighing instruments

9.2 Regulations classified by date

2007

- Directive 2007/68/EC of 27 November 2007, amending Annex IIIa to Directive 2000/13/EC of the European Parliament and of the Council as regards certain food ingredients
- Commission Regulation (EC) No 1237/2007 of 23 October 2007 amending Regulation (EC) No 2160/2003 of the European Parliament and of the Council and Decision 2006/696/EC as regards the placing on the market of eggs from Salmonella infected flocks of laying hens
- Regulation (EC) No 1441/2007 of 5 December 2007, amending Regulation (EC) No 2073/2005 on microbiological criteria for foodstuffs

2006

- Regulation (EC) N° 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

2005

- Regulation (EC) No 2073/2005 of 15 November 2005, on microbiological criteria for foodstuffs

2003

- Regulation (EC) n°1829/2003 on genetically modified food and feed
- Directive 2003/89/EC, amending Directive 2000/13/EC as regards indication of the ingredients present in foodstuffs

2004

- Regulation (EC) N° 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs (OJ L139, 30.4.2004)
- Regulation (EC) N° 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origin (OJ L139, 30.4.2004)
- Regulation (EC) n°1935/2004 on materials and articles intended to come into contact with food
- Codex alimentarius CAC/GL 50-2004 : General guidelines on sampling

2002

- Regulation (EC) N° 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety (OJ L31, 1.2.2002)

1990

- Council Directive N° 90/384 of 20 June 1990 on the harmonization of the laws of the Member States relating to non-automatic weighing instruments

1976

- Council Directive N° 76/211/EEC of 20 January 1976 on the approximation of the laws of the Member States relating to the making-up by weight or by volume of certain prepackaged products
- Codex alimentarius CAC/RCP 15 – 1976 : code of hygienic practice for eggs and egg products

1969

- Codex Alimentarius CAC/RCP 1 – 1969 : recommended international code of practice on general principles of food hygiene