



**European Code to good practice for the collection, transport, storage, trading and industrial manufacture of safe feed/food ingredients**

## **APPENDIX 3 - Sector reference document on the manufacturing of safe feed materials from starch processing**

**Version 4.0 (1 May 2021)  
Effective from 1 September 2021**



## Sectors covered by the European Guide

The following sector specific documents have been developed by the respective European sector organisations in cooperation with EFISC-GTP:

<a href="#">STARCH EUROPE</a>	Sector reference document on the manufacturing of safe feed materials from starch processing
<a href="#">FEDIOL</a>	Sector reference document on the manufacturing of safe feed materials from oilseed crushing and vegetable oil refining
<a href="#">EBB</a>	Sector reference document on the manufacturing of safe feed materials from Biodiesel processing
EUROMALT	Sector reference document on the manufacturing of safe feed ingredients from malt production
COCERAL	Sector reference document on the collection, storage, transport and trading of feed/food ingredients

This European Guide is open to other manufacturers producing feed materials by the development of a sector specific document.

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## APPENDIX 3 - Sector reference document on the manufacturing of safe feed materials from starch processing

## a) Introduction

The European starch industry produces a large number of products used for food and feed as an integral part of their overall business plans. Indeed, the starch industry separates the components of cereals, potatoes and peas in order to process them and meet the needs of its numerous customer industries.

It is imperative to the starch manufacturing industry that feed materials are produced in an economic and safe manner and that the products obtained are suitable for human and animal consumption as illustrated by their meeting all current European and national food and feed safety legislation requirements. Many food ingredients obtained by the starch industry are also used as feed materials. These products are listed in the Feed catalogue (Reg. EU 2022/1104) and can be included in the scope of the operators feed safety management system.

Regarding animal feed materials, Article 20 of the European Feed Hygiene Regulation (EC) n°183/2005/EC, which came into effect on January 1<sup>st</sup> 2006, allows for the development of Sector Guides by animal feed producers, including feed materials suppliers such as the members of STARCH EUROPE.

The fact that a HACCP approach to food safety risk management has been widely and successfully implemented in terms of food manufacture has highlighted the potential of such an approach within the feed industry. But a HACCP system alone is not sufficient and if the benefits of such an approach are to become a reality this must be backed by management support, traceability, as laid down in Regulation n°178/2002(EC), communication throughout the business/ sector and the internal monitoring and control of all feed production and distribution processes.

By the universal application of HACCP principles to all stages of production European starch manufacturers are able to provide animal feeds materials of plant origin which are safe for not only for the consuming animal but which also have no deleterious effect upon the safety of a human consumer further up the food chain.

The Starch Europe member companies bring to the attention the following points:

- The plant origin of raw materials processed by the starch industry and the nature of the feed materials limit risks for the feed industry and make risk management easier.
- A strong dynamic of progress is to be noted in the starch industry, which is of benefit to all its customers: indeed, most products of the starch industry are intended not only for feed materials but also for food, pharmaceuticals and other industries.
- Starch producers very carefully comply with regulations and the quality imperatives of all their customers' fields of activity. These requirements led to the setting up of quality assurance systems, with knock-on effects on all our products.
- The starch industry is therefore very much oriented towards quality control:
  - o ISO 22000:2005 and ISO/TS 22002 with a strong focus on HACCP

- Quality improvement programs integrating the principles of the HACCP method for all products;
- Extension of ISO certifications and/or HACCP program to all raw materials intended for feed materials.

Particular attention has always been given to raw materials supplies: increased traceability, quality assurance procedures applying to our suppliers, surveillance scheme (e.g. mycotoxins in wheat and maize), setting up of improvement agreements, audits, etc.

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## **a) Introduction**

### **List of abbreviations used:**

**As:** Arsenic

**Cd:** Cadmium

**CIP:** **cleaning**-in-place

**CCP:** Critical Control Point

**CFU/g:** Colony Forming Units per gram

**DDT:** Dichlorodiphenyltrichloroethane

**GMP:** Good Manufacturing Practice

**HACCP:** Hazard Analysis Critical Control Point

**HCB:** Hexachlorocyclohexane

**HCN:** Hydrogen cyanide

**Hg:** Mercury

**ISO:** International Organisation for Standardisation

**MRL:** Maximum Residue Limits

**PAH:** Polycyclic aromatic hydrocarbons

**Pb:** Lead

**PCB:** Polychlorinated biphenyls

**SFM:** Safe, Fair and Merchantable

**SO<sub>2</sub>:** Sulphur Dioxide

**T°C:** temperature degree Celsius

## **b) Methodology of the Starch Europe food and feed chain risk assessment**

1. Starch Europe made the following crops subject to a food and feed safety chain risk assessment:
  - Maize starch
  - Wheat Starch
  - Potato Starch
  - Pea Starch
2. Starch Europe conducted the chain risk assessments according to the requirements as described in chapter 6 of the European Guide to good practice for the industrial manufacture of safe feed materials.

Starch Europe will evaluate the food and feed safety assessments of the chains of starch products on a two yearly basis.

### c) Listing of Feed Materials

Feed materials from the starch industry meet the statutory definitions of raw materials (Regulation 2009/767 definitions). However, the composition of marketed products may differ, depending on production sites, production tools and processes, and market opportunities.

The following list is a non exhaustive list of the main products of the starch industry intended for use as feed materials by feeding stuffs producers; the definitions below are extracts or are adapted from Regulation 68/2013 (taking into account industrial language).

Name	Number in <a href="#">Catalogue of Feed Materials 2022/1104</a> <sup>1</sup>	Description
Maize Protein (Maize gluten)	1.2.8	Product from the manufacture of maize starch. It consists principally of protein (prolamins) obtained during separation of starch.
Maize protein feed (Maize gluten feed)	1.2.9	Product obtained during the manufacture of maize starch. It is composed of bran and maize solubles. The product may also include broken maize and co-products from oil extraction of maize germs. Other products derived from starch and from the refining or fermentation of starch products may be added.
Maize germ meal	1.2.12	Product of oil manufacture, obtained by extraction of processed maize germ.
Wheat Feed	1.11.6	Product of flour or malting manufacture obtained from screened grains of wheat or dehusked spelt. It consists principally of fragments of the outer skins and of particles of grain from which less of the endosperm has been removed than in wheat bran.
Wheat bran	1.11.7	Product of flour or malting manufacture obtained from screened grains of wheat or dehusked spelt. It consists principally of fragments of the outer skins and of particles of grain from which the greater part of the endosperm has been removed.
Wheat protein	1.11.15	Wheat protein extracted during starch or ethanol production, maybe partially hydrolysed
Liquid wheat starch	1.11.19	Product obtained from the production of starch/glucose and gluten from wheat
Wheat solubles	1.11.21	Product of wheat obtained after wet protein and starch extraction. May be hydrolysed
Wheat yeast concentrate	1.11.22	Wet co-product that is released after the fermentation of wheat starch for alcohol production
Starch hydrolysates cake	13.3.4	Product from starch hydrolysis liquor filtration which consists of the following: protein, starch, polysaccharides, fat, oil and filter aid (e.g. diatomaceous earth, wood fibre).
Wheat gluten feed	1.11.16	Product from the manufacture of wheat starch and gluten. It consists of bran, from which the germ may have been partially removed. Wheat solubles, broken wheat and other products derived from starch and

<sup>1</sup> Catalogue of feed materials of the COMMISSION REGULATION (EU) 2022/1104 of 1 July 2022 amending the Catalogue of the Regulation (EU) No 68/2013.



		from the refining or fermentation of starch products may be added.
Vital wheat gluten	1.11.18	Wheat protein characterized by high viscoelasticity as hydrated, with minimum 80 % protein (N × 6,25) and maximum 2 % ash on dry substance
Potato pulp	4.8.8	Product of the manufacture of potato starch consisting of extracted ground potatoes.
Potato pulp, dried	4.8.9	Dried product of the manufacture of potato starch consisting of extracted ground potatoes.
Potato protein	4.8.10	Product of starch manufacture composed mainly of protein substances obtained after the separation of starch.
Potato juice, concentrated	4.8.14	Concentrated product of the manufacture of potato starch, consisting of the remaining substance after partial removal of fibre, proteins and starch from the whole potato pulp and evaporation of part of the water
Pea protein	3.11.9	Product obtained from the separated pea fruit water when producing starch, or after grinding and air fractionation, maybe partially hydrolysed.
Pea solubles	3.11.11	Product obtained from starch and protein wet extraction from peas. It is mainly composed of soluble proteins and oligosaccharides.
Pea fibres	3.11.12	Product obtained by extraction after grinding and sieving of dehulled peas.
Starch mixture	13.3.3	Product consisting of native and/or modified food starch obtained from different botanical sources.
Dextrose	13.2.2	Product obtained after hydrolysis of starch and consists of purified, crystallized glucose with or without crystal water
Glucose molasses	13.2.5	Product produced during refining process of glucose syrups
Maltodextrin	13.3.6	Maltodextrin is the partially hydrolyzed starch
Glucose syrups	13.2.4	Glucose syrup is a purified and concentrated aqueous solution of nutritive saccharides obtained through hydrolysis from starch
Maize fibre	1.2.7	Product from the manufacture of maize starch. It consists principally of fibre.
Maize germ	1.2.10	Product of the manufacture of semolina, flour or starch from maize. It consists predominately of maize germ, outer skins and parts of the endosperm.
Maize steep liquor	1.2.15	Concentrated liquid fraction from the steeping process of corn
Maize grits	1.2.18	Hard, flinty portions of ground maize containing little or no bran or germs.
Cereal grains screenings	1.12.4	Products from mechanical screening (size fractionation) consisting of small grains and fractions of grain kernels, which may be germinated, separated before further processing of the grain. The products contain more crude fibre (e.g. hulls) than the unfractionated cereals.
Maize Starch pre-gelatinised	13.3.2	Product consisting of starch expanded by heat treatment
Maize Starch	13.3.1	Starch
Vinasse	12.3.1	Co-products derived from the industrial processing of musts/worts issued from microbial fermentation processes such as alcohol, organic acids or yeast

		manufacture. They are composed of the liquid/paste fraction obtained after the separation of the fermentation musts/worts. They may also include dead cells and/or parts thereof of the fermentation micro-organisms used
Crude maize germ oil	1.2.13	Oil and fat obtained either by processing and/or extraction of maize germs
Isomaltulose molasses	4.1.6	Non-crystallised fraction from the manufacture of isomaltulose by enzymatic conversion of sucrose from sugar beets.
Maize screening	1.2.6	Fraction of maize kernels separated by the screening process at product intake

The above list will be amended, if appropriate, in function of industrial developments within the starch industry, or of an evolution of the EU legislation on feed materials like e.g. a review of the Catalogue of feed materials.

The above list is non exhaustive. Other raw materials (e.g. barley and rice) and other feed materials (that can be specific to a plant or based on market demands) and all food ingredients sold also as feed materials, are considered to be within the scope of the 'Community Guide to good practice for the industrial manufacture of safe feed materials'. For all products sold as feeds materials a risk assessment in line with annex 3 needs to be available.

The exact compositions of marketed products sold to the feeding industry can be found in the marketing documents (data sheets) of each starch producer.

#### d) Overview of the main processes

The below manufacturing diagrams are basic schemes (i.e. examples) for the production of starch from wheat, maize, potato and pea, yet every production site may present distinctive features.

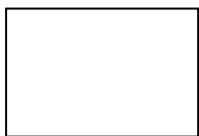
Specific feed materials are underlined in the flow charts. However all other products except ethanol can be used both for feed and food. More by-product streams and combinations thereof are possible as well.

They must not be regarded as a standardized process to be applied by starch companies. Each company remains free to decide what design each industrial processing unit should look like.

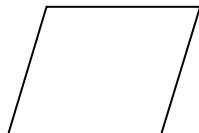
#### Symbols



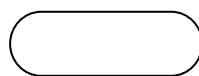
Main Process



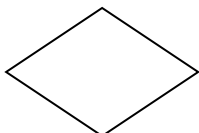
Process step



Material



Process start or terminator

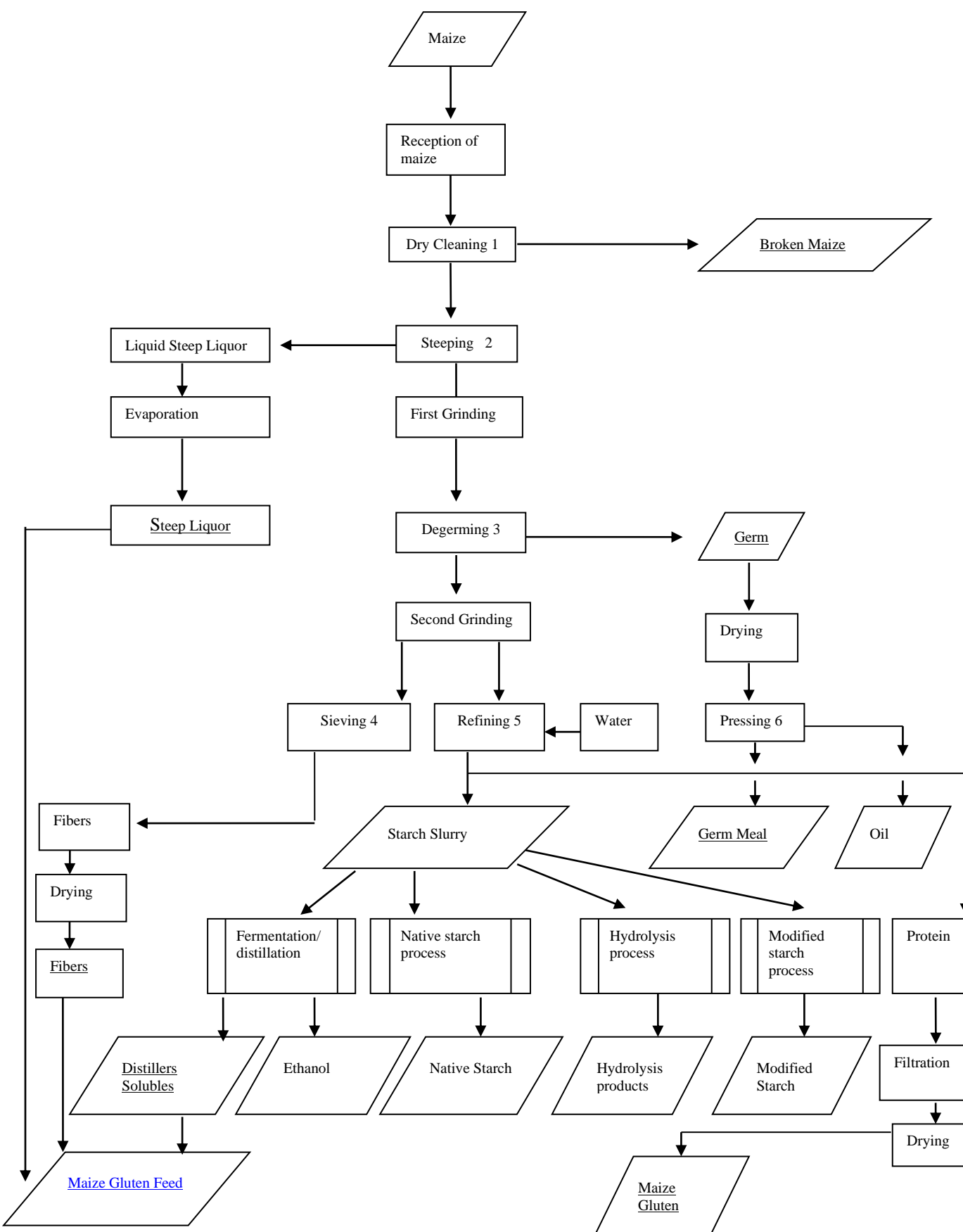


Decision

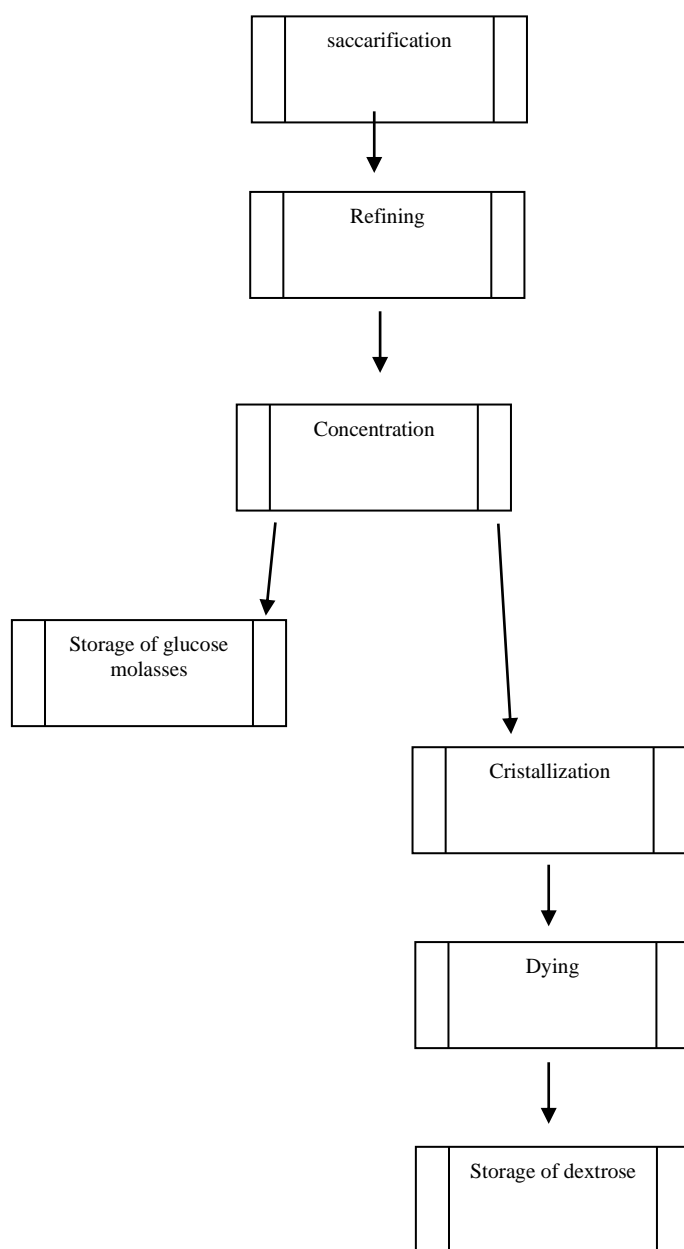
## **1. MANUFACTURE OF MAIZE STARCH**

1. Dry cleaning: sieving and sucking up of impurities and broken grains. The parts non suitable for feed use are eliminated. The parts suitable for feed use are sold as such or incorporated in corn gluten feed.
2. Steeping: corn put into water in order to separate the soluble components (= liquid steep liquor). Micro-organism controlling agent is added to prevent from bad fermentation.
3. Degerming: germ separated from the grain thanks to density difference going through a cycloning.
4. Sieving: product goes through a sieve. Fibres particles stay on the sieve / slurry made of starch and protein goes through.
5. Refining: starch separated from protein thanks to density difference going through a centrifugal extractor.
6. Pressing: oil separated from germ thanks to mechanical pressure.

## MANUFACTURE OF MAIZE STARCH - BASIC SCHEME



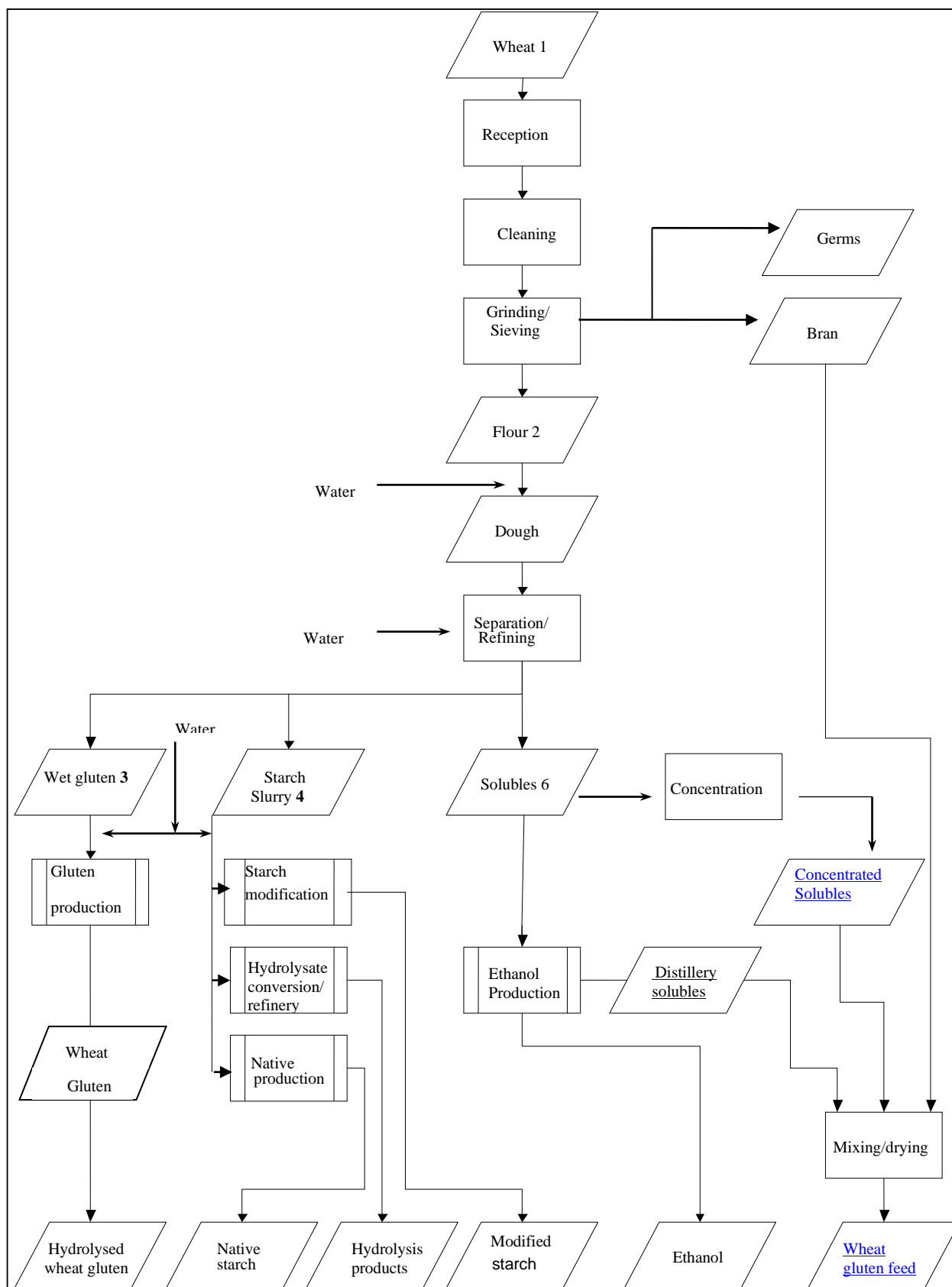
## HYDROLYSIS PROCESS



## 2. MANUFACTURE OF WHEAT STARCH

1. The incoming wheat is cleaned and ground to flour. The wheat bran and eventually also wheat germ are separated from the flour by sieving.
2. The flour is mixed with water to form a dough and the starch and gluten are separated by a physical process.
3. The wet gluten is washed with water to remove residual starch and dried to wheat gluten. The wet gluten can be partially hydrolysed also to produce hydrolysed wheat gluten.
4. The starch slurry is washed with water and can be:
  - Dried to produce native wheat starch;
  - Physically and/or chemically modified and dried to produce modified wheat starches;
  - Hydrolysed by acid hydrolysis and/or enzymes to produce a range of starch hydrolysis products.
5. A fraction of the starch separated during washing can be used in animal feed (liquid wheat starch) or in ethanol production (not shown in the flowdiagram).
6. A fraction of solubles from the separation of starch and gluten can be used in alcohol production, or concentrated and used as such in animal feed (wheat solubles) or added to the wheat bran to produce wheat gluten feed.
7. In ethanol production the starch is enzymatically hydrolysed to sugars and fermented to ethanol with yeast. The ethanol is separated by distillation, and the remaining solubles are concentrated and either used as such in animal feed (distillery grains and solubles) or added to the wheat gluten feed.

## 2. MANUFACTURE OF WHEAT STARCH - BASIC SCHEME



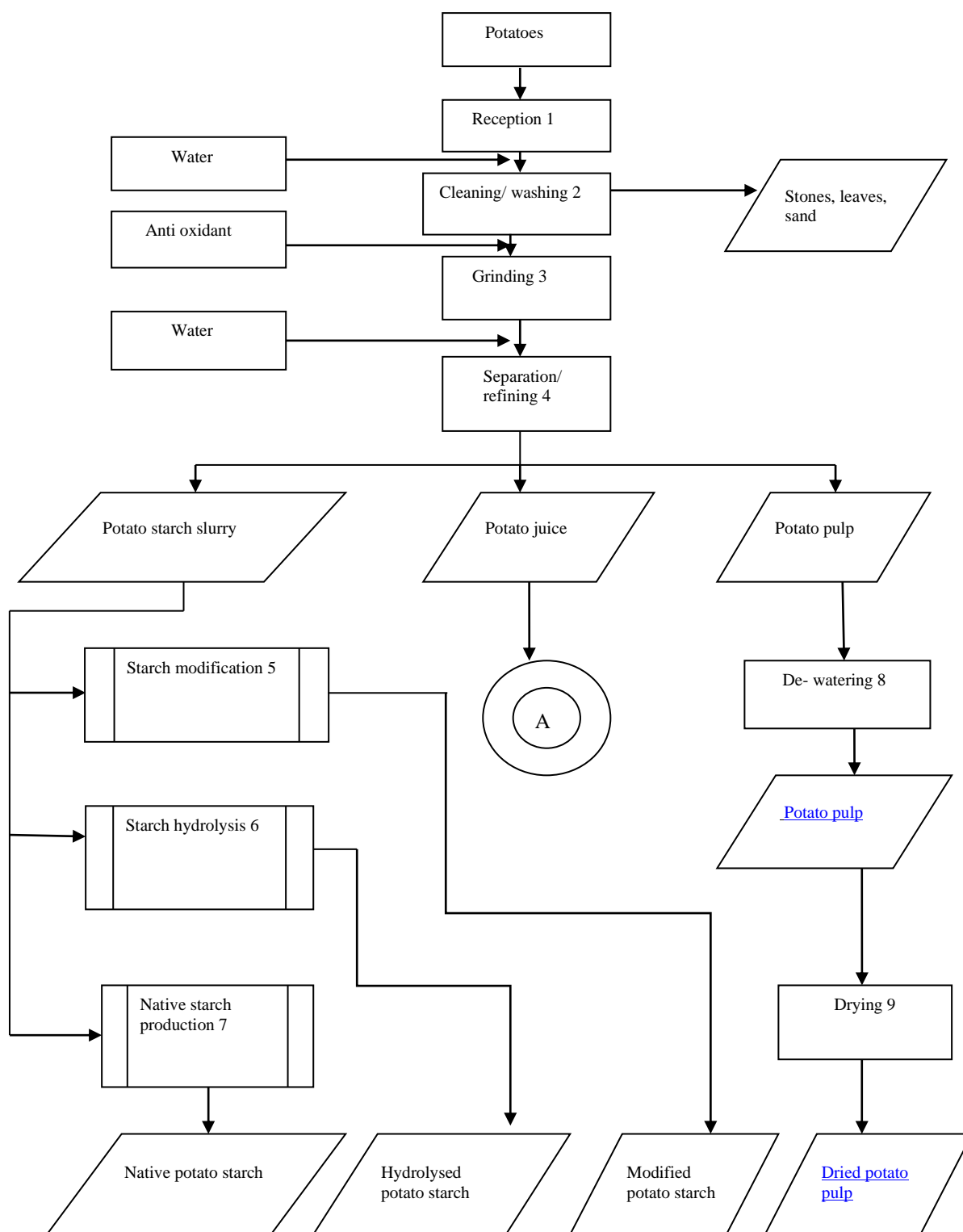


### 3. MANUFACTURING OF POTATO STARCH

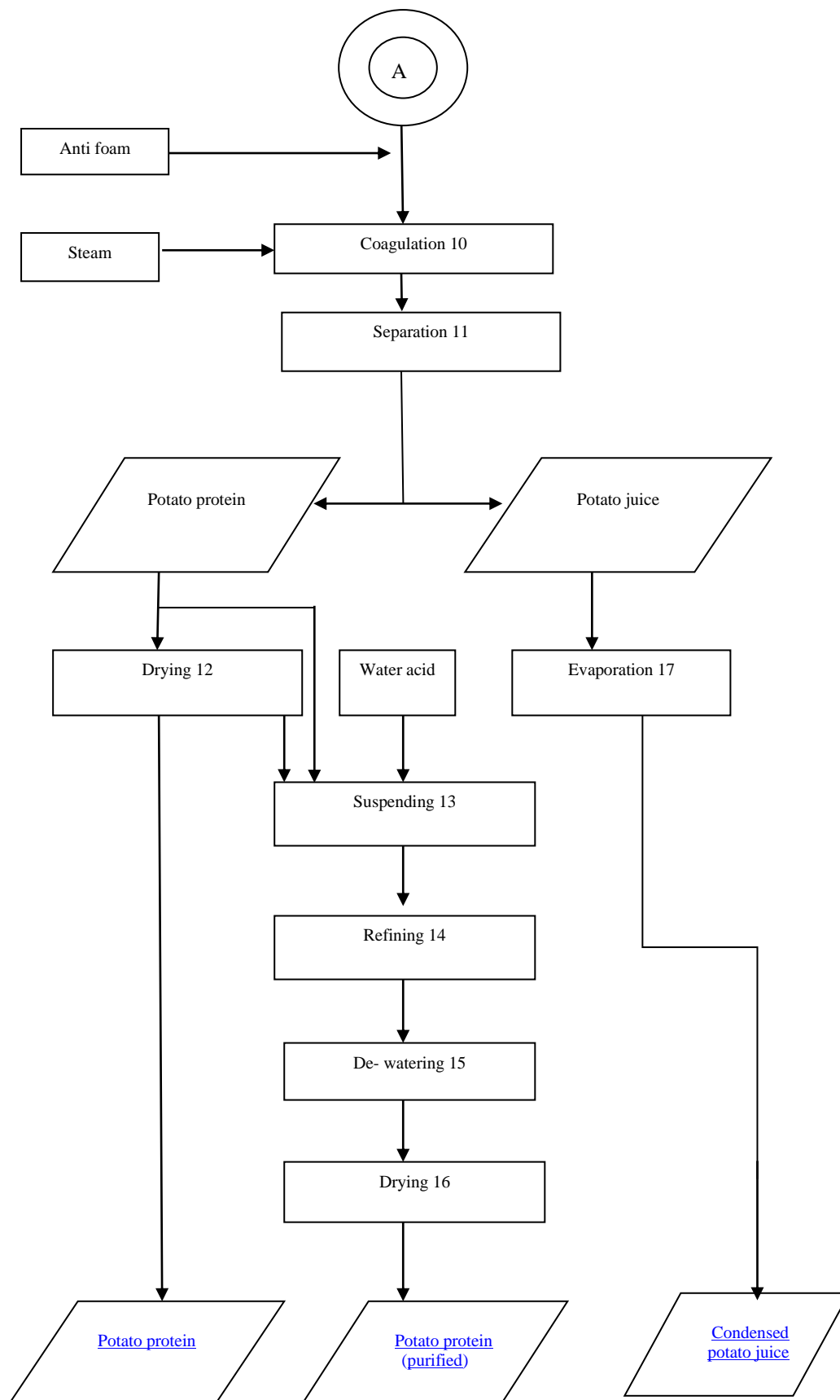
1. At the reception of the potatoes a sample is taken to check on quality.
2. The potatoes are washed and unwanted components like sand, leaves and stones are removed. To prevent excessive foaming some food grade anti foam is added.
3. The cleaned potatoes are grinded and anti oxidant is added.
4. The grinded potatoes are separated with gravity based techniques to potato starch slurry, potato juice and potato pulp.
5. The starch slurry is modified by chemical and/or physical techniques and dried to modified starch.
6. The starch slurry is hydrolysed with acid or enzymes and dried to hydrolysed starch.
7. The starch slurry is de-watered and dried to native potato starch.
8. The potato pulp stream is de-watered mechanically to the feed product potato pulp.
9. The regular potato pulp product can be dried further to dry pellets – dried potato pulp.
10. The potato juice is heated with steam and the protein components coagulate. To prevent excessive foaming some food grade anti foam is added.
11. The coagulated protein is separated by gravity techniques from the potato juice.
12. The protein is dried to the feed product potato protein.
13. Potato protein is mixed with water and acid for the production of potato protein (purified).
14. The mixture of water and coagulated protein is refined to remove the natural glycoalkaloids from the protein.
15. The refined protein is dewatered by gravity techniques.
16. The refined protein is dried to the feed product potato protein (purified).
17. The potato juice is heated to evaporate water and produce condensed potato juice.

The pH is checked and corrected by pH Regulators in various stages of the production process.

### 3. MANUFACTURING OF POTATO STARCH - BASIC SCHEME (1 OF 2)



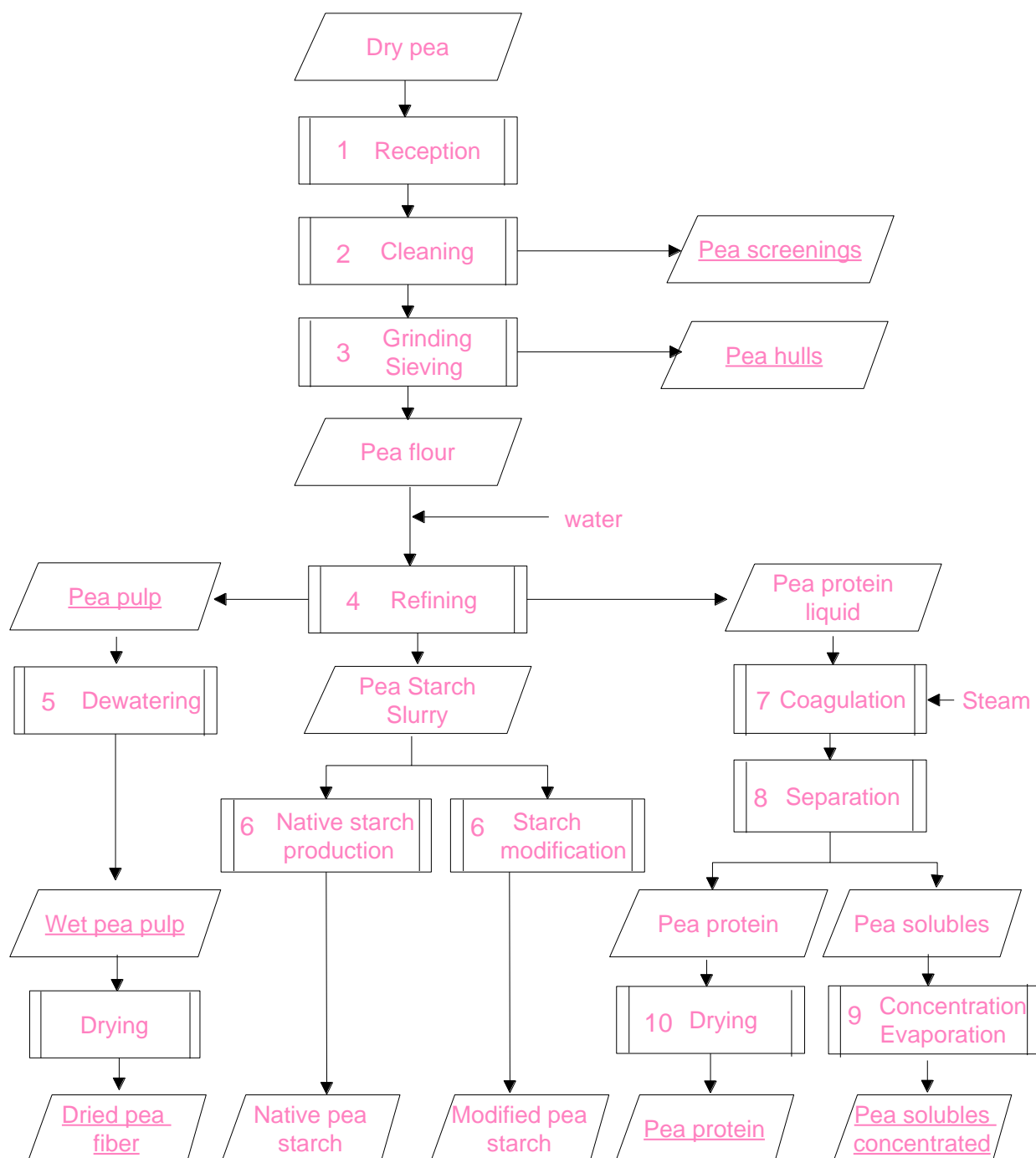
### 3. MANUFACTURING OF POTATO STARCH - BASIC SCHEME (2 of 2)



#### **4. MANUFACTURING OF PEA STARCH**

1. The incoming dry pea is sampled to check the quality.
2. Pea is cleaned to remove impurities and broken pea by sieving.
3. The cleaned peas are grinded / sieving to flour.
4. The flour is mixed with water to separate by physical process to pea starch slurry, pulp and liquid protein products.
5. Pea pulp fraction is de-watered mechanically to the feed product pea pulp.
6. The pea starch slurry is washed and can be:
  - dried to produce native pea starch,
  - physically and/or chemically modified and dried to produce modified pea starch.
7. The pea protein liquid is heated with steam and the protein components coagulate.
8. The coagulated protein fraction is separated by gravity techniques from pea protein liquid.
9. After coagulated protein fraction separation, the liquid fraction is heated to evaporate water and produce condensed pea soluble.  
The pH is checked and corrected by pH regulators in various steps of the production process.
10. The pea protein fraction is dried to obtain pea protein product.

#### 4. MANUFACTURING OF PEA STARCH - BASIC SCHEME



## e) Summary of the risk-based approach for the starch sector

In establishing the list of potential hazards, an operator should take due consideration of:

- The Directive of undesirable substances in feed (2002/32/EC).
- The Placing on the market Regulation (767/2009/EC)
- Commission Recommendation on the prevention and reduction of *Fusarium* toxins in cereals and cereal products (2006/576/EC).
- The Regulation on maximum residues levels of pesticides in or on food and feed of plant and animal origin (396/2005/EC).
- Council Regulation (Euratom) 2016/52 of 15 January 2016 laying down maximum permitted levels of radioactive contamination of food and feed following a nuclear accident or any other case of radiological emergency, and repealing Regulation (Euratom) No 3954/87 and Commission Regulations (Euratom) No 944/89 and (Euratom) No 770/90.

See the European Guide chapter 7 for more information regarding the legislation.

### Biological hazards

- Relevant Vegetative Pathogens according to the GMP feed regulation and associated microbiological criteria.  
Pest like rodents, insects

### Potential Chemical hazards

- Process chemicals, processing aids e.g. enzymes, micro organism controlling agents, pH regulators, antioxidants, mineral nutrients for fermentation
- Biocides
- Mycotoxins
- Phytotoxins
- Heavy metals
- Pesticides residues
- PCB, Dioxins
- Polycyclic aromatic hydrocarbons (PAH)
- Lubricants
- Noxious seeds
- Food contact packaging materials (including printing inks, paper and board, coatings...)
- Pest control chemicals

The use of processing aids is included in the hazards analysis developed by the operator according to the requirements of the section 6 of the guide.

**Physical contamination hazards**

- Metal
- Glass
- Hard plastic
- Any other relevant physical contamination.

**Radioactivity hazard**

- Radionuclides (after a nuclear accident)

#### **f) Risk-based approach for the characterisation of hazards applicable to starch products sold as feed**

The following tables present the characterisation of hazards applicable to starch products sold as feed materials. The risk level defined is based on a situation where no control measure is in place and the number obtained is an indicative number. For more understanding of the following risk assessment tables please see EFISC-GTP main text, chapter 6 HACCP system.

Those risks cannot be considered as complete and may differ amongst starch producers for example based on the origin of the raw materials and the individual and specific starch manufacturer's processing conditions and the combination of these.

Starch manufacturers have refined the risks to a level appropriate to their specific operating conditions.

Moreover, in these tables, no operational prerequisite programme (OPRP) or critical control point (CCP) is listed due to the fact that the decision leading to the establishment of such OPRP or CCP should be consistent with the reality of each plant or processing line.

Three categories of hazards were considered:

- Biological hazards;
- Chemical hazards; and,
- Physical hazards.



## FEED. Risk assessment of the chain of starch manufacturing

### 1: GENERAL RISK ASSESSMENT APPLICABLE FOR ANY RAW MATERIAL

1.1 General risk based approach				Ingredient: the raw materials (MAIZE, WHEAT, POTATO, PEA ) coming from primary production			
Hazard	Cat.	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Foreign bodies like glass, wood, metals, etc.	P	Low	High	3		In letter stages; general processing steps must be purifying (magnets, screens).	Supplier's specification.
Pesticide residues (authorised) above the MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the MRL	C	Medium	Medium	3	Reg. 396/2005/EC	Active participation in surveillance schemes for contaminant monitoring. A monitoring program should be in place based on risk assessment on raw material per country origin.	Supplier's specification. Traceability from supplier's silo's- attention for the use of post harvest pesticides. Special attention for the geographical origin.
Pesticides residues (unauthorised)	C	Very low	High	2	Directive 2002/32/EC	Active participation in surveillance schemes for contaminant monitoring. A monitoring program should be in place based on risk assessment on raw material	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff. Some of the banned pesticides may be present in the environment.
Mycotoxins above the specified limit	C	Medium	High	4	Dir. 2002/32/EC Rec. 2006/576/EC	Active participation in surveillance schemes for contaminant monitoring. A monitoring program should be in place based on risk assessment on raw material per country origin Regular moving of the goods to avoid T° increase	Supplier's specification. Traceability from supplier's silo's. Concentration factor in Wet mill area should be considered

## FEED. Risk assessment of the chain of starch manufacturing

Heavy metals above the specified limit	C	Low	High	3	Reg. 396/2005/EC Dir. 2002/32/EC Rec. 2006/576/EC	Active participation in surveillance schemes for contaminant monitoring. A monitoring program should be in place based on risk assessment on raw material per country origin	Supplier's specification. Special attention for the geographical origin.
						be in place.	
Phytotoxins	C	Low	Medium	2	Directive 2002/32/EC limits the maximum content of toxic weed seeds	Active participation in surveillance schemes. A monitoring program should be in place.	Supplier's specification. Special attention for the geographical origin.
Radioactivity hazard	C	Low	Medium	2		A monitoring program should be in place based on risk assessment on raw material per country origin (ex Ukraine)	
Non-EU-authorized GMOs	B	Low	Medium	2		Different pace of new GMOs between EU and third countries from which seeds are imported. Risk of traces of non-EU-authorized GMOs ending up in EU imported	This is an issue of legal compliance rather than one of food safety
Dioxins	C	Low	Medium	2		A monitoring program should be in place based on risk assessment on raw material per country origin	Critical are the countries where drying is made by diesel fuel

## FEED. Risk assessment of the chain of starch manufacturing

Presence of allergenic seeds	C	Medium	Medium	3		A monitoring program should be in place to put in light the presence of foreign allergenic seeds (defining a limit in % of the total volume)	
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## FEED. Risk assessment of the chain of starch manufacturing

1.2 General risk based approach				Ingredient: WATER			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Contamination present in water such as PFOA and PFOS	Physical	Low	Medium	2		Filtration + compliance with potability standards	In latter stages; general processing steps are purifying
Cross contamination	Chemical	Low	Medium	2		Dedicated water circuits	
Pesticides, heavy metals, hydro carbons	Chemical	Low	Medium	2	Reg. 396/2005/EC Dir. 2002/32/EC	Dedicated water circuits	
Metal leaching	Chemical	Low	Medium	2		Inert contact materials; construction standards	
Pathogenic micro - organisms	Biological	Low	High	3		Dedicated water circuits and regular micro monitoring	In line with EU Regulation for water potability

## FEED. Risk assessment of the chain of starch manufacturing

1.3 General risk based approach				Processing agent: <b>CHEMICAL AGENTS</b> (antifoams, acidification or alkalising agents, SO <sub>2</sub> and derivatives, enzyme catalysing salts...)			
Hazard	Category	Chance	Severity	Risk Class	Legislation	Control Measure	Remarks
Heavy metals	Chemical	Low	Medium	2	Dir. 2002/32/EC	Ingredient specification contracts containing food adequate requirements	
Cross contamination	Chemical	Low	Medium	2		On-line process monitoring (pH, sensorial, consumption rates), correct labelling of chemical containers	

1.4 General risk based approach				Processing agent: <b>ENZYMES</b> (particularly those specific to usage in the scope of starch processing)			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Cross contamination	Biological	Low	Low	1		On-line process monitoring (consumption rates), correct labelling of enzyme containers	
Toxicity	Biological	Low	Low or max medium	3		Ingredient specification contracts containing food adequate requirements	
Pathogenic micro-organisms	Biological	Very Low or hazard to be deleted	High	3		Ingredient specification contracts containing food adequate requirements	

## FEED. Risk assessment of the chain of starch manufacturing

1.5 General risk based approach				Processing agent: FILTER AIDS (filtering earth, silica, coal, cellulose fibre...)			
	Category	Chance	Severity	Risk Class.	Legislation	Hazard	Remarks
Metal leaching	Chemical	Low	Medium	2		Ingredient specification contracts containing food adequate requirements	
Cross contamination	Physical	Low	Medium	2		Filtration in latter process stages	

1.6 General risk based approach				Materials: MATERIALS IN CONTACT (equipment, packaging...)			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Metal leaching	Chemical	Low	Medium	2		Ingredient specification contracts containing food adequate requirements	

## FEED. Risk assessment of the chain of starch manufacturing

1.7 General risk based approach				Process stage: MANUFACTURING PROCESS CONTROL			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Foreign bodies	Physical	Medium	Low	2		Dedicated buildings and circuits. Filters, screens, staff hygiene (clothes), glass procedure, good maintenance practices	
Insects and rodents	Biological	Medium	Low	2		Building proofing, cleaning programs + pest control system as part of the prerequisite programme	
Pathogenic micro - organisms	Biological	Medium	High	4		Closed lines, low probability of growth via raw material, stages with higher temp routes and lower pH ranges, usage of SO2 + regular monitoring of finished products Insulation of production line and storage silo to avoid condensation	
Lack of Hygiene	Biological	Medium	Medium	3		Staff hygiene training, appropriate clothing, work instructions regarding cleaning	
Heavy metals, mycotoxins, pesticides	Chemical	Low	Medium	2	Reg. 396/2005/EC Dir. 2002/32/EC Rec. 2006/576/EC	Knowledge regarding distribution of chemical contaminants from raw material into end product. Anticipate harvest events + regular monitoring of finished products	
Direct drying (PAH, nitrous oxides), dioxins	Chemical	Medium	Medium	3	Dir. 2002/32/EC Reg. 183/2005/EC	Good burner maintenance practices	Avoid formation of soot + in depth HACCP study + good maintenance practices

## FEED. Risk assessment of the chain of starch manufacturing

Cross contamination	Chemical	Low	Medium	2		Dedicated circuits, dedicated storage of chemicals	
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1.8 General risk based approach					Process stage: STORAGE and TRANSPORT CONTROL		
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Cross contamination with backhaul products	Chemical	Medium	Medium	3		Haulier contractor specification	
Mycotoxin formation	Chemical	Low	High	3	Dir. 2002/32/EC Rec. 2006/576/EC	Good storage control; closed storage area, Humidity & T controls + regular finished products monitoring Regular moving of the goods to avoid T° increase	
Pesticides	Chemical	Low	Medium	2	Reg. 396/2005/EC Dir. 2002/32/EC	Disinfection of silo's to be done by qualified persons	
Pathogenic micro - organisms	Biological	Low	High	3		Humidity and temp controls + regular finished products monitoring	
Insects and rodents	Biological	Medium	Low	2		Covered storage and loading + pest control system	
Cross contamination with OGM event	Biological, if at all	Low	Medium	2		Dedicated truck or warehouse and cleaning procedure in place	



## FEED. Risk assessment of the chain of starch manufacturing

### EXAMPLE 2.1a: A MAIZE PRODUCT, FOCUS ON RECEPTION, PROCESS, STORAGE AND LOADING STEPS

<b>RISK BASED APPROACH FOR MAIZE GLUTEN FEED</b>	<b>Process stage: RECEPTION (Cereal Maize)</b>
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Hazard	Category	Chance	Seriousness	Risk Class	Legislation	Control Measure	Remarks
Foreign bodies	Physical	Medium	Medium	3		Closed process, sieving, magnets	Visual checks
Toxic/Allergenic seeds	Chemical	Low	Medium	2	Dir. 2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis	Visual checks Aggregate sampling
Heavy Metals	Chemical	Low	Medium	2	Dir.2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme	Purchasing specifications
Pesticide residues	Chemical	Low	Medium	2	Reg. 396/2005/EC Dir. 2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme	Purchasing specifications
Mycotoxins	Chemical	Medium	Medium	3	Dir. 2002/32/EC Rec. 2006/576/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme	Purchasing specifications
Lubricants	Chemical	Low	Low	1		PREREQUISITE PROGRAM for maintenance Use of Food grade lubricant	Purchasing specifications
Pests	Biological	Medium	Medium	3		Closed buildings, PREREQUISITE PROGRAM for Pest control	Checks on pest activity

## FEED. Risk assessment of the chain of starch manufacturing

<b>RISK BASED APPROACH FOR MAIZE GLUTEN FEED</b>					<b>Process stage: PROCESS (Dry cleaning, Steeping, First and Second grinding, Degerming, Sieving, Drying, Mixing, Drying)</b>		
<b>Hazard</b>	<b>Category</b>	<b>Chance</b>	<b>Seriousness</b>	<b>Risk Class</b>	<b>Legislation</b>	<b>Control Measure</b>	<b>Remarks</b>
Foreign bodies	Physical	Low	Medium	2		Closed process, sieving, dedicated transport lines, dry cleaning of maize PREREQUISITE PROGRAM for personal hygiene	Visual checks
Lubricants	Chemical	Low	Medium	1		PREREQUISITE PROGRAM for maintenance Use of Food grade lubricant	Purchasing specifications
Processing aids	Chemical	Low	Low	1		On-line monitoring (follow up excessive use of processing aids) pH control, SO <sub>2</sub> content control, ISO9001 plans, work instructions and training personnel	
Cleaning agents	Chemical	Low	Low	1		PREREQUISITE PROGRAM for cleaning and sanitation Use of Food contact authorized	Purchasing specifications
Undesirable substances from direct drying	Chemical	Medium	Medium	3	Dir. 2002/32/EC	Drying according to dryer type and use instructions; end-product analyses (risk-based acc. to historical data and minimum once a year)	
Water contamination	Chemical / Biological	Low	High	3	Reg. 183/2005/EC	PREREQUISITE PROGRAM for layout of premises and workspace Analysis via monitoring programme	
Pests	Biological	Low	Medium	2		PREREQUISITE PROGRAM for Pest control Closed process	Checks on pest activity

## FEED. Risk assessment of the chain of starch manufacturing

Pathogenic Microbiological organisms	Biological	Low	High	3		Process control (Temperature, pH, Time and Moisture content) SO2 control Process monitoring on micro organisms Final product monitoring on micro organisms Drying/evaporating steps: Control moisture content of product	
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<b>RISK BASED APPROACH FOR MAIZE GLUTEN FEED</b>	<b>Process stage: STORAGE AND LOADING</b>
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Hazard	Category	Chance	Seriousness	Risk Class.	Legislation	Control Measure	Remarks
Foreign bodies	Physical	Low	Medium	2		Closed process, sieving	Visual checks
Lubricants	Chemical	Low	Low	1		PREREQUISITE PROGRAM for maintenance Use of Food grade lubricant	Purchasing specifications
Pests	Biological	Medium	Medium	3		PREREQUISITE PROGRAM for Pest control	Checks on pest activity
Pathogenic microbiological organisms	Biological	Low	High	3		PREREQUISITE PROGRAM for Pest control, PREREQUISITE PROGRAM for Personal hygiene, PREREQUISITE PROGRAM for cleaning and PREREQUISITE PROGRAM for maintenance	

## FEED. Risk assessment of the chain of starch manufacturing

### EXAMPLE 2.1b: MAIZE PRODUCT, FOCUS ON RECEPTION, PROCESS, STORAGE AND LOADING STEPS

RISK BASED APPROACH FOR MAIZE GLUTEN MEAL				Process stage: RECEPTION (Cereal Maize)			
Hazard	Category	Chance	Seriousness	Risk Class.	Legislation	Control Measure	Remarks
Foreign bodies	Physical	Medium	Medium	3		Closed process, sieving, magnets	Visual checks
Toxic/Allergenic seeds	Chemical	Low	Medium	2	Dir. 2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis  This part should be put in the raw material as part of RM selection more that control point of receiving	Visual checks Aggregate sampling
Heavy Metals	Chemical	Low	Medium	2	Dir. 2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme	Purchasing specifications
Pesticide residues	Chemical	Low	Medium	2	Reg. 396/2005/EC Dir. 2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme	Purchasing specifications
Mycotoxins	Chemical	Medium	High	4	Dir. 2002/32/EC Rec. 2006/576/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme	Purchasing specifications
Lubricants	Chemical	Low	Low	1		PREREQUISITE PROGRAM for maintenance Use of Food grade lubricant	Purchasing specifications
Pests	Biological	Medium	Medium	3		Closed buildings, PREREQUISITE PROGRAM for Pest control	Checks on pest activity

## FEED. Risk assessment of the chain of starch manufacturing

RISK BASED APPROACH FOR MAIZE GLUTEN MEAL				Process stage: <b>PROCESSING</b> (Dry cleaning, Steeping, First and Second grinding, Degerming, Refining, Filtration, Drying)			
Hazard	Category	Chance	Seriousness	Risk Class.	Legislation	Control Measure	Remarks
Foreign bodies	Physical	Low	Medium	2		Closed process, sieving, dedicated transport lines, dry cleaning of maize PREREQUISITE PROGRAM for personal hygiene	Visual checks
Lubricants	Chemical	Low	Low	1		PREREQUISITE PROGRAM for maintenance Use of Food grade lubricant	Purchasing specifications
Processing aids	Chemical	Low	Low	1		On-line monitoring (follow up excessive use of processing aids) pH control, SO <sub>2</sub> content control, ISO9001 plans, work instructions and training personnel	
Cleaning agents	Chemical	Low	Low	1		PREREQUISITE PROGRAM for cleaning and sanitation Use of Food contact authorized	Purchasing specifications
Undesirable substances from direct drying	Chemical	Medium	Medium	3	Dir. 2002/32/EC	Drying according to dryer type and use instructions; end-product analyses (risk-based according to historical data and minimum once a year)	
Water contamination	Chemical / Biological	Low	High	3	Reg. 183/2005/EC	PREREQUISITE PROGRAM for layout of premises and workspace Analysis via monitoring programme	
Pests	Biological	Low	Medium	2		PREREQUISITE PROGRAM for Pest control. Closed process	Checks on pest activity
Pathogenic Microbiological	Biological	Low	High	3		Process control (Temperature, pH, Time and Moisture content)	

## FEED. Risk assessment of the chain of starch manufacturing

organisms						SO2 control Process monitoring on micro organisms Final product monitoring on micro organisms Drying/evaporating steps: Control moisture content of product	
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RISK BASED APPROACH FOR MAIZE GLUTEN MEAL				Process stage: Storage and loading			
Hazard	Category	Chance	Seriousness	Risk Class	Legislation	Control Measure	Remarks
Foreign bodies	Physical	Low	Medium			Closed process, sieving	Visual checks
Lubricants	Chemical	Low	Low			PREREQUISITE PROGRAM for maintenance Use of Food grade lubricant	Purchasing specifications
Pests	Biological	Medium	Medium	3		PREREQUISITE PROGRAM for Pest control	Checks on pest activity
Pathogenic microbiological organisms	Biological	Low	High	2		PREREQUISITE PROGRAM for Pest control, PREREQUISITE PROGRAM for Personal hygiene, PREREQUISITE PROGRAM for cleaning and PREREQUISITE PROGRAM for maintenance Insulation of the silos and transport	

## FEED. Risk assessment of the chain of starch manufacturing

### EXAMPLE 2.2: FOR A WHEAT PRODUCT, FOCUS ON RECEPTION, PROCESS, STORAGE AND LOADING STEPS

RISK BASED APPROACH FOR WHEAT GLUTEN FEED				Process stage: RECEPTION, FIBRE EXTRACTION, (CONCENTRATED) SOLUBLES FROM STARCH EXTRACTION OR ETHANOL DISTILLERY			
Hazard	Category	Chance	Seriousness	Risk Class.	Legislation	Control Measure	Remarks
Foreign bodies	Physical	Low	Medium	2		Closed process, Sieving, dedicated lines, wheat cleaning, magnets, glass policy PREREQUISITE PROGRAM for personal hygiene	
Toxic/Allergenic seeds Botanic impurities	Chemical	Low	Medium	2	Dir. 2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis	Visual checks Aggregate sampling
Heavy metals	Chemical	Low	Medium	2	Dir.2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme on raw material and final product (recommendation min 1 x per year) Raw material specification contracts	These can be carried over from wheat and inadequate wheat cleaning steps
Pesticide residues	Chemical	Low	Medium	2	Reg. 396/2005/EC Dir. 2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme Information about treatments done by the supplier during storage	These can be carried over from wheat

## FEED. Risk assessment of the chain of starch manufacturing

Mycotoxins	Chemical	Medium	Medium	3	Dir.2002/32/EC Rec.2006/576/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme on raw material and final product (recommendation min 1 x per year) Raw material specification contracts	These can be carried over from wheat and inadequate wheat cleaning steps and have tendency to enrich in wheat gluten feed
Lubricants	Chemical	Low	Low	1		PREREQUISITE PROGRAM for maintenance Use of Food grade lubricant	Purchasing specifications
Processing Aids	Chemical	Low	Low	1		On-line monitoring (follow up excessive use of processing aids) Processing aids used shall not be toxic pH control, ISO9001 plans, work instructions and training personnel	
Cleaning agents	Chemical	Low	Low	1		PREREQUISITE PROGRAM for cleaning and sanitation Use of Food contact authorized	Purchasing specifications
Undesirable substances from direct drying	Chemical	Medium	Medium	3	Dir.2002/32/EC	Drying according to dryer type and use instructions; end-product analyses (risk-based according to historical data and minimum once a year	
HCN	Chemical	Low	Medium	2	Dir.2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme on raw material and final product (recommendation	



## FEED. Risk assessment of the chain of starch manufacturing

						min 1 x per year) Raw material specification contracts	
Fluorine	Chemical	Low	Medium	2	Dir.2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme on raw material and final product (recommendation min 1 x per year) Raw material specification contracts	This can be carried over via wheat raw material
Pests	Biological	Low	Medium	2		PREREQUISITE PROGRAM for Pest control Closed process	Checks on pest activity
Pathogenic Microbiological organisms	Biological	Low	High	3		Process control (Temperature, pH, Time and Moisture content) Process monitoring on hygiene indicator micro organisms Final product monitoring on micro organisms (recommendation to check min 1 x per year for pathogens) Drying/evaporating steps: Control moisture content of product	

## FEED. Risk assessment of the chain of starch manufacturing

<b>RISK BASED APPROACH FOR WHEAT GLUTEN FEED</b>	<b>Process stage: STORAGE &amp; LOAD OUT</b>
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Hazard	Category	Chance	Seriousness	Risk Class.	Legislation	Control Measure	Remarks
Foreign bodies	Physical	Low	Medium	2		Protected storage, sieving	Visual checks
Lubricants	Chemical	Low	Low	1		PREREQUISITE PROGRAM for maintenance Use of Food grade lubricant	Purchasing specifications
Pests	Biological	Medium	Medium	3		PREREQUISITE PROGRAM for Pest control	Checks on pest activity
Pathogenic microbiological organisms	Biological	Low	High	3		PREREQUISITE PROGRAM for Pest control, PREREQUISITE PROGRAM for Personal hygiene, PREREQUISITE PROGRAM for cleaning and PREREQUISITE PROGRAM for maintenance	

## FEED. Risk assessment of the chain of starch manufacturing

### EXAMPLE2.3 : POTATO PROCESSING; STARCH AND CO-PRODUCT MANUFACTURING

GENERAL RISK BASED APPROACH FOR POTATO STARCH				Process stage: 1 RECEPTION (POTATOES)			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Bad rotten potatoes	Biological	Medium	Low	2		Portal control, Inspection truck loads, removal	
Stones, glass, plastics, wood, metal, carton, sand, soil	Physical	Medium	Low	2		Portal control, Inspection truck loads. Cleaning potatoes, removal	
Pesticide residues, heavy metals	Chemical	Medium	Medium	3	Dir. 91/414/EC Reg.396/2005/EC Dir. /2002/32/EC	Certified potato growers Contaminant monitoring	
Natural contaminants (solanine)	Chemical	Medium	Medium	3	Dir. 2002/53/EC	Certified potato growers, Allowed potato varieties listed in National Varieties List, Monitoring solanine content potato protein	

## FEED. Risk assessment of the chain of starch manufacturing

GENERAL RISK BASED APPROACH FOR POTATO STARCH				Process stage: (Process (CLEANING/WASHING, GRINDING, SEPARATION/REFINING, DE-WATERING, DRYING, COAGULATION, SUSPENDING, REFINING, DE- WATERING, DRYING, EVAPORATION))			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Water contamination	Chemical	Low	Medium	2	Reg. 183/2005/EC	Water monitoring	
Water contamination	Biological	Low	Medium	2	Reg. 183/2005/EC	Water monitoring	
GENERAL RISK BASED APPROACH FOR POTATO STARCH				Process stage: 3 GRINDING			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Excessive use of processing aid	Chemical	Low	Low	1		Control process and ready product	
GENERAL RISK BASED APPROACH FOR POTATO STARCH				Process stage: 4 SEPARATION/REFINING			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Water contamination	Chemical	Low	High	3	Reg. 183/2005/EC	Water monitoring	
Water contamination	Biological	Low	High	3	Reg. 183/2005/EC	Water monitoring	
Microbial growth	Biological	Low	High	3		Washing water, CIP	

## FEED. Risk assessment of the chain of starch manufacturing

GENERAL RISK BASED APPROACH FOR POTATO STARCH				Process stage: 5 DE-WATERING/DRYING Native potato starch			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Undesirable substances from direct drying	Chemical	Low	Medium	2		Drying according to dryer type and use instructions; end-product analyses (risk-based acc. to historical data and minimum once a year)	

GENERAL RISK BASED APPROACH FOR POTATO STARCH				Process stage: 6 DE-WATERING/DRYING Hydrolysed potato starch			
Hazard	Category	Chance	Severity	Risk	Legislation	Control Measure	Remarks
Undesirable substances from direct drying	Chemical	Low	Medium	2		Drying according to dryer type and use instructions; end-product analyses (risk-based acc. to historical data and minimum once a year)	
Excessive use of processing aid	Chemical	Low	Medium	2		Control process and ready product	

## FEED. Risk assessment of the chain of starch manufacturing

GENERAL RISK BASED APPROACH FOR POTATO STARCH				Process stage: 7 DE-WATERING/DRYING Modified potato starch			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Undesirable substances from direct drying	Chemical	Low	Medium	2		Drying according to dryer type and use instructions; end-product analyses (risk-based acc. to historical data and minimum once a year)	
Excessive use of processing aid	Chemical	Low	Medium	2		Control process and ready product	

GENERAL RISK BASED APPROACH FOR POTATO PULP				Process stage: 8 DEWATERING POTATO PULP			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Microbiol growth	Biological	Low	Medium	2		CIP	

GENERAL RISK BASED APPROACH FOR POTATO PULP DRIED				Process stage: 9 DRYING			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Neoformed chemicals	Chemical	Low	Medium	2		Burner control direct dryers	

## FEED. Risk assessment of the chain of starch manufacturing

GENERAL RISK BASED APPROACH FOR POTATO PROTEIN				Process stage: 10 COAGULATION			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Microorganisms	Biological	Medium	Low	2		Steam injection	
Excess use of processing aid	Chemical	Low	Medium	2		pH control, control ready product, food grade antifoam	

GENERAL RISK BASED APPROACH FOR POTATO PROTEIN				Process stage: 11 DEWATERING			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Microorganisms	Biological	Medium	High	4		CIP CCP: temperature dryer	

GENERAL RISK BASED APPROACH FOR POTATO PROTEIN				Process stage: 12 DRYING			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Undesirable substances from direct drying	Chemical	Low	Medium	2		Drying according to dryer type and use instructions; end-product analyses (risk-based acc. to historical data and minimum once a year)	

## FEED. Risk assessment of the chain of starch manufacturing

GENERAL RISK BASED APPROACH FOR POTATO PROTEIN (purified)				Process stage: 13 SUSPENDING (OPTIONAL)			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Excess use of processing aid	Chemical	Low	Medium	2		pH control, control ready product	
Water contamination	Chemical	Low	High	3	Reg. 183/2005/EC	Water monitoring	
Water contamination	Biological	Low	High	3	Reg. 183/2005/EC	Water monitoring	

GENERAL RISK BASED APPROACH FOR POTATO PROTEIN				Process stage: 14 REFINING (OPTIONAL)			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Water contamination	Chemical	Low	High	3	Reg. 183/2005/EC	Water monitoring	
Water contamination	Biological	Low	High	3	Reg. 183/2005/EC	Water monitoring	



## FEED. Risk assessment of the chain of starch manufacturing

GENERAL RISK BASED APPROACH FOR POTATO PROTEIN				Process stage: 15 DEWATERING (OPTIONAL)			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Microorganisms	Biological	Low	High	3		CIP, temperature dryer	

GENERAL RISK BASED APPROACH FOR POTATO PROTEIN				Process stage: 16 DRYING (OPTIONAL)			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Undesirable substances from direct drying	Chemical	Low	Medium	2		Drying according to dryer type and use instructions; end-product analyses (risk-based acc. to historical data and minimum once a year)	

GENERAL RISK BASED APPROACH FOR CONDENSED POTATO JUICE				Process stage: 17 EVAPORATION			
Hazard	Category	Chance	Seriousness	Risk Class.	Legislation	Control Measure	Remarks
Microorganisms	Biological	Medium	Medium	3		Process control dry matter, high temperature evaporation step	

## FEED. Risk assessment of the chain of starch manufacturing

RISK BASED APPROACH FOR POTATO FEED MATERIALS				Process stage : 18 STORAGE & LOAD OUT			
Hazard	Category	Chance	Seriousness	Risk Class	Legislation	Control Measure	Remarks
Foreign bodies	Physical	Low	Medium	2		Protected storage, sieving	Visual checks
Lubricants	Chemical	Low	Low	1		PREREQUISITE PROGRAM for maintenance Use of Food grade lubricant	Purchasing specifications
Pests	Biological	Medium	Medium	3		PREREQUISITE PROGRAM for Pest control	Checks on pest activity
Pathogenic microbiological organisms	Biological	Low	High	3		PREREQUISITE PROGRAM for Pest control, PREREQUISITE PROGRAM for Personal hygiene, PREREQUISITE PROGRAM for cleaning and PREREQUISITE PROGRAM for maintenance	

## FEED. Risk assessment of the chain of starch manufacturing

### EXAMPLE 2.4: A PEA PRODUCT, FOCUS ON RECEPTION, PROCESS, STORAGE AND LOADING STEPS

RISK BASED APPROACH PEA PROTEIN				Process stage: RECEPTION (Pea)			
Hazard	Category	Chance	Seriousness	Risk Class.	Legislation	Control Measure	Remarks
Foreign bodies	Physical	Medium	Medium	3		Closed process, sieving, magnets, cleaning steps: sieving, magnets	Visual checks
Toxic/Allergenic seeds	Chemical	Low	Medium	2	Dir. 2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis	Visual checks Aggregate sampling
Heavy Metals	Chemical	Low	Medium	2	Dir.2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme	Purchasing specifications Regulatory compliance
Pesticides residues	Chemical	Low	Medium	2	Reg. 396/2005/EC Dir. 2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme	Purchasing specifications Regulatory compliance
Mycotoxins	Chemical	Low	Medium	2	Dir. 2002/32/EC	PREREQUISITE PROGRAM for incoming raw materials Analysis via monitoring programme	Purchasing specifications Regulatory compliance
Lubricants	Chemical	Low	Low	1		PREREQUISITE PROGRAM for maintenance Use of Food grade lubricant	Purchasing specifications Prerequisite program
Pests	Biological	Medium	Medium	3		Closed buildings, PREREQUISITE PROGRAM for Pest control Covered storage and loading	Checks on pest activity

## FEED. Risk assessment of the chain of starch manufacturing

RISK BASED APPROACH FOR PEA PROTEIN				Process stage: <b>PROCESS</b> (Dry cleaning, Grinding, Sieving, Refining, Drying)			
Hazard	Category	Chance	Seriousness	Risk Class	Legislation	Control Measure	Remarks
Foreign bodies	Physical	Low	Medium	2		Closed process, sieving, dedicated transport lines, dry cleaning of pea Glass procedure Good maintenance practices PREREQUISITE PROGRAM for personal hygiene clothes)	Visual checks
Lubricants	Chemical	Low	Low	1		PREREQUISITE PROGRAM for maintenance Use of Food grade lubricant	Purchasing specifications
Processing aids	Chemical	Low	Low	1		On-line monitoring (follow up excessive use of processing aids) pH control, ISO9001 plans, work instructions and training personnel	Purchasing specifications
Cleaning agents	Chemical	Low	Low	1		PREREQUISITE PROGRAM for cleaning and sanitation Consumption rates Use of Food contact authorized	Purchasing specifications
Undesirable substances from direct drying	Chemical	Low	Medium	2		Drying according to dryer type and use instructions; end-product analyses (risk-based acc. to historical data and minimum once a year)	
Water contamination	Chemical / Biological	Low	High	3	Reg. 183/2005/EC	Analysis via monitoring programme	Apply water of suitable quality
Pests	Biological	Low	Medium	2		PREREQUISITE PROGRAM for Pest control Closed process / closed workshops	Checks on pest activity

## FEED. Risk assessment of the chain of starch manufacturing

Pathogenic Microbiological organisms	Biological	Low	High	3		Process control (Temperature, pH, Time and Moisture content) Cleaning procedures Drying/evaporating steps: Control moisture content of product Process monitoring on micro organisms Final product monitoring on micro organisms	Prerequisite program for cleaning and sanitation
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RISK BASED APPROACH FOR PEA PROTEIN				Process stage: STORAGE AND LOADING			
Hazard	Category	Chance	Severity	Risk Class.	Legislation	Control Measure	Remarks
Foreign body	Physical	Low	Medium	2		Closed process, sieving	HACCP, visual checks
Lubricants	Chemical	Low	Low	1		PREREQUISITE PROGRAM for maintenance. Use of Food grade lubricant	HACCP, Purchasing specifications
Pests	Biological	Moderate	Moderate	3		PREREQUISITE PROGRAM for Pest control	Checks on pest activity
Pathogenic microbiological organisms	Biological	Low	High	3		PREREQUISITE PROGRAM for Pest control, PREREQUISITE PROGRAM for personnel hygiene, PREREQUISITE PROGRAM for cleaning and PREREQUISITE PROGRAM for maintenance	

## FEED. Risk assessment of the chain of starch manufacturing

### g) Annex Minimum monitoring requirements- Sector Starch

EFISC-GTP system participants shall implement a monitoring plan as described in the EFISC-GTP Code §4.4.3.

**In case insufficient data is available for a risk assessment the following minimum monitoring requirements shall apply.** The total minimum number of analysis will depend on the volume of feed materials in tons manufactured in one location as shown in the tables below.

#### 1. Control plan for starch production, their products and co products.

**Table A. Corn**

Annual production in tons/ Parameter	<25.0000	≤ 25.000- < 100.000	≥100.000 <200.000	≥200.000
<b>Aflatoxine B1 *</b>	1-2	2-4	4-8	6-12
<b>DON *</b>	1	2	4	6
<b>Ochratoxin *</b>	1-2	2-4	4-8	6-12
<b>ZEA *</b>	1	2	4	6
<b>T2/HT2 *</b>	1	2	4	6
<b>Dioxin *</b>	1	1	1	2
<b>Dioxin like PCB *</b>	1	1	1	2
<b>PCB *</b>	1	1	1	2
<b>Salmonella</b>	1-2	2-4	3-6	4-8
<b>Heavy metals (Pb, As, Hg, CD) *</b>	1	2	4	6
<b>Pesticides*</b>	1	2	4	6
<b>OGM *</b>	1	2	4	6

\*Minimum Analysis within inspection of incoming raw materials in unprocessed primary products. The analysis on finished products (starch and derivatives) should be a simple confirmation monitoring

## FEED. Risk assessment of the chain of starch manufacturing

**Table B. Wheat**

<b>Annual production in tons/ Parameter</b>	<b>&lt;25.0000</b>	<b>≤ 25.000- &lt; 100.000</b>	<b>≥100.000 &lt;200.000</b>	<b>≥200.000</b>
<b>DON</b>	1-2	2-4	4-8	6-12
<b>ZEA</b>	1	2	4	6
<b>Dioxin</b>	1	1	1	2
<b>Dioxin like PCB</b>	1	1	1	2
<b>PCB</b>	1	1	1	2
<b>Salmonella</b>	1-2	2-4	3-6	4-8
<b>Heavy metals (Pb, As, Hg, CD)</b>	1	2	4	6
<b>Pesticides*</b>	1	2	4	6

\*Analysis within inspection of incoming raw materials in unprocessed primary products

## FEED. Risk assessment of the chain of starch manufacturing

**Table C. Potatoes**

<b>Annual production in tons/ Parameter</b>	<b>&lt;25.0000</b>	<b>≤ 25.000- &lt; 100.000</b>	<b>≥100.000 &lt;200.000</b>	<b>≥200.000</b>
<b>Dioxin</b>	1	1	1	2
<b>Dioxin like PCB</b>	1	1	1	2
<b>PCB</b>	1	1	1	2
<b>Salmonella</b>	1-2	2-4	3-6	4-8
<b>Heavy metals (Pb, As, Hg, CD)</b>	1	2	4	6
<b>Pesticides*</b>	1	2	4	6

\*Analysis within inspection of incoming raw materials in unprocessed primary products



## FEED. Risk assessment of the chain of starch manufacturing

**Table D. Peas**

<b>Annual production in tons/ Parameter</b>	<b>&lt;25.0000</b>	<b>≤ 25.000- &lt; 100.000</b>	<b>≥100.000 &lt;200.000</b>	<b>≥200.000</b>
<b>DON</b>	1-2	2-4	4-8	6-12
<b>ZEA</b>	1	2	4	6
<b>Dioxin</b>	1	1	1	2
<b>Dioxin like PCB</b>	1	1	1	2
<b>PCB</b>	1	1	1	2
<b>Salmonella</b>	1-2	2-4	3-6	4-8
<b>Heavy metals (Pb, As, Hg, CD)</b>	1	2	4	6
<b>Pesticides*</b>	1	2	4	6
<b>Animal components</b>	The number of analysis should be determined with regards to risks within the scope of the manufacturers feed safety management system			

\* Analysis within inspection of incoming raw materials in unprocessed primary products

## FEED. Risk assessment of the chain of starch manufacturing





