



Nordic Sugar
Member of Nordzucker Group

HACCP plan

on sugar beet pulp pellets production



Content

1. Objectives
2. The method
3. Identification of CCPs and POAs
4. Verification process
5. Documentation

1. Objectives

The objectives with this booklet are to

1. Explain and introduce Nordic Sugar's HACCP work to customers and authorities
2. Exchange general experiences with HACCP plans throughout the organisation
3. Create a common understanding of the HACCP method (calibration between factories)

The current HACCP plan addresses product safety associated with production of pelletized dried sugar beet pulp (e.g Betfor®/Kosetter®).

2. The method

The HACCP plans at Nordic Sugar are based on the GMP+ method (International Feed Ingredients Standard - IFIS) and the international food safety standard ISO 22000. We have taken every identified hazard in the whole process chain and evaluated them with regard to three basic steps in this method (the fourth step below is the verification of the system). This procedure has clarified where the hazard should be controlled, how the hazard should be controlled and what verification procedures are necessary.

1. Identification of chemical, physical, biological and allergenic hazards in each step of the process chain.
2. In a risk assessment (2.2.) the severity and probability of each identified hazard are combined to determine the risk class and the type of control method necessary.

3. By using the decision tree (2.3.) we have identified where the hazards should be controlled along the production chain. Based on the risk classes the decision tree is used to determine whether a given process step is a critical control point (CCP), a point of attention (POA/GMP) or just a periodic measure (PM).

4. Apart from product specifications, process diagrams, risk analysis tables and summary tables, also activities towards verification of the HACCP system are documented. These activities are e.g. audits, sampling and analysis of products, analysis of deviations and customer complaints.

2.1. Severity and probability

The severity of every possible hazard in the production chain has been estimated by the Nordic Sugar HACCP Reference Group independent of the current production process. The probability of each hazard is very closely associated with the processes and the current process equipment. The probability has therefore been determined by the local HACCP group at the factory.

2.2. Risk assessment matrix

		Severity		
		Small	Medium	Great
Probability*	Great	3 POA Specific measures	4 CCP Critical measures	4 CCP Critical measures
	Medium	2 PM General measures	3 POA Specific measures	4 CCP Critical measures
	Small	1 No measures	2 PM General measures	3 POA Specific measures

* Refers to the probability of the hazard being present in the end product e.g. at the moment of consumption.

2.3. Decision tree

Where will the hazard be controlled?

- Q1: Are there identified hazards present which have a harmful effect on the safety of the product and/or can the hazard exist or increase to unacceptable levels?
Yes → Q2, No → stop!
- Q2: Which type of control measures are necessary according to the risk assessment?
Critical measures (class 4) → Q3, Specific measures (class 3) → include measures as POA and in verification procedures,
General measures (class 2) → include measures as PM and in verification procedures or no measures (class 1) → stop!
- Q3: Are the critical control measures referred to present?
Yes → Q4, No → Modify the process or product and start again at Q1.
- Q4: Has this process step been specifically developed to eliminate the risk or reduce it to an acceptable level? No → Q5, Yes → CCP!
- Q5: Will the risk be eliminated in a subsequent process step or will it be reduced to an acceptable level? Yes → Stop, No → CCP!

3. Identification of CCPs and POAs

The way Nordic Sugar differs between a CCP and a POA

CCP

- A high risk step, which is likely to get out of control
- Critical (and possible/applicable) control measures are needed in order to prevent, eliminate or reduce food & feed safety hazards to an acceptable level
- If measures are out of control the corrective actions must include isolation of product batch, retesting, decontamination or destruction
- The hazard is not eliminated or reduced to an acceptable level at a later stage in the process
- If not in control the end product constitutes a serious health risk

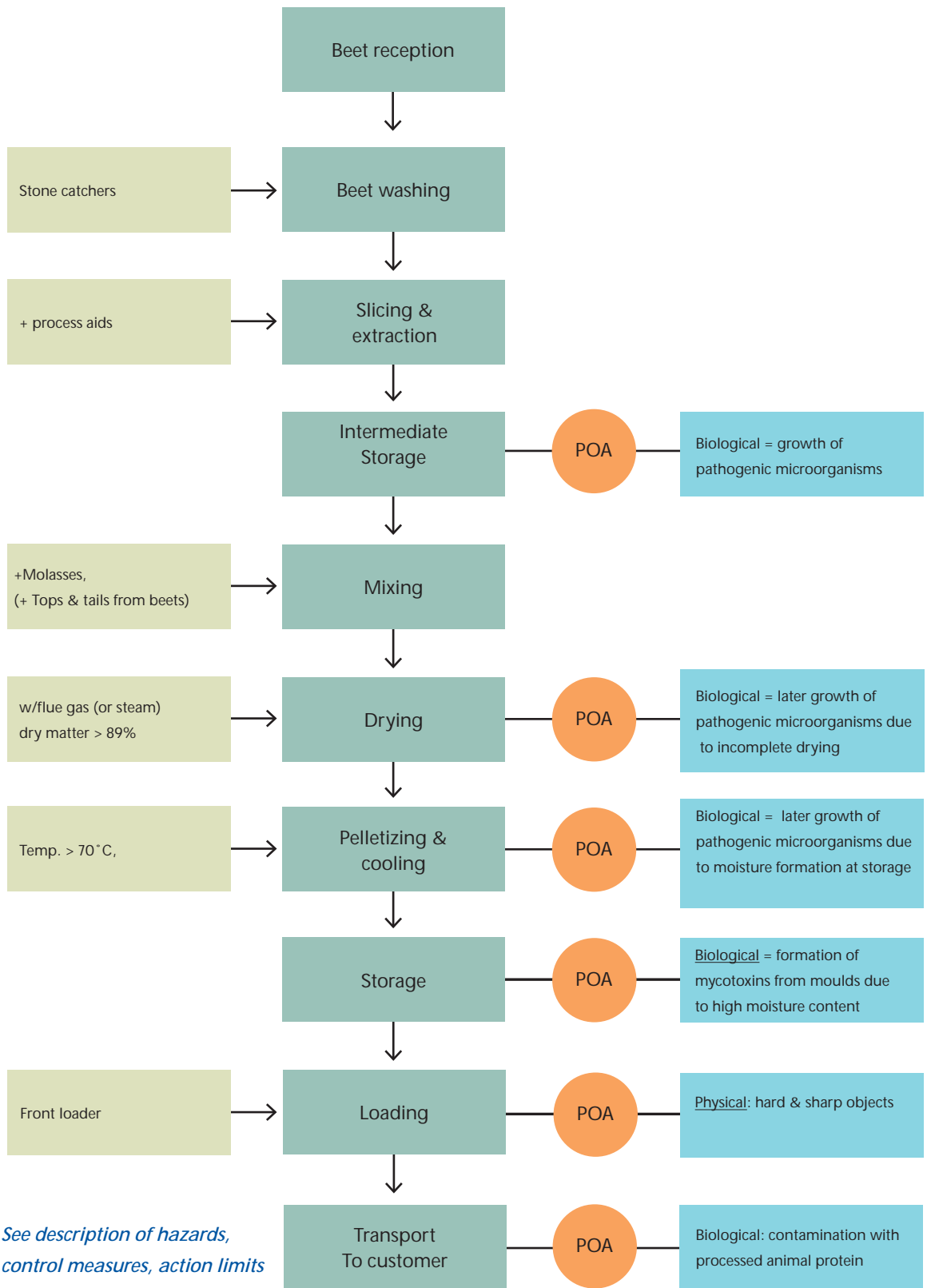
POA

- A moderate risk step
- Specific control measures essential to control the likelihood of introduction, contamination and/or proliferation of food & feed safety hazards
- The hazard may be reduced at a later stage in the process
- If measures are out of control the corrective actions include reevaluating procedure and/or checking equipment

In total six POAs have been identified for the production of pelletized pulp at an arbitrary Nordic Sugar factory (see 3.1. Pelletized pulp(molassed) process). Whether any of our factories have actually confirmed the existence of the CCP and POAs, is however dependent on the characteristics of the factory i.e. equipment, specific production parameters, intended use of the product etc.

3.1 Pelletized pulp (molassed) production process

General process steps and description of POAs



See description of hazards, control measures, action limits and corrective actions for these process steps in table 3.2. and 3.3.

3.2. Hazard analysis table (risk evaluation)

Processing step	Potential Hazards introduced, controlled or enhanced at this step	Control measures applied at this step to prevent/reduce/ eliminate the hazard.
1 Intermediate storage	(B) Prolong storage time of pulp resulting in growth of pathogenic microorganisms & mycotoxin producing moulds	Visual inspection and FIFO ²⁾ principle at the storage area, should limit the maximum storage time
2 Drying	(B) Growth of pathogenic microorganisms and formation of mycotoxins from mould due to incomplete drying	Right heating temperature and process flow
3 Pelletizing & cooling	(B) Growth of pathogenic microorganisms - and formation of mycotoxins from mould at storage - if temperature is too high (condensation)	Cooling of pellets before storage
4 Storage	(B) Growth of pathogenic microorganisms and formation of mycotoxins from mould due to moisture formation during storage	Discarding affected pellets
5 Loading	(P) Contamination with hard and sharp objects 3-25 mm	Visual inspection of trucks and storage area/trucks
6 Transport To customer	(B) Contamination with processed animal protein (BSE)	Contract with transporters and random sampling of trucks

1) Refers to the questions in the Decision tree (see 2.3. Decision tree).

B=Biological

C=Chemical

P=Physical

SM=Specific measures

2) FIFO = first in first out

Is this step a critical control point?

Evaluation of hazard

Severity and probability in the risk assessment matrix gives the risk class

Decision tree questions
1 / 2 / 3 / 4 / 5¹⁾

CCP/POA/PM Comm. / Ref

Great × small = 3	Yes / SM → POA	Intermediate storage is a POA for microbiological hazards
Great × small = 3	Yes / SM → POA	Drying is a POA for microbiological hazards
Great × small = 3	Yes / SM → POA	Cooling is a POA for microbiological hazards
Great × small = 3	Yes / SM → POA	Storage of pellets is a POA for microbiological hazards
Medium × medium = 3	Yes / SM → POA	Loading is a POA for physical hazards
Great x small = 3	Yes / SM → POA	Contract agreement and random samling of trucks is a POA for biological hazard (BSE)

3.3 HACCP Summary table

CCP or POA	Process step	Hazard to control	Control Method	Frequency
1 POA	Intermediate storage	Growth of pathogenic microorganisms and mycotoxin formation	Visual inspection and FIFO ¹⁾ principle at the pulp storage area	Continuously
2 POA	Drying	Growth of pathogenic microorganisms & formation of mycotoxin due to moisture content of pulp and pellets	Heating and flow control	Continuously
3 POA	Pelletizing & cooling	Growth of pathogenic microorganisms & formation of mycotoxins if moisture content or temperature is too high after cooling	Cooling of pellets	Continuously
4 POA	Storage	Growth of pathogenic microorganisms & formation of mycotoxins due to high moisture content	Visual inspection of pellets and discard of mould-affected pellets	Weekly
5 POA	Loading	Presence of hard & sharp objects 3 - 25 mm	Visual inspection before loading of vehicles	At loading
6 POA	Transport To customer	Processed animal protein (BSE) contaminating pulp during transport	Contract with transporters about no transports of risk materials and random verification of compliance	Randomly at loading

2) FIFO = first in first out

Action limit	Corrective action - when action limit is exceeded	Responsible	Reference
Target limit: Storage time < 3 days Action limit: Storage time > 3 days	Discard of older pulp	Head of storage	Local instructions for activities covering this area
Target limit: Dry matter > 89%, drying temperature > 550°C Action limit: Dry matter < 89%, drying temperature > 550°C	Evaluate product with low dry matter and/or poor heat treatment - discard if necessary	Process operator	Local instructions for activities covering this area
Target limit: temperature of pellets below instructions Action limit: temperature of pellets above instructions	Evaluate product with poor cooling - discard if necessary	Process operator	Local instructions for activities covering this area
Target limit: Visually mould-free pellets Action limit: Visual mouldy pellets	Mould and affected pellets are discarded	Storeman	Local instructions for activities covering this area
Target limit: No foreign objects Action limit: Presence of foreign objects	Observed foreign objects are removed, and vehicles are returned for cleaning	Storeman	Local instructions for activities covering this area
Target limit: Confirmation that no-risk materials has been transported Action limit: Transport of risk materials	Vehicle is rejected	Operator at weighing bridge	Load instructions for activities covering this area

4. Verification process

Sustaining a high quality and secure HACCP system requires continuous evaluation and review of the system.

A Nordic Sugar review of the risk analysis and verification of the HACCP plans consists of the following elements:

- Trend analyses of monitoring of POAs and or CCPs e.g. how often do we identify broken sieves

- Sampling and analysis of end products as a part of our quality program.
- Evaluation of complaints and/or emergencies reported to Nordic Sugar.
- Internal and external audits.

Audits -with focus on e.g. hygiene and HACCP are performed by internal and external parties.

These elements are used to verify the current HACCP plans at the different production sites. The verification is done whenever necessary and at least once a year.



5. Documentation

In the description of our HACCP system the following documents are included:

- HACCP team documents (members and areas of expertise)
- Flowcharts i.e. process diagrams
- Hazard analysis tables
- HACCP summary tables (comprising exclusively POAs and CCPs)

These documents are handled in the document management system (DMS) for each factory. The product safety manager located at the production site supports the management and updates the documentation. Deviations from criteria set for CCPs/ POAs are reported and registered in a Deviation Database and/or the Laboratory Information Management

System (LIMS) or Production Information Management System (PIMS). Deviations identified at the factories (at e.g. audits) are reported and communicated in a Deviation Database. Customer complaints are registered in a similar database, "Sugar Complaints for sugar, Fibrex and animal feed products".





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