

HACCP for Animal Feed Manufacturing



1

Course Plan

Day 1
9.00am Introductions
9.15am Introduction to HACCP
10.30am Break
10.45am Hazard Analysis
12.45 pm Lunch
1.30pm Critical Control Points
2.30pm Validation, verification and review
3.00pm Revision
3.45pm Level 2 Examination

2

H.A.C.C.P.

- Hazard
- Analysis and
- Critical
- Control
- Points

3

H.A.C.C.P

“A system which identifies, evaluates and controls hazards which are significant for food/feed safety”

World Health Organisation:
Codex Alimentarius Commission/RCP 1-1969 Rev 3-1997, Amd 1999

4

H.A.C.C.P.

First used by N.A.S.A. and Pilsbury company in 1950's, to guarantee food safety for astronauts

A preventative system for making feed safe

5

The Benefits of HACCP

- Fulfils the legal requirement to produce and sell safe feed
- Ensures safety of all feed, not just sampled end product
- Can act as a 'due diligence' defence in court
- Reduces non-conforming product and waste
- Focuses employees awareness of critical points in the production system
- Increased consumer confidence
- Can help to increase profits

6

If our product is unsafe.....

- How many animals will be affected?
- How much food will be affected?

7

The consequences of a feed safety failure



Distillers Dark Grains
Included in a ration at 10%

30T Product will produce 300T finished feed
1 cow could eat 10 kg/day
30T Product will feed 30,000 daily rations

If a farm has 500 cows, this will last 60 days
Cows producing 40 litres milk per day

8

The consequences of a feed safety failure

500 cows will produce 1,200,000 litres of milk in 60 days
Cost of milk 25ppl
£300,000



9

“Hazards”

“Microbiological, chemical or physical characteristics of feed which may harm....”

- Animals which consume the feed
- Humans who may consume livestock products - meat, eggs, milk, fish

10

Historical Hazards introduced into the food chain via animal feed

- B.S.E, foot and mouth disease, AI
- Dioxins 0.75ng/kg
- Salmonella

11



12



13

Microbiological Hazards

- Salmonella
- Enterobacteriaceae
- Moulds
 - Mycotoxin (Aflatoxin, DON)
- Animal Diseases (zoonoses)

14

Microbiological Hazards

In order to grow, bacteria and moulds need

- A source of nutrients
- An appropriate atmosphere
- Neutral or mild alkaline conditions
- Available moisture
- Appropriate temperature 5-63oC

Bacterial growth in animal feeds is minimised by

- Keeping feed dry
- Many mineral-type products do not supply a source of nutrients
- Avoidance of contamination with faecal material
- Treating with acid preservatives
- Mixing with high sugar materials (molasses)
- Heat treatment

15

Chemical Hazards

- Heavy Metals
- PCBs/Dioxin
- Copper in sheep feed
- Pesticide residues
- Mammalian Protein/fishmeal
- Anti Nutritional Factors
- Cleaning chemicals
- Medicinal residues and coccidiostats
- Salt in poultry feed 0.35% Limestone 10%
- Excess urea
- Excess selenium

16

Physical Hazards

- Glass
- Plastic
- Stone
- Metal
- Waste

17

Current Legislation (GB/Ireland)

Responsibility: FSA/FSS/DAFM
Enforcement : Trading Standards Officers/Animal health officers/DAERA

*Regulation
EC
183/2005
on feed
hygiene*

*Council
Directive
2002/32/EC
Undesirable
Substances*

*EC
Regulation
1831/2003
Feed
Additives*

*Regulation
767/2009
on the
placing on
the market
and use of
feed*

1

18

Legislation relating to HACCP

Regulation 183/2005

“Feed Business operators carrying out operations other than primary production shall put in place, implement and maintain a permanent written procedure based on HACCP principles”

“The implementation of the HACCP principles requires the full co-operation and commitment of feed business’ employees”

“HACCP principles should take into account the principles contained in the codex alimentarius but should allow sufficient flexibility”

19

Legislation relating to HACCP

Regulation 183/2005

“In certain feed businesses it is not possible to identify critical control points and in some cases good practice can replace the monitoring of critical control points”

20

Other Relevant Legislation

• *Animal Byproducts Regulations 2009* - DEFRA BSE Division

• *Veterinary Medicines Regulations 2013* - Veterinary Medicines Directorate

21

Hazards in Animal Feed

Hazards inherent or introduced into materials used to feed animals destined for the food chain.

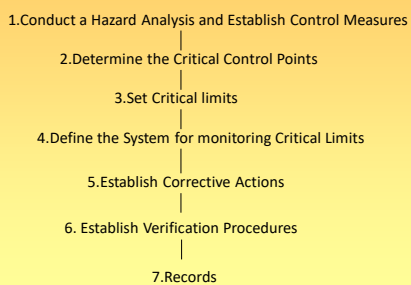
22

Sources of Animal Feed

- Primary products: wheat, barley, oats
- By-products of food industry: sugar beet pulp, rape meal, fats and oils, distillers grains, molasses
- By products of other industries: palm kernel
- Naturally occurring minerals: limestone, salt
- Additives: yeasts, trace elements
- Forages: Grass, silage, hay
- Compound feeds: mixtures of the above

23

The Seven Principles of HACCP



24

Principle 1 - Hazard Analysis

1. Assemble HACCP Team
2. Describe Product
3. Identify Intended use
4. Construct flow diagram
5. Confirm flow diagram
6. List potential hazards, conduct a hazard analysis and consider control measures

25

HACCP Team

- a. Production Operator
- b. Nutritionist
- c. Engineer
- d. Quality Manager/Lab Technician
- e. Transport operator
- f. HACCP Team Leader



26

The HACCP Team

- A multidisciplinary team:
 - Animal nutrition, microbiology, production, engineering, cleaning, transport, HACCP
- Specific expertise where necessary
 - vets, nutritionists, microbiologists, research

27

Product Description



And describe the
type of feed to be
produced



28

Product Description

- Characteristics
- Shelf life
- Raw Materials
- Overview of process
- Specific hazards
- Relevant legislation and guidance

29

Intended Use



List species of animal
who will eat feed

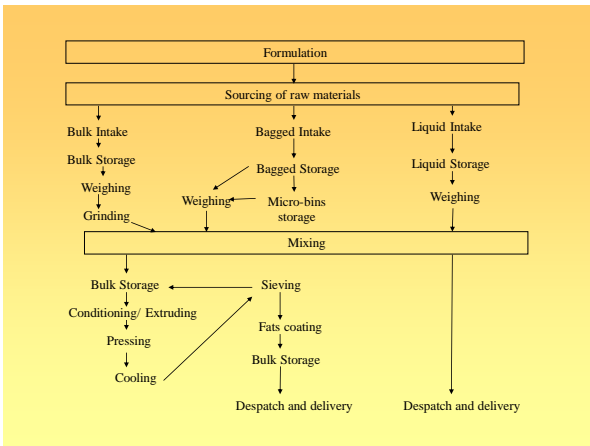


30

Flow Diagram

- Define each step in the process
- Include all steps
- Confirm the flow diagram is accurate (on site, walking of process, observation during production)

31



32

Identify Hazards

Microbiological	Chemical	Physical
<i>Salmonella</i>	Heavy Metals (Pb, Cd, As, Hg, Fl)	Glass
Mycotoxins (Mould)	Dioxins and PCBs	Wood
Zoonoses (eg Brucellosis, toxoplasmosis, TB)	Pesticide Residues (incl rodent bait)	Stones
Enterobacteriaceae	Copper in sheep feed	Packaging
(eg <i>E.Coli</i> , <i>Listeria</i> , <i>Clostridium botulinum</i>)	Mammalian Protein in Ruminant Feed	Metal
	Salt in Poultry Feed	Plastic
	Excess Urea	
	Excess selenium	
	Medicinal Residues	

33

Hazard Analysis

At every step in the flow diagram, identify every possible source of these hazards and where possible, eliminate or put controls in place to prevent the hazard from occurring.

34

Control Measures

“Any action and activity that can be used to prevent or eliminate a food/feed safety hazard or reduce it to an acceptable level”

- May include prerequisites

35

Step	Hazard	Control Measures	CCP	Critical Limits	Monitoring Procedure	Corrective Action
Formulation	Introduction of copper into sheep feed due to incorrect mineral premix used	Qualified, experienced nutritionist, Computer programme				
	Introduction of excess salt in poultry feed due to incorrect quantity of salt added	Qualified, experienced nutritionist, Computer programme				
Bulk Intake	Introduction of copper into sheep feed due to high copper distillers blown into wrong bin/bay	Operator Training Labelled bins/bays				
	Introduction of excess salt into poultry feed due to discharge of salt to incorrect bin	Operator training Locked mineral bins Labelled bins				

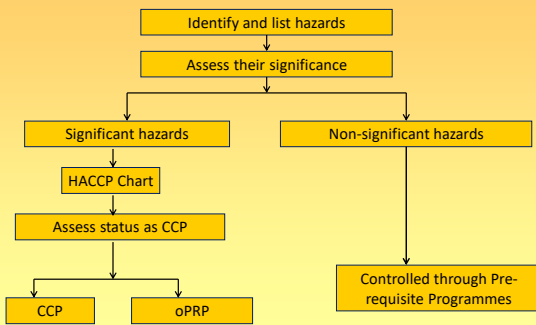
36

A Hazard must have...

- A source/cause.
- Manifestation: Presence, Introduction, Growth, Survival

37

The Hazard Analysis Process



38

High Likelihood Low Severity	High Likelihood Medium Severity	High Likelihood High Severity
Medium Likelihood Low Severity	Medium Likelihood Medium Severity	Medium Likelihood High Severity
Low Likelihood Low Severity	Low Likelihood Medium Severity	Low Likelihood High Severity

39

Prerequisites

- Procedures designed to control 'non-significant' hazards, or general site-wide hazards
- Enable the HACCP plan to focus on the most significant food hazards
- Prerequisites should be included in documentation, audits and review of the HACCP plan

40

Prerequisite Programmes



- Cleaning Procedure
- Pest Control Procedure
- Maintenance Procedure
- Personal Hygiene Procedure
- Glass Control Procedure
- Magnet Control Procedure
- Supplier Approval



41

Prerequisite Methodology

Metal	Salt in poultry feed	Salmonella in Broiler Breeder Feed Medicinal Residues /coccidiostats
Salmonella in Ruminant Feed	Mycotoxins	Excess Urea Copper in sheep feed
Wood Glass Stones	Heavy Metals Pesticide Residues	Dioxins and PCBs Mammalian protein Excess Selenium

42

Pre-requisites

Prerequisites should be included in documentation, audits and review of the HACCP plan

43

Step	Hazard	Control Measures	CCP	Critical Limits	Monitoring Procedure	Corrective Action
Formulation	Introduction of copper into sheep feed due to incorrect mineral premix used	Qualified, experienced nutritionist, Computer programme				
	Introduction of excess salt in poultry feed due to incorrect quantity of salt added	Qualified, experienced nutritionist, Computer programme				
Bulk Intake	Introduction of copper into sheep feed due to high copper distillers blown into wrong bin/bay	Operator Training Labelled bins/bays				
	Introduction of excess salt into poultry feed due to discharge of salt to incorrect bin	Operator training Locked mineral bins Labelled bins				

44

Step	Hazard	Control Measures	CCP	Critical Limits	Monitoring Procedure	Corrective Action
Bag Weighing	Introduction of copper into sheep feed due to incorrect mineral supplement added	Operator training Colour coded bags				
	Introduction of excess salt into poultry feed due to incorrect quantity weighed	Weigher calibration Operator training Computer screens				
	Introduction of urea due to incorrect quantity weighed	Weigher calibration Operator training Computer screens				
	Introduction of coccidiostat due to incorrect additive weighed	Operator training Segregated locked storage of medicines and coccidiostats				

45

Step	Hazard	Control Measures	CCP	Critical Limits	Monitoring Procedure	Corrective Action
Mixing	Introduction of copper into sheep feed due to contamination from previous product	Production scheduling and cross contamination matrix				
	Introduction of coccidiostats into a product for a species for which they are not licensed due to contamination from previous product	Production scheduling and cross contamination matrix				
	Introduction of coccidiostats into a product for a species for which they are not licensed due to contamination from subsequent product	Production scheduling and cross contamination matrix				

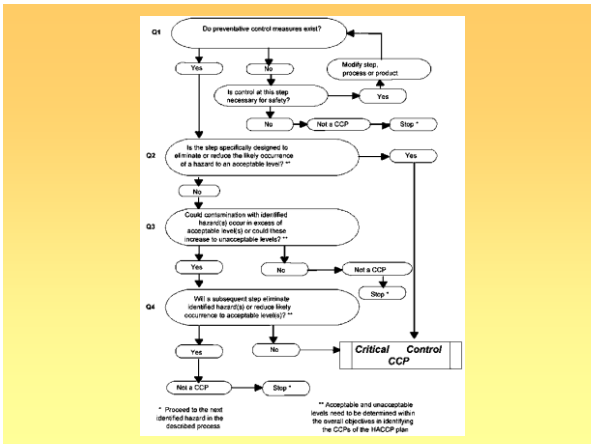
46

Determine the Critical Control Points

"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"

- Codex Decision Tree
- Simplified Decision Tree
- Judgement and Experience

47



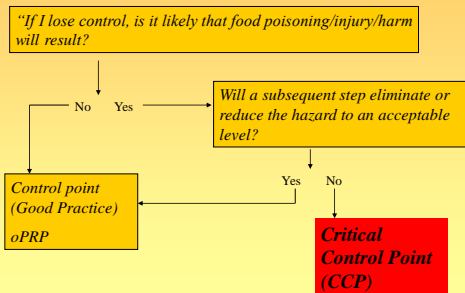
48

Use of the decision tree

- “Application of a decision tree should be flexible. It should be used for guidance when determining CCPs. This example of a decision tree may not be applicable to all situations. Other approaches may be used.”
- “Training in the application of the decision tree is recommended”

49

Simplified Decision Tree



50

Step	Hazard	Control Measures	CCP	Critical Limits	Monitoring Procedure	Corrective Action
Formulation	Introduction of copper into sheep feed due to incorrect mineral premix used	Qualified, experienced nutritionist, Computer programme	Y			
	Introduction of excess salt in poultry feed due to incorrect quantity of salt added	Qualified, experienced nutritionist, Computer programme	Y			
Bulk Intake	Introduction of copper into sheep feed due to high copper distillers blown into wrong bin/bay	Operator Training Labelled bins/bays	N			
	Introduction of excess salt into poultry feed due to discharge of salt to incorrect bin	Operator training Locked mineral bins Labelled bins	Y			

51

Step	Hazard	Control Measures	CCP	Critical Limits	Monitoring Procedure	Corrective Action
Bag Weighing	Introduction of copper into sheep feed due to incorrect mineral supplement added	Operator training Colour coded bags	Y			
	Introduction of excess salt into poultry feed due to incorrect quantity weighed	Weigher calibration Operator training Computer screens	N			
	Introduction of excess urea due to incorrect quantity weighed	Weigher calibration Operator training Computer screens	N			
	Introduction of coccidiostat due to incorrect additive weighed	Operator training Segregated locked storage of medicines and coccidiostats	Y			

52

Step	Hazard	Control Measures	CCP	Critical Limits	Monitoring Procedure	Corrective Action
Mixing	Introduction of copper into sheep feed due to contamination from previous product	Production scheduling and cross contamination matrix	Y			
	Introduction of coccidiostats into a product for a species for which they are not licensed due to contamination from previous product	Production scheduling and cross contamination matrix	Y			
	Introduction of coccidiostats into a product for a species for which they are not licensed due to contamination from subsequent product	Production scheduling and cross contamination matrix	Y			

53

At each CCP

.....there should be a system in place which will identify EVERY TIME a CCP has become unsafe

- Critical Limit – the criteria for which a CCP is considered unsafe
- Monitoring Procedure – The system which will identify every time the critical limit becomes unsafe
- Corrective Action – the agreed action to be taken in the event that the monitoring system finds the critical limit has been breached.

54

Step	Hazard	Control Measures	CCP	Critical Limits	Monitoring Procedure	Corrective Action
Formulation	Introduction of copper into sheep feed due to incorrect mineral premix used	Qualified, experienced nutritionist, Computer programme	Y	Sheep Minerals only in sheep feeds	Double check by another qualified person before activation	Reformulate
	Introduction of excess salt in poultry feed due to incorrect quantity of salt added	Qualified, experienced nutritionist, Computer programme	Y	<0.4% salt in poultry feeds	Double check by another qualified person before activation	Reformulate
Bulk Intake	Introduction of copper into sheep feed due to high copper distillers blown into wrong bin/bay	Operator Training Labelled bins/bays	N			
	Introduction of excess salt into poultry feed due to discharge of salt to incorrect bin	Operator training Locked mineral bins Labelled bins	Y	Salt blown into salt bin only	Physical check of stock following every intake	Quarantine material Use for ruminants only

55

Step	Hazard	Control Measures	CCP	Critical Limits	Monitoring Procedure	Corrective Action
Bag Weighing	Introduction of copper into sheep feed due to incorrect mineral supplement added	Operator training Colour coded bags	Y	No sheep minerals left at end of shift	Operator brings correct quantity of sheep mineral at beginning of shift and checks amount left at end	Quarantine all sheep feed made on shift Rework into beef feed
	Introduction of excess salt into poultry feed due to incorrect quantity weighed	Weigher calibration Operator training Computer screens	N			
	Introduction of excess urea due to incorrect quantity weighed	Weigher calibration Operator training Computer screens	N			
	Introduction of coccidiostat due to incorrect additive weighed	Operator training Segregated locked storage of medicines and coccidiostats	Y	Correct coccidiostat added to poultry non-breeder/layer products only	Stock count of coccidiostat products at beginning and end of every shift	Quarantine all products made since last check. Rework into suitable products or test before release

56

Step	Hazard	Control Measures	CCP	Critical Limits	Monitoring Procedure	Corrective Action
Mixing	Introduction of copper into sheep feed due to contamination from previous product	Production scheduling and cross contamination matrix	Y	100kg flush used where incompatible sequence occurs	Daily check of production schedule by mill manager	Quarantine affected product Rework into beef feed
	Introduction of coccidiostats into a product for a species for which they are not licensed due to contamination from previous product	Production scheduling and cross contamination matrix	Y	Must be 3 batches between coccidiostat and a breeder/layer feed	Daily check of production schedule by mill manager	Quarantine affected product Rework into suitable feed
	Introduction of coccidiostats into a product for a species for which they are not licensed due to contamination from subsequent product	Production scheduling and cross contamination matrix	Y	Must be 1 batch between coccidiostat and a breeder/layer feed	Daily check of production schedule by mill manager	Quarantine affected product Rework into suitable feed

57

Validation

Are your claims valid?

All decisions made by the team in the HACCP study should be supported by scientific evidence where possible.

1. Pre-requisite Methodology
2. How the Critical Limit has been defined

58

Verification

Does the HACCP study work?

1. Routine analysis
2. Internal and External Audits
3. Review of customer complaints

59

Review

Is the HACCP study up to date?

Have there been changes to..

1. Equipment
2. Legislation
3. Raw Materials or Products
4. New hazards

A Food/Feed Safety Failure

60

Documentation and Records

- Hazard Analysis and CCP determination
- CCP Monitoring Activities
- Corrective actions
- Modifications to the HACCP system

61

Training

“Training of personnel in HACCP principles and applications and increasing awareness of consumers are essential elements for the effective implementation of HACCP”

“As an aid in developing specific training to support a HACCP plan, working instructions and procedures should be developed which define the tasks of the operating personnel to be stationed at each CCP”

CAC/RCP 1-1969 Rev 4 2003

62