

## Proposed method for monitoring the cleanliness of an industrial animal feed site

This proposed method was developed in 1998, during meetings of a commission comprising industrial operators (Tecaliman, 1999).

On the request of members of this commission, it is worth remembering that this method only serves as an example and that everyone is free to apply it or modify it in line with the risks occurring on their site. Furthermore, it was developed within the context of a site using a heat treatment that has demonstrated its effectiveness against pathogenic bacterial flora, with the aim of limiting contamination upstream of this process and preventing recontamination downstream.

The method is based on two key focuses:

- A visual health inspection of the state of wear and cleanliness of equipment

- Samples for conducting a one-off assessment of the site's bacterial contamination before and/or after disinfection

### 1. Health inspection

#### 1.1. Visual inspection

This type of inspection can be carried out using an overall assessment sheet. The visual inspection method takes account of three risk levels:

- that associated with the plant area (Open area, Protected area).
- that associated with the condition of equipment.
- that associated with the deposits present and moisture.

#### Example of the units in question in the case of a pre-grinding type diagram:

<b>“Open” area:</b>	<b>“Protected” area:</b>
• The site's outdoor areas	• Mixer top and cover
• The plant's indoor areas	• Mixer spindle
• Reception pit cladding	• System for the incorporation of liquids in the mixer
• Pit floor and grating	• Inside of the hopper under the mixer
• Pit intake filters	• Molasser
• Transfer elevator for incoming raw materials	• Transfer elevator for mixes
• Transfer mechanisms for incoming raw materials	• Transfer mechanisms for moving mixes to the presses
• Distribution mechanisms for incoming raw materials	• Distribution mechanisms for moving mixes to the presses
• Cells or silo for incoming raw materials	• Press valves
• Cells or silos for external recycling	• Press valve extractor
• Grinding valves	• Conditioner
• Inside of the grinder	• Inside of the press door
• Grinder area	• Pipe from the press to the cooler
• Grinder intake filter	• Cooler walls
• Cyclone and transfer system for fine products	• Cooler top
• Siever	• Cooler grating
• Return system for coarse particles	• Intake system filter
• Transfer elevator for ground raw materials	• Cyclone
• Transfer mechanisms for ground raw materials	• Transfer system for returning fine products drawn towards the press
• Distribution mechanisms for ground raw materials	• Transfer elevator for crude pellets
• Cells or silo for ground raw materials	• Transfer mechanisms for crude pellets
• Inside of the weighing bin	• Crumbler
• Transfer elevator for measured raw materials	• Sifter / Screener
• Transfer mechanisms for measured raw materials	• System for returning fine sieved products to the press
• Inside of the hopper above the mixer	• System for returning large sieved particles to the crumbler
	• Coater
	• Transfer mechanisms for finished meals
	• Distribution mechanisms for finished meals
	• Pre-shipment storage silo for finished meals
	• Transfer elevator for other finished products
	• Transfer mechanisms for other finished products
	• Distribution mechanisms for other finished products
	• Cell or storage silos for other finished products
	• Mixer before loading
	• Loading system
	• Loading area ceiling and walls
	• Loading area floor

The visual inspection method includes an inspection of each unit and targeting of one or more levels corresponding to observations made. Two lists of units are drawn up based on the area in which they are located (See previous page).

The units can be inspected in whole or part based on the diagrams for the sites in question. This order can be modified depending on the diagram and the physical sequence of the inspection.

Some units can be added and some multiplied by their number on the site.

For each unit, the condition of equipment is recorded on the basis of four defined levels in ascending order of possible deterioration. The terms used have been chosen to suit all the equipment used:

- Ok
- Eroded or pitted
- Damaged, corroded or rusty
- Severely worn, distorted or holed

In the case of cleanliness, the inspector may indicate the extent of the corresponding deposit with one to three crosses. Cleanliness and types of possible deposits are classified in four levels:

- Clean
- Powdery deposits: powdered product or dry dust that can be easily removed with a finger.
- Dry crusts: dry deposits sticking to the wall originating from a build-up of product.
- Wet clumps: wet deposits or greasy musts sticking to the wall, originating from a build-up of product.

## 1.2. Preventive measures

The frequency of cleaning, the implementation of equipment repairs or the application of disinfection procedures takes account of inspection results. The principle consists of implementing measures at a greater frequency or at shorter intervals in the area considered "protected".

### In the open area:

- Condition of equipment:
  - OK: no action required
  - Eroded or pitted equipment: no action required.
  - Damaged, corroded or rusty equipment: renovation/repair scheduled.
  - Severely worn, distorted or holed equipment: replacement scheduled.
- Cleanliness:
  - Clean: no action required
  - Powdery deposits: no action required.
  - Dry crusts: cleaning planned.
  - Wet clumps: identify the cause of the moisture and implement corrective action in the near future.

### In the protected area:

- Condition of equipment:
  - Ok: no action required.
  - Eroded or pitted equipment: renovation/repair scheduled.
  - Damaged, corroded or rusty equipment: replacement or renovation/repair, depending on the damage.
  - Severely worn, distorted or holed equipment: A rapid response from the maintenance team for scheduled renovation/repair and/or replacement.
- Cleanliness:
  - Clean: no action required.
  - A few powdery deposits: no action required.
  - Widespread powdery deposits: Cleaning scheduled.
  - A few dry crusts: Cleaning scheduled.
  - Widespread dry crusts: More frequent cleaning, identify the cause of the moisture and implement corrective action in the near future.
  - Wet clumps: More frequent cleaning, disinfection, identify the cause of the moisture and implement corrective action in the near future.

## 2. One-off assessment of bacterial contamination before or after cleaning and disinfection

### 2.1. Health inspection of a plant before action

#### 2.1.1. Objective

This inspection involves monitoring the bacterial contamination status of an industrial site. This kind of assessment conducted regularly and on different sites also enables changes in the site's level of contamination in terms of time and space to be interpreted.

For a complete diagnosis of a site's level of contamination, a greater number of samples are taken.

#### 2.1.2. Principle

Assessment is based on sampling of 9 deposits: 4 in the open area and 5 in the protected area. Testing for Salmonella and counting of Enterobacteria is carried out for each of these 9 deposits.

#### 2.1.3. Apparatus

- Sterile gloves.
- Sterile pots or bags.
- Personnel authorised to take samples in sterile conditions.

## 2.1.5. Method

### 2.1.5.1 Sampling plan

Samples are taken when seeking to assess the presence of Salmonella or a system's potential to harbour it. Samples are taken just before relaunching production at the start of the week.

The recommended sampling locations are, for example:

Open area:

- A filter or cladding in the receiving area.
- The top of the cell or silo receiving external recycling.
- A grinder's filters or intake unit.
- The top of a weighing bin.

Protected area:

- The top of the mixer.
- A pipe between a feed screw and a conditioner.
- A pipe between a press and a cooler.
- The top of a cooler.
- A cooler filter or cyclone.

In the event that there are several existing production lines on a site, samples can be taken from a different line for each measurement campaign or from several lines at the same time.

If medicated feeds containing antibiotics have been produced on a line, on the day prior to testing, it is not advisable to take samples from this line, as analyses could potentially be distorted. The sampling method takes account of the following:

- A deposit present at each sampling location is collected using sterile sampling apparatus. Sterile bags or gloves enable removable deposits to be easily collected by hand. Naturally, sterile bags or gloves must be changed between two sampling locations.
- The deposits may have a variable appearance and wet deposits should not be favoured.
- For hard deposits that are difficult to remove by hand, it is possible to use a tablespoon or a spatula that has been sterilised in alcohol. Samples are then placed in a sterile bag or pot. A new spoon is used or the spoon is sterilised for each sampling location.
- The quantity of deposits collected is the maximum possible, up to a limit of 1 kg.

### 2.1.5.2 Microbiological analyses

The microbial analyses to be carried out are:

- Counting of Enterobacteria (AFNOR standard V08-054 and V08-100)
- Testing for Salmonella (AFNOR standard V08-052)

It is possible to assess the counting of Enterobacteria by categorising them in classes:

Classes	Assessment	CFU / g	Log (CFU / g)
1	Good	< or = $10^3$	< or = to 3
2	Average	Between $10^3$ and $5 \cdot 10^5$	between 3.01 and 5.68
3	Poor	> or = to $5 \cdot 10^5$	> or = to 5.69

It is up to each industrial operator to set its own tolerance thresholds for the levels of bacterial contamination it permits. The recommendation, for comparisons over time of several series of samples, is to always have the analyses assessed by the same laboratory.

The results can be interpreted:

- on the basis of a historic principle of changes in levels of contamination over time.
- on the basis of serotypes and their frequency of occurrence.
- on the basis of an assessment of the quantity and quality of deposits present at the sampling location. This information is already used to assess the health condition of a plant. However, these observations do not provide a definite conclusion regarding the Salmonella contamination status of a site. They only provide grounds, in the case of mediocre cleanliness, for assuming that there is a possibility of contamination persisting if it occurs.

## 2.2. Health inspection of a plant after action

### 2.2.1. Objective

Conducted immediately after a cleaning and/or disinfection procedure, this inspection enables the effectiveness of this procedure to be assessed. If testing is carried out following a period of production and deposits have been able to reform, you must comply with the previous testing plan. If deposits have not been able to form, this plan will apply.

### 2.2.2. Principle

This is a question of detecting the possible presence of Salmonella and counting of Enterobacteria (on the surface) at locations that have been cleaned or disinfected. Swabs or contact plates will be used to do this.

### 2.2.3. Apparatus

- Sterile gloves
- Pre-soaked + neutralising swabs (2)
- VRBG + cycloheximide (1) + neutralising contact plates (2)

(1) Commercial name = actidione; used at a level of 50 mg / l to prevent the growth of mould, which would interfere with reading the results.

(2) Used to inhibit the action of disinfectants in the event that disinfection has taken place. Used at a level of 10 %.

### 2.2.4. Method

#### 2.2.4.1 Sampling plan

Samples are taken when seeking to assess the presence of Salmonella or Enterobacteria after cleaning and/or disinfection. Samples are taken at locations that have been cleaned and/or disinfected. The sampling plan comprises:

- 3 VRBG contact plates, applied to each location that has been subjected to cleaning operations. They must be applied to flat surfaces by pressing in the centre of the plate. Contact of 3 to 5 seconds seems appropriate. It is necessary to adhere to the same contact time for all the plates.
- a swab that can be passed over each location, after the application of contact plates. The sterile swab is held by hand using a sterile glove. It is used to wipe the surface covered by the inspection. After wiping, the swab is placed back in its original sterile bag.

After sampling, it is advisable to transfer the media and swabs to a refrigerated icebox.

#### 2.2.4.2 Microbiological analyses

The microbial analyses to be carried out are:

- Counting of Enterobacteria on contact plates
- Testing for Salmonella

It is up to each industrial operator to set its own tolerance thresholds for the levels of contamination it permits. The thresholds or classifications suggested in this document are only proposals for interpreting microbiological analyses. A visual inspection of the cleanliness of locations cleaned is already a good way of judging its effectiveness.

For swabs (Salmonella), interpretation can also be undertaken fairly simply:

Result	Presence of Salmonella	Absence of Salmonella
Assessment	Unsatisfactory	Satisfactory

For contact plates (Enterobacteria), a score of 1 to 4 can be given (Table below).

Score	Assessment	Number of Enterobacteria / plate
1	Very good	< 10
2	Good	10 to 50
3	Average	51 to 150
4	Poor	> 150

## 2.3. Corrective measures

In the event of poor results or unsatisfactory results, possible corrective actions will be to:

- Increase the frequency of cleaning and disinfection,
- Carry out remedial cleaning/disinfection.
- Repeat a more focussed sampling campaign for the problem locations.
- Revise the cleaning and disinfection procedure:
  - Is the concentration of active ingredient stipulated by the supplier being adhered to?
  - Is the active ingredient effective?
  - Is the action time for the disinfectant adhered to?
- Re-examine a system or its operation.

## 3. Conclusion

Let us reiterate that the methodology proposed as part of this sheet is provided solely as an example. It is up to everyone to make use of it for their own purposes and in their own environment. Its intention is to provide an element of choice as part of the preparation of a HACCP and a monitoring mechanism as part of the management of critical control points or as part of an audit enabling an updated review to be conducted of an established system. The points of comparison for this may be:

- previous assessments conducted on the same site
- previous assessments conducted on other sites operated by the same company or on a significant group of plants within the sector of the same type as those conducted within the framework of the SYPRAM 47 b agreement (Tecaliman, 2002).

## 4. Bibliographic references

### Tecaliman 1999.

Control elements of Salmonella recontamination in animal feed. i'Doc\_S11

### Tecaliman, 2002.

Summary of the salmonella recontamination source identification program for heat treated feed and preventive measures. i'Doc\_S13.