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Identification of high risk points associated with the use of additives in plants

The aims of this sheet are to encourage plant managers to be more vigilant, to lead them to question themselves regarding their practices and to make them aware of the HACCP method (Tecaliman 1996 : **i'Tec_S2**).
This sheet has been drafted using the results of the program implemented by TECALIMAN, with the assistance of the SYPRAM fund, relating to the risks associated with the use of additives.
Within this framework, HACCP studies were carried out in four feed production plants (Tecaliman 1995).

The results of these studies have enabled the high risk points for each of the sites to be identified.
These results are not exhaustive and for a given company, only the internal risk assessment for each hazard source can enable solutions for managing these risks to be proposed. In doing so, it is vital to remember that a rare event can also be extremely expensive.

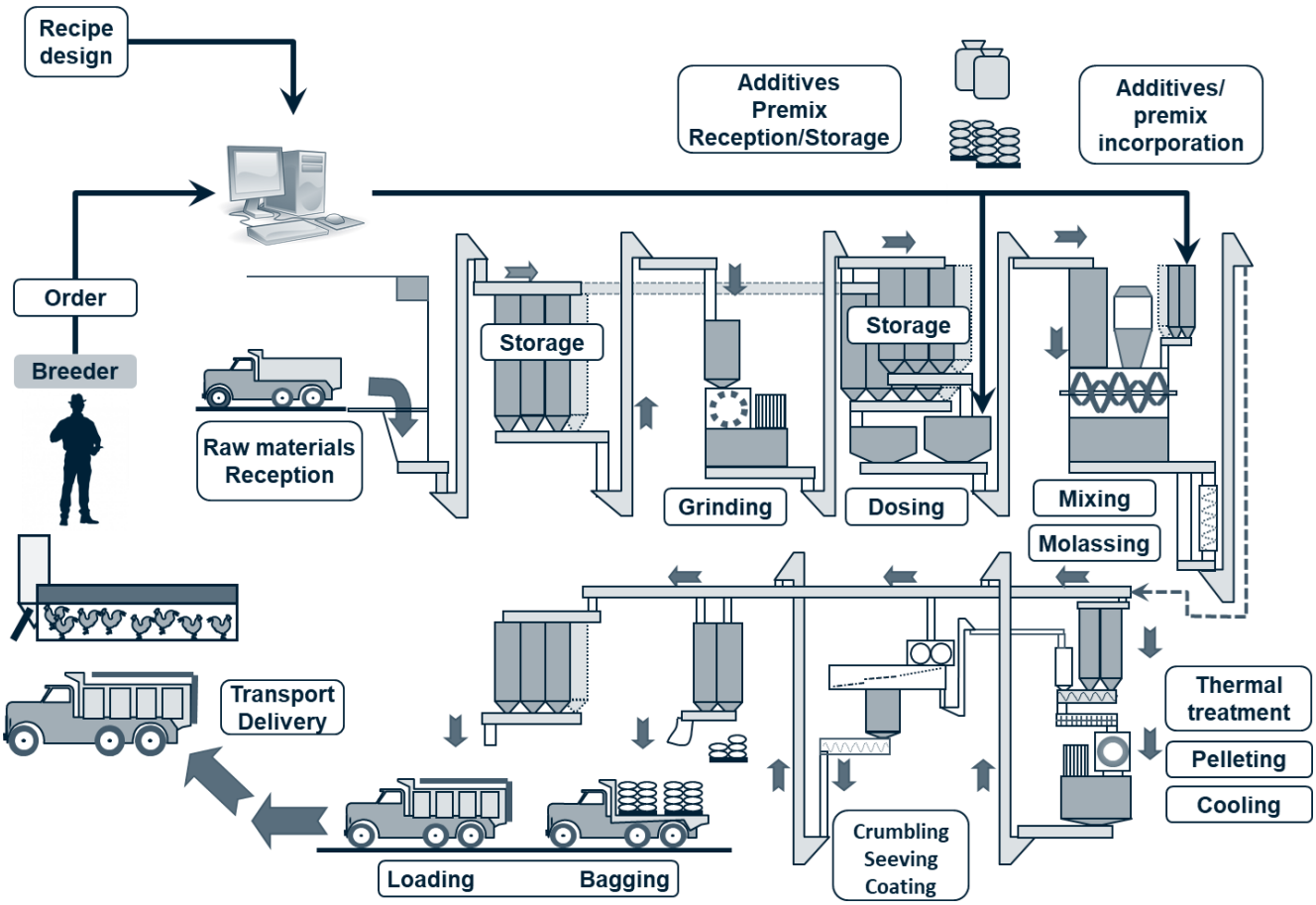

Figure 1

1. Definitions

1.1. Hazards

Two types of hazards have been studied:

- carry-over, in the broadest possible sense, from back-end contamination (e.g. deposits in circuits) or front-end contamination (e.g. a leak from a hatch) to the reversal of two batches (e.g. orientation error for a batch).
- heterogeneity in accordance with the definition in **i'Tec_H9**.

1.2. Additives

This study covers pure products or premixtures of pure products incorporated at low doses, except for medicinal products.

2. The hazards at each step

The process flow diagrams were divided into different steps (Figure 1).
For each of them, the operations likely to be potential sources of the hazards assessed are listed. In order to identify them, these sources are annotated in the text with the letter C for carry-over and H for heterogeneity.

2.1. Formula conception

C➢A code error when recodifying a formula, resulting from reading errors or originating from the incorrect design of operations (unnecessary recoding, similar codes, etc.)
C➢Incorrect authorisation for the incorporation of recycled items into a formula intended for the plant.
C➢An error in attributing incompatibilities.
C➢A lack of verification of the recorded data following the entry of formulae.

2.2. Taking orders

C➢An error when taking an order: poor communication, input error, poor handwriting when drawing up an order form, etc.

2.3. Receipt of raw materials

C➢Recycled feed allocated to a cell occupied by a raw material or vice versa.
C➢Feed for recycling poured into the wrong pit containing another product or not.
C➢A lack of or incorrect identification of feed for recycling on the plant site.

2.4. Storage of raw materials

C➢A full recycled feed cell declared as empty as the result of a low level sensor malfunction, for example.
C➢An overfilled recycled feed cell resulting from a high level sensor malfunction. A blockage in the feed transfer may result in recycled feed being distributed into other cells.

2.5. Transferring raw materials

C➢A complete direction error for recycled feed (e.g. inattention) or partial direction error (e.g. leak from a hatch).
C➢A recycled feed transfer being stopped without emptying, as the result of a technical issue or a lack of sensors or a malfunction of the sensors detecting the presence of product (e.g. on the elevators).
C➢Product being deposited in the transfer system.

2.6. Grinding

C➢The incorporation of additives before grinding, which results in the presence of additives in the ventilation system.
C➢A blockage of the return line for fine ground recycled feeds and their release into the following batch.

2.7. Dosing

C➢The opening of a dosing cell containing recycled feed instead of another containing a raw material.
C➢No account being taken of incompatibilities between successive batches.
C➢The presence of a leak from the weighing bin in the event that there is recycled feed in the bottom of the bin.
C➢The incorrect incorporation of recycled products into a formula not using them in manual dosing mode (machine breakdown)

2.8. Receipt and storage of additives

C➢The big-bag whose loading will be transferred to titration cells does not contain the required additives.
C➢An error in connecting the link between the pneumatic conveyor and the additive storage cell.
C➢A destination error for additives.
C➢Additives being deposited in the transfer system.
C➢A misidentification or loss of identification for bags/sacks or big-bags of additives.
C➢Repackaging of additives should a bag/sack be holed with an incorrect transfer of the product identification.

2.9. Incorporation of additives

C➢A bag error resulting from mistakes in the warehouse or at the weighing location. Following an error during weighing, it is often impossible to detect it after the event with any certainty.
C➢Additives being deposited in the circuit and the "bag dump station" hopper.
C➢Recovery of an excess pouring likely to be contaminated during the successive weighing of several additives in the same container.
C➢A leak from the hatch of the "bag dump station" hopper containing additives intended for the next load.

C➢Poor cleaning of the container and shovel used for weighing additives, likely to contaminate other loads or bags.
C➢Contamination between open bags of additives at the weigh station.
C➢Unclogging of previous deposits from the "bag dump station" hopper intake towards the circuit.
C➢Late pouring into the "bag dump station" hopper, in the event that they are incorporated into the flow of macro-ingredients, may result in larger deposits in the circuits.
C➢Dosing in manual mode, which causes difficult calculations or choices to be made in an emergency if the plant usually operates automatically.
H➢Premature or late opening of the hatch of the "bag dump station" hopper may result in the product arriving in the bottom or above the mixer's load. These two locations are often poorly mixed.
H➢The use of a clumped additive will not ensure that it is homogeneously distributed.

2.10. Mixing

C➢A leak from the hatch of the hopper on the mixer, or from the mixer, results in contamination of the previous batch.
C➢The unintended/accidental or premature opening of hatches causes a mixture of two loads.
C➢Incorrect emptying of the mixer or the hoppers.
H➢Incorrect incorporation of liquids following the clogging of nozzles may result in mixing time that is too long or the presence of lumps.
H➢The use of incorrect filling levels above or below the mixer manufacturer's recommendations.
H➢Incorrect mixing time, which is often too long when the circuit is stopped downstream.
H➢Deposits on coils, which is often associated with the incorrect incorporation of liquids in the mixer
H➢The mixer shaft not rotating after it, the motor or the transmission circuit has broken.

2.11. Incorporation of liquids.

C➢A leak from the feed hatch for the molasser, as it is frequently positioned upstream of the outlet directly feeding the elevator for recovering the mixture. Non-molassed mixes pass through this hatch and consequently fill the molasser.

2.12. Transfer of ground mixes

C➢A direction error for the entire or partial load, which may have numerous causes.
C➢A transfer being stopped without emptying or with it being impossible to detect the presence of product, resulting from a mechanical problem, for example.
C➢Deposits of product in the transfer mechanisms.
H➢Transfers and spillages of meal are known to be conducive to segregating.

2.13. Storage of ground mixes

C➢Deposits of product in cells that may, in this case, be press valves.
C➢A cell that is still full and declared empty. A malfunction of the level sensor may cause this kind of incident.

2.14. Pelleting and cooling

C➢The die not being emptied means that a proportion of the previous batch will contaminate the following batch.
C➢Deposits of product in the soakers, the press and the cooler.
C➢A malfunction of the hatches on vertical coolers in the case of two-stage coolers, which contain different products at each stage.
C➢Changing the batch before complete emptying of the circuits, when the emptying times are disregarded, for example.
C➢The recycling circuits for fine products originating from the cooler can possibly be blocked. These fine products can be inadvertently carried into the following batches. With no blockage, the same problem arises at the end of each batch.
C➢A malfunction of filter unclogging with the possibility of the unintentional unclogging of a significant deposit.

2.15. Crumbling and sieving

C➢A premature stoppage of the circuit without emptying, particularly in sieves where the presence of product is hard to detect.
C➢No emptying of the return circuit for fine sieved products caused by a blockage, or at the end of a batch.
C➢A malfunction of junction boxes where these mechanisms are included to divert fine products at the end of a batch.

2.16. Transfers of pellets

C➢A destination error.
C➢Leaks from a hatch.
C➢A premature stoppage and a restart with a new batch, without previously emptying the circuit.
C➢A simultaneous feed at the same destination (a cell for example) via two channels.
C➢A deposit of product in the transfer mechanism.

2.17. Storage of finished products

C➢An error assessing the quantity stored, in terms of quantity or quality, caused by a low level sensor malfunction or a lack of "manual" stock management, for example
C➢Bridging/arching or a significant deposit in a cell and a change of product with no visual verification of actual emptying.
C➢A leak from an emptying hatch for storage cells above a shared transfer mechanism.

2.18. Bagging

C➢An emptying hatch or cell mistake by the bagging manager.

C➢A leak from an emptying hatch when several cells are feeding the same bagging line.
C➢A misidentification of the bags produced.
C➢A misidentification of bags at other stations (fine products for recycling, unblocking, cleaning residues, etc.).

2.19. Loading

C➢Incorrect location of the mobile chute or truck creates the opportunity for partial unloading into another compartment.
C➢An incorrect compartment or loading chute resulting in a reversal of two batches.
C➢A premature stoppage of the loading conveyor leaving a significant deposit when the loaded compartment overflows, for example.
C➢Forgetting to close the truck compartment hatch before loading.
C➢No verification that the loaded compartment has been emptied.
C➢The compartment overflowing, in particular when the product's density has been incorrectly assessed.
C➢A lack of traceability for inter-truck transfers outside the plant's boundaries.
C➢No account being taken of truck incompatibilities.

2.20. Transport and delivery

C➢**A bag error when the products are delivered in this kind of packaging.**
C➢A hatch error by the driver results in two deliveries being reversed.
C➢A leak from a compartment hatch.
C➢An incorrect delivery address.
C➢No emptying of the screw system.
C➢A failure to close hatches after delivery may result in a deposit present in the compartment moving towards the screw system.

3. Conclusions

In plants, there are more sources of cross-contamination than of heterogeneity. This results from the existence of individual operations, the implementation of which reduces the risks of heterogeneity: mixing, pelleting.
In practice, the hazards of **heterogeneity** relate above all to: controlling segregating phenomena during the production of feed meals and controlling the "mixing" operation for all production. This finding makes the "mixing" operation a critical control point for this hazard in accordance with HACCP.
By contrast, controlling **carry-over** appears far more complex. There are a number of options available to production managers for improved control of this hazard: These are, for example:

- Managing deposits in the transfer mechanisms.
- Increasing the reliability of the incorporation of micro-ingredients.
- Improving the traceability of the product, from loading onwards.
- Checking the operation of automatic systems and sensors.
- Improving the management of recycled products.
- Fine-tuning the traceability of batches within the plant.
- Enhancing the management of stocks of finished products.
- Being better acquainted with the emptying times for equipment.
- Formalising the procedures for the operations carried out by operators.

The implementation of any such actions certainly requires personnel to be well informed of the fundamental issues of heterogeneity and cross-contamination in advance.

4. Bibliography

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