HACCP in the Meat Industries : A Practical, Implementable Interpretation.

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INTRODUCTION

Changes in eating habits, more incidents of food born infections and intoxications as well as an older population in the developed countries emphasize the need to introduce preventive systems like HACCP. Nevertheless, the main reason for the introduction of HACCP in the Meat Processing Industry are the legal requirements (Common Market Directive 77/99 ; 92/005 and 94/43).
Big companies usually don't have difficulties in making their interpretation of the HACCP principles. Smaller companies on the other hand, due to lack of knowledge, will hesitate to introduce HACCP systems. This may result in unfair competition and higher risks for the whole meat business. The presented interpretation is the result of a coordinated action between the "Belgian Federation of Meat Processors" (Fenavian), the official controlling authorities (IVK - IEV) and the Universities of Ghent and Liège. Emphasis was put on the applicability for big as well as small companies. The presented interpretation is currently accepted as a reference for the Belgian Meat Processing Industry. HACCP is known to consist of 7 basic principles.

INTERPRETATION OF THE 7 PRINCIPLES

1. Hazard analysis

- Make a list of all products sold by the company
- Reduce this list to product groups with the same basic hazards
- Make a flow chart of the process for each product group
- Make a table for each product group indicating the following items :
  * the process steps involved
  * the potential hazards (3 different types are dealt with : M = microbiological / C = chemical, e.g. residues of cleansers / Ph = physico-chemical, e.g. foreign objects, metals, glass)
  * the precautions normally taken for the considered hazard

2. Identification of the critical control points (CCP's)

For each potential hazard involved in the table mentioned above four questions are to be answered :
Q1 : Do there exist precautions for the considered hazard ?
Q2 : Is this process step designed in order to reduce or eliminate the considered hazard ?
Q3 : Can additional contamination in this process step increase the hazard to an unacceptable level ?
Q4 : Does there exist a process step further in the flow that reduces or eliminates the considered hazard ?
Indicate this process step as a CCP when arriving at one of the following sequences of answer combinations :
Q1 : Y ; Q2 : N ; Q3 : Y ; Q4 : N or : Q1 : Y and Q2 : Y

3. Defining the limits for the CCP's

The limits for the CCP's are to be fixed with sufficient common sense. A less severe limit in combination with consistent reactions in case of an "out of limit" result is highly preferable to a more severe limit in combination with a very tolerant reaction. In the former combination a company may start up a never ending improving process while in the latter combination the company risks to introduce an expensive theoretical system without any guarantee of improvement.

4. Controls

4.1 ***Microbiological controls :*** This type of controls being expensive and time-consuming, it is advisable to replace the microbiological controls by others such as physico-chemical controls. With a well-known contamination before heat treatment, for example, the follow-up of the temperature - time evolution during cooking has to suffice to monitor some microbiological hazards. This presupposes the "cooking specifications" to be justified by previous microbiological data. As detection of different pathogens (Salmonella, E coli 0157, Listeria, S. aureus, etc.) is difficult to realize as a routine practice, preference is given to the follow-up of "indicator-organisms" such as Total Aerobic Count, Enterobacteriaceae, etc.

4.2 ***Physico-chemical controls :*** The involved controls are pH, temperature - time (F-value), weight, relative humidity, etc. This type of controls is mostly easy to be carried out and afterwards, in line measurements can be taken.

4.3 ***Visual checks :*** Visual checks, carried out on a regular basis, often result in preventive corrective actions, guaranteeing a continuous improvement. In order to do this, divide the company in process areas such as "reception hall", "deboning hall", "stuffing area" etc. In order to monitor possible hazards in each area, use checklists for the following 5 items : material, method, machine, men, building environment.

4.4 ***Control of cleaning and disinfection :*** In a similar way as for visual checks, divide the company in process areas and establish a sampling plan for each area (e.g. 3 times 5 samples a week). Although new techniques such as ATP bioluminescence based are available, preference is given to simple methods such as swabbing and Agar contact (Rodac, Petrifilm). During visual checks the result of cleaning will be evaluated ; here the result of the subsequent disinfection is evaluated.

5. Data gathering and data processing

5.1 ***Microbiological and physico-chemical data :*** Condensation of the data and visual presentation including a clear indication of the levels of acceptance are considered extremely important for the system being used in practice as a management tool. Figure 1 shows how the control results, as attributive data, are processed. The use of the chart is as follows :

Box 1 Indicate the process involved, e.g. cooking and cooling of ham
Box 2 Indicate the product involved, e.g. cooked ham type "A"
Box 3 Indicate the type of control, e.g. microbiological control, core temperature and cooling rate
Box 4 Indicate the person or department responsible for the control / inspection
Box 5 Indicate the items checked, e.g. Total Aerobic Count, Enterobacteriaceae, core temperature, cooling rate
Box 6 Mark the boxes if the result is "out of limit"
Box 7 Once the chart is full, indicate the frequency of "out of limit" results for each item

Box 8 Cf. box 7, but now in percentage of the total
Box 9 Number of samples taken for each control (here "1")
Box 10 Total number of samples taken for this chart
Box 11 Indicate the total "out of limits" for each sample
Box 12 Sum of the data of box 11
Box 13 Sample identification such as batch number, supplier, etc.
Box 14 Average "out of limits" detected per sample. This is "data of box 12" devided by "data of box 10".
Box 15 Date of sampling
Box 16 Standards (limits of the CCP's), e.g. Total Aerobic Count < 10^3/g ; core temperature > 67°C
Box 17 Objective ; this target being an improvement in comparison with the data of former charts, e.g. this chart indicates an objective of 3 or less "out of limits" per sample, based on the former chart with an average "out of limit" of 3,5
Box 18 Visualization of the results by means of a graph. The target line is indicated as a dotted line.

5.2 Visual checks : The same type of chart as described under 5.1 can be used. The following differences have to be mentioned :
Box 1;2;3 Indicates the inspected area, the type of visual inspection and of the control, e.g. deboning area ; machine ; visual check
Box 5 Indicates what is inspected for the involved type of inspection, e.g. knives, conveyors, tables, disinfection equipment, etc.
Box 16 No objective standards are to be mentioned. 'OK' or 'NOK' depends on the inspector's common sense.

5.3 Cleaning and disinfection checks : After incubation, a classification number is given for each area (see 4.3) . See table 1 (example only for a 16 cm^2 contact sample).
An evaluation is given weekly, depending on the average classification number, as shown in table 2.
These results are visualized weekly in a graph indicating the "limit of acceptance" as a dotted line (see figure 2 : hygienogram).

6. Corrective measures

For each "out of limit" result on the graph a corrective action is required. This is to be mentioned in a table indicating WHO is to do WHAT in what TIME SPAN. During the scheduled HACCP follow-up meetings the realization of these corrective actions is evaluated.

7. Verification

7.1 Interval verification

7.1.1 On product level : A sampling scheme of end products to be evaluated according to previously fixed microbiological standards is worked out.

7.1.2 Verification of the "system" : Regularly scheduled interval HACCP audits are carried out. Two basic questions are considered :
1. Are people working according to the agreed system and are the required controls carried out as scheduled ?
2. Are the established system and the required controls applicable in practice ?

7.2 External audit

This is the verification done by the official authorities. Nonconformities detected during the verification indicate that the system doesn't function as required. This will result in system corrective actions such as introduction of an additional CCP, changing control frequencies, changing limits for a CCP, etc.

Figure 1 : Control chart HACCP

CONTROL CHART HACCP

1. Process :	2. Product :								3. Type of control :				4. Inspector :	
5. Items checked	6. Detected "out of limits"												7. Freq.	8. %
a.	x	x	x				x		x	x		x	x	8	20
b.				x			x				x	x		4	10
c.	x	x	x		x	x		x	x	x	x		x	10	24
d.			x								x	x		3	7
e.	x	x	x			x	x							5	12
f.		x	x			x	x			x	x			6	15
g.			x		x	x	x				x			5	12
h.															
9. N° of samples	1	1	1	1	1	1	1	1	1	1	1	1	1		10. Σ 13
11. N° "out of limit"	3	4	6	1	2	4	5	1	2	3	5	3	2		12. Σ 41
13. Identification															14. Average 3,15
15. Date of sampling															

18. Graph

16. Standards

17. Objectives ≤ 3

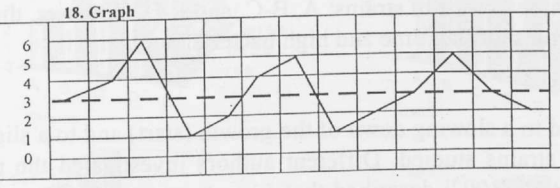

Table 1 : Classification in function of the CFU's counted on a 16 cm^2 area

N° of CFU's	Class. N°
< 3	0
3 - 9	1
10 - 19	2
20 - 90	3
> 90	4

Table 2 : Evaluation of the cleaning and disinfection checks

Average class. N° (weekly based)	Evaluation	
< 0,5	very good	OK
0,5 - 1	good	OK
1,1 - 1,5	acceptable	OK
1,6 - 2,0	unacceptable	NOK
2,1 - 2,5	bad	NOK
> 2,5	very bad	NOK

Figure 2 : Hygienogram