IMPLEMENTATION OF FOOD SAFETY MANAGEMENT SYSTEM IN A PRODUCTION UNIT OF FEED AND POULTRY

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Abstract

In accordance with the legal requirements, all organizations involved in producing, packaging, distribution and sale of food must ensure that the safety of these products was not compromised throughout the food chain. The concept of food security involves ensuring all food's quality parameters (chemical, physical, microbiological) are met from the stage of raw material to the stage of food reached to consumer.

A guarantee to ensure the food safety of products during the production flow of an organization is the implementation and certification of the food safety management system. Food safety management system is actually a quality management system, whose goal is the production of safe products for consumption and is based on hazards analysis of critical control points - HACCP.

One of AVIECO PN II project objectives, led by INCD BNA Balotesti, where INCD ECOIND is partner is to design, develop and implement a food safety management system to another partner, SC AUGER PETRUS SRL.

For this purpose, in accordance with the requirements of SR EN ISO 22000:2005, in INCD ECOIND was developed a methodology for designing and implementing the food safety management system.

The paper describes the methodology for the design and implementation of the system and presents the results:

- the technological flow charts for each product
- the hazards analysis
- the critical and the critical control points
- the preliminary Programs (PRP)
- the HACCP plan

- the documentation of food safety management system: the food safety management manual, the system procedures and the operational procedures.

Keywords: management, hazards analysis, flow chart, critical points, control, plan, manual, procedures

INTRODUCTION

All organizations involved in producing, packaging, distribution and sale of food products must ensure that the safety of these products has not been compromised in the food chain. This can be achieved through the implementation and certification of food safety management system, because each organization:

• must demonstrate the ability to control food safety hazards in order to provide safe products that meet food safety requirements approved by the customers / consumers and the regulator

• has major interests to proposes to improve customer satisfaction through the effective control of food safety hazards,

• It is much cheaper to prevent than to correct

In 2005, was released ISO 22000:2005 - *Food safety management systems. Requirements for any organization in the food chain*, which establishes requirements for a food safety management system where an organization in the food chain needs to demonstrate its ability to control food safety hazards in order to ensure that food is safe for human consumption.
The food chain means all the processes of transporting and processing of raw materials and ingredients to finished product stage, and their entire route to sales and consumption.
This standard, taken in Romania - SR EN ISO 22000:2005 provides general framework for the implementation of HACCP, which do not vary from one country to another, from one product to another. In addition, it successfully expands the best practices of ISO 9001:2000 quality management system in food.

THE METHOD APPLIED

Methodology for designing and implementing of a food safety management system (FSMS) developed by the Environmental Quality Management department of INCD ECOIND includes the steps corresponding to these stages and activities which meet the requirements of the standard:

• Planning FSMS;

• Designing and implementing FSMS;

• Checking the status of implementation of the FSMS.

I. Planning FSMS includes the following activities:

1. HACP team building, team leader designation;
2. Training team in HACCP principles and HACCP food safety management;
3. Check of the organization hygiene system
4. Identification of products, raw materials and ingredients
5. Identification the processes and activities within the organization
6. Drawing the flow diagram
7. Identification of potential hazard, risk assessment and establish hazard control measures
8. Determination of critical control points (CCP) using decision tree
9. Establish critical limits for processes and products
10. Establish CCP monitoring system

Check of the organization hygiene system

According to Codex Alimentarius recommendations before applying HACCP to any sector of the food chain, they must operate in accordance with:

• Code of Good Food Hygiene Practice (GHP);

• Code of Good Manufacturing Practices (GMP), and

• Appropriate legislation for "food safety".

HACCP team, before moving on to document the HACCP system, should consider if these preliminary requirements have been achieved by the company, concerned to check the hygiene system of organization: location, rooms and equipment, infrastructure, maintenance and sanitation, hygiene of personnel and transport.

Drawing of flow chart

HACCP team, on product specifications or other documents contained in the FSMS, identify products, raw materials and ingredients and processes used in the organization and activities which contribute to manufacture the products. Based on this information the team draws the production process flow diagram and checks it on the field.
In addition to technological block diagram and flow diagram will be outlined and location plan of the manufacturing department, all serving to facilitate tracking and notification technology deployment process and return any stream crossings.

Identifying hazards, assessing risks and establishing hazard control measures

HACCP team identifies potential hazards of contamination of the product, evaluate the risks associated with identified hazards and establish control measures to prevent, eliminate or reduce risk to an acceptable level.

The potential hazard is any biological agent possessing the ability to compromise the safety of food.
Risk assessment is to analyze the probability (frequency) for expression of each identified hazard and the severity (seriousness), on food consumption.

Determination of critical control points (CCP)

Based on risk assessment, HACCP team determines the critical control points.
Critical control point (CCP) is the stage where control can be applied and is essential to prevent or eliminate a hazard or to reduce a potentially significant risk to food safety to an acceptable level.
The critical control points are determined during the process, where process parameters or product parameters are controlled. Once identified CCP will be marked in the flow diagram to highlight very quickly the phases requiring more attention (adequate control) for the manufacture of safe food.
CCP identification is made by the "decision tree" method designed in 1991 by the Working Group of Codex HACCP and presented in SR 13462-2:2002 [8].

Establish critical limits for processes, and manufactured

Further the team defines the standard values and establishes critical limits (tolerances) for each parameters of CCP to be met or satisfied by relying on a good documentation and knowledge of product and process being studied. Sources of information for determining these values are: literature, standards, technical rules, records and data from suppliers, experts in food technology, hygiene, specific legislation, Codex Alimentarius etc.
Note that a CCP can be characterized by one or more parameters, so that will be set critical limits for each parameter.
Standard values and critical limits must be validated.
The values of critical limits have not the technological considerations, but have considerations to ensure the safety of food.

Establish CCP monitoring system

Monitoring is planned sequence of measurement or observation of the process or product parameters, which determine whether control measures are considered appropriate.
As methods of monitoring the parameters of the CCP are: visual inspection, sensory assessment, measuring physical, chemical and microbiological analysis.
For the management of critical control points identified for disposal, to prevent or reduce food safety hazards specified in the product, as was determined during hazard analysis is used a HACCP plan.
The structure of a HACCP plan is usually as follows:

Stage	Important hazard	Control measures	PCC/ PC nr.	Critical limits	Monitoring			Corrective Actions	Record	Corrective Actions Resp.
					Resp.	Method	Period			

II. FSMS design and implementation includes the following activities:

11. Establish Managing commitment
12. Setting policy and food safety objectives
13. Preparation of working plan for drafting the FSMS
14. Development of FSMS documentation: food safety manual, procedures, instructions, forms
15. Training HACCP team for implementation drafted documents;
16. Implementation of documentation

Documenting FSMS: food safety manual, procedures, instructions, forms

FSMS documentation magnitude varies from one organization to another, depending on: size of organization, type of activities, complexity of processes and their interaction, the products manufactured, staff competence.
Documentation can be defined as all information that is maintained on paper or electronically on the FSMS.

III. Checking the status of implementation of the FSMS.

11. Formation of internal auditors of FSMS (pending audit according to SR EN ISO 19011:2003)
12. Planning, implementation and reporting of internal audits
13. Establishment and implementation of corrective action to settle any nonconformity identified in internal audits
14. Making pre-qualification audits

RESULTS AND DISCUSSION

INCD ECOIND is a partner in the PN II project AVIECO, led by INCD BNA Balotesti. One of the main objectives of the project is to design, develop and implement for the partner SC AUGER Petrus SRL the food safety management system.
SC AUGER Petrus SRL has as main activity culture of fodder plant in ecological system: alfalfa, soybean, sunflower, peas, wheat, barley, maize and rapeseed as green manure and growth laying hens in organic diet.
Culture of forage in ecological system was the subject of a previous works.
Poultry in ecological system is their growth in production areas (halls) on the ground and providing a space outside. Foods used in feeding laying hens are obtained in own organic farm.

Technological flow chart

Poultry and egg production for commercialization

ACTIVITIES POTENTIAL	RISK FACTOR
1. Acquisition pullets and adult hens	Chicks and chickens infected / sick
2. Placing pullets and adult hens	Drops from nests and floor
3. Production of eggs • Feeding • watering and washing • Production of eggs management • Environmental and external dependencies management • Check the health, well being, production and quality of products obtained • Storage of non-viable eggs and dead birds • Collection of eggs	Equipments Peoples Vehicles Aerosols Feed Washing and Drinking Water Dead birds non-viable eggs Wild birds and other species of
4. Free access to the outside	Rodents Animals Insects
5. Removal of drops	Drops

The main risks that may occur in the process are biological hazards.
Biological hazards, methods of propagation and control measures

Microorganisms / pests	Ways to spread	Control measures
0	*1*	*2*
Newcastle disease virus and Newcastle disease (ND or PPA)	Live birds, people, aerosols, equipment and vehicles, litter, manure and dead birds, mice, pigeons, feed	Acquisition of uninfected lots, controlled movements of batches / hygiene measures for birds, people, equipment, vehicles, litter from shelters or farms, geographic isolation of farms or other means of preventing the spread of aerosols; Disinfection / cleaning shelters and equipment, removal of drops and dead birds, avoiding growth of other species of birds and animals, avoid direct contact with birds chicks, manufacture, transport and storage of fodder in terms of hygiene, vaccination;
Flu virus/ avian influenza (GA)	Live birds, waders, watered and wash contaminated water, people, equipment and vehicles, manure and dead birds, rodents	Acquisition of uninfected lots, avoid direct contact with chickens or waders, sanitation drinkers in shelters, disinfection and change bedding in shelters, controlled movements of batches / hygiene measures for birds, people, equipment, vehicles, litter in shelters or farms, removing drops and dead birds, avoiding the strong growth in other species of birds and animals;
Avian infectious bursitis virus and Gumboro's disease (BIA sau GD)	Live birds, manure and dead birds, people, water and feed contaminated equipment;	Acquisition of uninfected lots, controlled movements of batches / hygiene measures for birds, people, equipment, vehicles, litter from shelters or farms, disposal of drops and dead birds, hygiene, sanitation of shelters drinkers, manufacture, transport and storage of fodder in conditions of hygiene, vaccination;
Avian larynx tracheitis infectious virus (LTI, ILT)	Live birds, equipment and vehicles; aerosols;	Vaccination, movement control of batch / hygiene measures for birds, people, equipment, vehicles, litter from shelters and farms;
Laying loss syndrome virus (EDS)	Rotten eggs, live birds, waders, water contaminated equipment and vehicles;	Acquisition of non-infected groups, vaccination, water sanitation shelters, avoiding direct contact with birds chickens, disinfection and change bedding in shelters, disinfection / hygiene
Marek disease virus (BM)	Live birds, equipment, drops, aerosols, waste of feathers, insects litter;	Vaccination, disinfection / cleaning hatchery, bedding and equipment, disposal of sanitary waste; geographical isolation hatchery;

0	*1*	*2*
Avian infectious bronchitis virus (IB, BI)	Avian infectious bronchitis virus	Vaccination;
Avian encephalomyelitis virus or avian infectious anemia (AE, EMIA)	Rotten eggs, living chicken	Vaccination buying uninfected lots
Pox virus that causes avian variola (VA)	Mosquitoes;	Vaccination;
Mycoplasma gallisepticum (MG)	Rotten eggs, living chicken aerosols;	Vaccination buying uninfected lots
Salmonella pullorum (SP) and *Salmonella enteritidis* (SE)	Rotten eggs (SP si SE); live birds, people, rodents and feed (SE);	Acquisition of uninfected lots, controlled movements of the lots, farm personnel and visitors hygiene, rodent control programs, avoiding the strong growth in other species of birds and animals, manufacture, transport and storage of fodder in terms of hygiene, vaccination
Other Salmonella	Feed, rodents, live birds, birds and wild animals, equipment, drops and dead birds;	Production, transportation and storage in conditions of hygiene fodder, disinfection / hygiene, avoid contact with birds of other species of bird farms or animal manure and hygienic disposal of dead birds;
Haemophilus paragallinarum producing infectious coryza (CI)	Live birds	Vaccination, buying uninfected lots
Pasteurella multocida produces avian cholera (HA)	Live birds, wild birds, equipment, swine;	Vaccination, disinfection / hygiene, avoid contact with other birds of farm birds or animals;
External parasites (PE)	Live birds, wild birds, eggs nests, rodents	Acquisition of uninfected lots, avoiding contact with other birds of farm birds or animals, rodent control programs, disinfection / cleaning of eggs nests, insect control programs;
Internal parasites (PI)	Live birds, insects, floor / soil contamination;	Acquisition of uninfected lots, proper medication, insect control programs; disinfection / sanitation and shelter floors.

Table of risk assessment

Stages	Possible biological risk factors	Hazard (birds diseases)	Class of risk	Control measures
0	*1*	*2*	*3*	*4*
1	Sick chicks and sick adult chickens	ND or PPA, GA, BIA or GD, SP, SE, CI, HA LTI, EDS, BM, AE, BI, VA, MG CI, HA	3 – PCC	Acquisition of uninfected lots, certificates, from breeding farms Vaccination programs certified or minimizing contact with potential carriers (wild birds, pigs, etc.)
2	Litter for pavement and nests	ND or PPA, GA, BIA or GD	3 - PCC	Acquisition / use of clean straw from sources approved by management
2 – 6	Equipments: cages for delivery pullets / hens, nests, tools, sprinklers, feeders, watering, equipment for removal of dead birds / a nonviable eggs / grops People: farm staff, visitors, vendors, vaccination teams, service providers and veterinarians, suppliers of equipment, personnel dealing with bird transport personnel in charge of raising the dead birds / eggs unviable / waste	ND or PPA, GA, BIA or GD, PE, PI LTI, EDS, BM, HA ND or PPA, GA, BIA or GD, SP, SE ND or PPA, GA, BIA or GD, SP, SE	2 - PC 3 – PCC	Use of equipment disinfected by methods approved by the technical advisor / management or new equipment, contaminated (eg egg casings us) Vaccination programs certified Sanitary Filters entry in shelters Sanitary Filters in shelters entry
1 – 6	Vehicles: providing straw, chicken, chicks and feed, vehicles which are transported in dead birds, litter and slaughter chickens	ND or PPA, GA, BIA or GD LTI, EDS	3 – PCC	Using vehicles disinfected by methods approved by the technical advisor / management of the farm, for all vehicles entering the farm or poultry shelters close Vaccination programs approved / certified
2 – 6	Aerosols coming from the farm or farms neighboring sheets	ND or PPA LTI, BM, BI	2 - PC	Avoiding infection through aerosols by placing shelters / farms / processing units / recommended distances for waste dumps and planting of trees Strategic location remote dependencies for reproduction or recommended by other shelters, waste / drops and vaccination programs

0	*1*	*2*	*3*	*4*
2 – 6	Drinking / wash water	GA, BIA or GD EDS	2 - PC	Drinking and washing water sanitation Vaccination certified programs
3	Feed	ND or PPA, BIA or GD, SE	2 - PC	Use of feed manufactured in conformity with an approved quality assurance system of technical advisor / management system and a farm close to transport, storage and distribution of farm and mill
4	Wild birds	ND or PPA, GA EDS, HA PE	2 - PC	Avoid direct contact with waders chicks, pigeons and parrots and avoiding the introduction of feces from wild birds to chicks and laying hens dependencies through shoes by placing disinfectant mats at entrances Vaccination programs certified
2 – 6	Other species of birds and animals	ND or PPA, GA	2 - PC	No growth of other species of birds, rodents or birds farm
3	Trash / non-viable eggs / bird death	ND or PPA, GA, BIA or GD, BM	2 - PC	Drops storage, the viable eggs and dead birds as specified by the technical advisor / management
2 – 6	Rodents	SE, HA	2 - PC	Implementing an effective program of rodent control
2 – 6	Animals	HA	2 - PC	Not recommended growth of pigs or farm birds
2 – 6	Insects	BM, VA , PI	2 - PC	Implementation of appropriate programs to combat insects, medical and vaccination programs

ABBREVIATIONS:

- ND or PPA – Newcastle disease;
- GA – Avian influenza virus;
- BIA or GD – Avian infectious bursitis or Gumboro's disease;
- LTI – Avian larynx tracheitis infectious virus;
- EDS – Laying loss syndrome virus;
- MDV – Marek disease virus;
- IBV – Avian infectious bronchitis virus;
- AE – Avian encephalomyelitis virus or avian infectious anemia;
- VA – Pox virus that causes avian variola;
- MG –*Mycoplasma gallisepticum*;
- SP – *Salmonella pullorum;*
- SE – *Salmonella enteritidis*;
- CI – Infectious coryza -*Haemophillus paragallinarum*;
- HA – avian cholera - *Pasteurella multocida*;
- PE – External parasites;
- PI – Internal parasites.

PRP PLAN
Poultry and egg production for commercialization

Stage	Important hazard	Control measure	Critical Limits	Process / product monitoring			Corection/ AC	Record	AC Responsible
				Method	Frequency	Responsible			
2-6	Equipments	Cleaning disinfection	Legislation, standards	Monitoring cleaning disinfection program	Permanent	Resp. CTC	Repeating / change substances, concentration or frequency	Book for Cleaning and sanitation	Head of farm
	Aerosols	Corresponding location	-	-	-	-	-	-	Head of farm
	Watered / wash water	Sanitation of drinking and washing water	Legislation, standards	Analysis	Monthly	Resp. CTC	Changing the source	-	Head of farm
	Other species of birds and animals	Avoid growth of other species of birds or animals	-	-	-	-	-	-	Head of farm
	Rodents and insects	Deratization	Zero pests	Program Monitoring	Permanent	Resp. CTC	Repeating / change substances, concentration or frequency	Book for Cleaning and sanitation	Manager
3	Feed	Analyze	Legislation, standards	Analyze	half-yearly	Resp. CTC	Replacement	Analysis bulletins	Head of farm
	Trash / non-viable eggs / bird death	Adequate storage	-	-	-	-	-	-	Head of farm
4	Wild birds	Vaccination	-	Program Monitoring	Annual	Resp. CTC	Change vaccine / frequency	Vaccination records	Head of farm

HACCP PLAN
Poultry and egg production for commercialization

Stage	Important hazard	Control measure	PCC	Critical Limits	Process / product monitoring			Corection/ AC	Record	AC Responsible
					Method	Frequency	Responsible			
1	Sick chicks and sick adult chickens	Check the status of health	PCC 1	Zero sick birds	Health bulletin	At acquisition	Head of farm	Change the supplier	Journal of pro-duction	Head of farm
2-6	Litter	Analyze	PCC 2	Lack of mold, bacteria, viruses	Analyze	Quarterly	Head of farm	Change the supplier	Journal of pro-duction	Head of farm
	People	Sanitary filters	PCC 3	Without infested equipment	Visual verification	Permanent	Head of farm	Replacemen t equipment	-	Head of farm
1-6	Vehicles	Cleaning, disinfection	PCC 4	Legislation, standards	Cleaning, disinfection program monitoring	Daily	Resp. CTC	Repeating / change substances, concentratio n or frequency	Book for Cleaning and sanitation	Head of farm

FSMS documentation includes 21 procedures and food safety management manual.

Nr	Procedure cod	Procedure name
1	PS-01	Control of documents
2	PS-02	Control of record
3	PS-03	Internal audit
4	PS-04	Control of nonconforming product
5	PS-05	Corrections, corrective and preventive actions
6	PS-06	Competence, awareness and training
7	PS-07	Preparation and Emergency Response
8	PS-08	Supply
9	PS-09	Internal and external communication
10	PS-10	Control of monitoring and measuring equipment and machinery
11	PS-11	Relationship with client
12	PS-12	Management analysis and improvement
13	PS-13	Feeding crop
14	PS-14	Poultry and egg production for commercialization
15	PS-15	Complaints handling and customer satisfaction
16	PO-01	Develop of procedures
17	PO-02	Retreats
18	PO-03	Hazard analysis
19	PO-04	Critical control points, preliminary programs, HACCP plan
20	PO-05	Cleaning and sanitation
21	PO-06	The process of delivery and sale

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