

SUMMARY

Key words: *food safety, prerequisite programmes, HACCP system.*

Since the last decades of the 20th century, the food processors, hypermarkets, supermarkets and food control authorities, together have been more focused on food safety, more specifically on the production and marketing of safe food, which does not causes illness to consumers. Whatever the quality of the product, its safety is primary. In vain, a high quality food is produced if it is contaminated (biologically, physically or chemically) or if the allergen is not declared on the label. In the struggle for secure food, two powerful "armies" were involved: HACCP system (Hazard Analyses and Critical Control Points) and Prerequisite Programmes.

For a guaranteed victory, they must work together while respecting certain principles and strategies. Unfortunately, there have also been fighting and strategy errors that have led to malfunctions in and between the two "armies", namely HACCP and Prerequisite Programmes. Having noted these, I first tried to identify the causes and then find solutions for remedial action, to understand the principles correctly and to apply them properly. As the compliance pressure was very high, year by year, increasing the requirements either from the authorities or from merchants or consumers, I had to find the most effective methods for understanding concepts, implementing and maintaining them. Thus, these motivations were the basis for the elaboration of this study.

The PhD thesis is structured in two parts, according to the legal provisions.

Part I, "*The bibliographic study*", consists of 4 chapters in which are synthesized data from the literature on the stage of knowledge in the field of food safety, meat and its role in food, the food safety management system, the HACCP principles and Prerequisite Programs.

Part II, "*Personal Researches*", is structured in 4 chapters, in which there are presented the purpose of the study, the materials and the method, the results and the discussions regarding the implementation of the preliminary programs and the HACCP system in the meat processing units, as well as the final conclusions and recommendations.

At the end of the thesis there are presented the bibliography (which contains 154 titles) and the annexes.

CHAPTER I – THE GENERAL CONTEXT contains information on the current level of knowledge on food safety, on food-borne illnesses, on their severity and on favoring

factors, on the consequences of such illnesses, on new legislative requirements (listing the basic European regulations applied also in our country) and the principles and responsibilities of the general food law.

CHAPTER II – MEAT, provides data about meat in general, types of meat, chemical composition, the role of meat in man's nutrition and its nutritional value.

CHAPTER III – THE FOOD SAFETY MANAGEMENT SYSTEM, first describes the general principles and then the HACCP system. It presents the history of the HACCP system, where, when, for what purpose and by whom it was developed, the concept and its application in the food industry. The 7 HACCP principles and system application steps are listed. Then, each principle and each step of application is successively described, also referring to the legislation and *Codex Alimentarius* definitions.

CHAPTER IV – PREREQUISITE PROGRAMS This chapter first describes the importance of Prerequisite Programs and the correlation with the HACCP system. Afterwards, the programs deemed "traditional" prerequisite are listed and described: plant location, design and construction, processing equipment, cleaning and disinfection (sanitation), personnel health and hygiene, pest control, raw material control, production control, traceability and recall, glass and hard plastic control, labeling, complaint handling, training and more.

CHAPTER V – MATERIALS AND METHODS. The study was conducted on a total number of 58 meat processing plants (mainly slaughterhouses, cutting plants, minced meat and meat preparation, meat products, canned meat). The main objective of this study was to find the optimal method for the successful implementation of the food safety management system and, in particular, the HACCP system. I considered this to be very necessary given the fact that in the assessments made at the factories I found a lot of problems, mainly due to the lack of understanding of the HACCP system and the role played by the Prerequisite Programmes on its implementation, the role that each of them plays in hazards control, also being unclear. So, I have inspired from two sources (which I mentioned in detail in the study) and I created a pyramid to control the contamination, multiplication and survival risks, taking into account all the three biological, physical and chemical hazards, including in this pyramid the Prerequisite Programs and HACCP systems. Presenting this pyramid, the misunderstandings have been clarified and the system has been more easily and efficiently developed and implemented.

CHAPTER VI – RESULTS AND ARGUMENTS ON THE IMPLEMENTATION OF THE PREREQUISITE PROGRAMMES. This chapter has 8 subchapters in which the programmes deemed prerequisite are developed in detail, as follows:

Subchapter 6.1 – DESIGNING, BUILDING, MODERNIZING OR EXTENDING FACTORIES. In this subchapter, which is the basis for eliminating many risks of further contamination, are described the right ways of designing and building a new factory, but also for modernizing and extending an existing plant, starting with choosing the location, selection and structure of the designing team, in particular team training and experience, as well as collaboration with the factory team (processing engineers, quality assurance, technical) in order to establish space, flow, technology, work environment, etc. requirements in accordance with the legal and specific processing needs. The non-compliances found and the resulting problems are also thoroughly discussed, as well as the correct solutions and finally the conclusions and recommendations are presented.

Subchapter 6.2 – GOOD PRACTICE AND HYGIENE RULES. *Good practice and hygiene rules* are a set of simple rules that need to be applied or respected in a food processing plant to eliminate and/or minimize *the physical, chemical and biological contamination risks* of products. Good practice and hygiene rules are an important part of *Prerequisite Programmes* and they have a very important role in that, because by following these rules, the risks that cannot be controlled or monitored through HACCP can be kept under control. This is a very elaborate subchapter that reviews one by one the main rules regarding: access of staff and visitors to the production areas, the structure and organizing of cloakrooms, the design and structure of the work and protection clothes, personnel hygiene and health, including the hygiene rules that must be respected, the using and hygiene of hand tools, the good practice rules applicable to crates and other containers and pallets using, handling and storage of the products, unpacking of meat, ingredients and auxiliary materials, the standing time of the meat and semifinished products in the processing areas. In particular, specific rules on the prevention and elimination of contamination risks during beef, pork, mutton and game slaughter operations have been described. Each topic also described the problems encountered, and finally conclusions and recommendations on the success of implementing and maintaining these rules in a plant.

Subchapter 6.3 – TECHNICAL MAINTENANCE is a very important subchapter for preventing and eliminating the risks of biological, physical and chemical contamination. The structure and responsibilities of the technical team are firstly described, then the relationship with the service and equipment suppliers, the proper provision of utilities, the maintenance of the factory building, the maintenance of the equipments and machinery, the metrological checking and the calibration of the measuring and monitoring devices, the access, the accessories and the

staff conduct during maintenance and repairs operations. Another important issue is the prevention of contamination with detectable foreign bodies (metal objects) and undetectable ones (plastic), and here are discussed the ways of prevention. All of this has a role for the optimal working of this department. At the same time, for everything already mentioned, the problems encountered as a result of the lack of application of good practice rules in this field are also described. Finally, the conclusions and recommendations are presented.

Subchapter 6.4 – SANITATION AND SANITATION CONTROL. The *sanitation* consists in a set of operations whereby the surfaces, equipment and utensils from a plant are washed and disinfected to prevent the occurrence of biological, physical, chemical and allergenic *contamination risks* associated with food. The subchapter is structured on several sections, namely: substances used in sanitation, types, applicability, storage and use, tools and materials required and used, the structure and responsibilities of the sanitation team, post operational sanitation and arguments for each stage of the procedure, the description of the operational sanitation, when and for what it is applied, specific sanitation procedures for certain equipments and machinery, for yards and animal paddocks and for the staff working equipment (protective clothes). Here is also approached the hygiene control, which is commonly referred to as "*pre-operational hygiene control*" and consists in operations that verify the effectiveness of sanitation. The most common are *visual control* and *swab tests*. These two topics are described in detail, as are the effective ways to organize the swab tests. Each section also describes the noncompliances encountered and in the end, the conclusions and recommendations for the efficient operation of the sanitation team and thus for proper sanitation.

Subchapter 6.5 – PEST CONTROL is a very important chapter of *Prerequisite Programmes* because an efficient pest control prevents, eliminates or minimizes a significant number of food safety risks. The subchapter begins with the definition of pests and the correct ways of handling, preparing and storing of the toxic substances, in conditions where pest control is carried out by the unit. Afterwards, the causes that lead to an inefficient control are described: generated by inappropriate design and building of the plant, improper maintenance of the yard and its annexes, wrong procedures for prevention and control and misunderstanding of the meaning of the words "*prevention*" and "*combat*", inadequate staff training and errors in the application of good practice. Finally, the conclusions and recommendations for control' optimizing are highlighted.

Subchapter 6.6 – PRODUCTION CONTROL. This subchapter starts with comments about raw materials, the base in a food processing plant. Thus, the types of raw materials used in a plant are listed, the specifications containing the requirements for the purchased product are described, the purchasing ways and the supply relationship arrangements, as well as the

suppliers' assessment, are listed. Products (semi-finished or finished) with various qualitative defects that do not leave the plant and which can be reprocessed are also under discussion. Waste management is also very important in order to prevent and to eliminate the risks of product contamination with and through them. Waste management consists of two sections, in the first, waste of animal origin are defined and is described how they are collected, identified and stored in the plant, and in the second, waste of other origins are mentioned (foil, cardboard, paper, wood, garbage etc.). The subchapter continues with issues related to labeling and consumer education. Afterwards, the self-control by laboratory analyzes is approached, including the meat and products, ingredients, packaging materials and water analyzes control (hygiene control was described in the chapter which regarded sanitation). As in the other subchapters, the noncompliances encountered as well as conclusions and recommendations are presented and discussed in each section.

Subchapter 6.6 – TRACEABILITY, PRODUCT RECALL AND COMPLAINT HANDLING. In short, traceability means to trace back to the compounds origin of a product. The subchapter begins with the legal definitions of traceability and continues to describe how to identify batches of raw materials, semi-finished products and finished products on the flow, as well as the records that can prove traceability, obviously being also discussed the problems leading to the failure of traceability and which should be avoided. Consecutive to the traceability, the subchapter follows the recall of the products, both of which are closely related. If the product is not correctly identified, it cannot be traced in both directions, from raw material suppliers to recipients and vice versa, from recipients to raw material suppliers. This describes how to act in a recall situation that needs to be tested before an incident occurs. The last part describes how to deal with complaints, customer and/or consumer complaints and solve them. And here are also described the frequently encountered problems, as well as some conclusions and recommendations.

Subchapter 6.8 – TRAINING. Staff training is very important in the production of safe food. All staff involved in production must be aware of their role and responsibilities in preventing the contamination risks. This subchapter describes the requirements for staff qualifications and skills, training programmes and training needs. Then I described in detail my training methods and materials as well as the experience gained in this. Documentation of training, staff supervision and knowledge testing, both theoretically, practically and refresher training were also discussed. Finally, the conclusions and recommendations were presented.

CHAPTER VII – RESULTS AND ARGUMENTS ON THE IMPLEMENTATION OF THE HACCP SYSTEM. In this chapter, the HACCP principles and the system implementation phases are resumed, describing at each stage the noncompliances

found and which led to failures or malfunctions in the implementation and operation of the system. Besides deficiencies, I have also described and explained the practical solutions as well as some recommendations for clarification and avoidance of misunderstandings.

CHAPTER VIII – GENERAL CONCLUSIONS AND RECOMMENDATIONS.

This chapter presents the conclusions and recommendations for this study.