HACCP Plan
For Bakeries

Implementation of a HACCP plan in bakeries guarantees the safety of the baked goods produced. The considerations of the overall production process, and potential hazardous microbiological, physical and chemical risks that may be present during the development stages are fundamental for the development of a successful HACCP program.[1]

HACCP programs are established once the prerequisites program and good manufacturing practices have been successfully implemented. They are intended to fully guarantee the safety of products by preventing the occurrence of potential hazards.[1]

Since 2015, all food facilities are required to have a food safety plan in place that must include hazards and risk-based preventive controls to eliminate or minimize identified hazards. Several compliance date have been established for different types and sizes of businesses.[1]

What is a HACCP plan?

HACCP is the acronym for Hazard Analysis and Critical Control Points. It is a system used to identify, evaluate, control and to correct and prevent potential safety hazards in production processes.[1] A HACCP plan is the documentation obtained after the development of a HACCP program.

HACCP programs are based on seven basic principles:

1. Conduct hazard analysis
2. Determine critical control points (CPPs)
3. Establish critical limits (CL)
4. Establish monitoring procedures
5. Establish corrective actions
6. Establish verification procedures
7. Establish effective record keeping and documentation procedures

Successful implementation of HACCP programs heavily depends on the commitment of all areas of the company, especially the support of management, quality assurance and operations departments.[1]
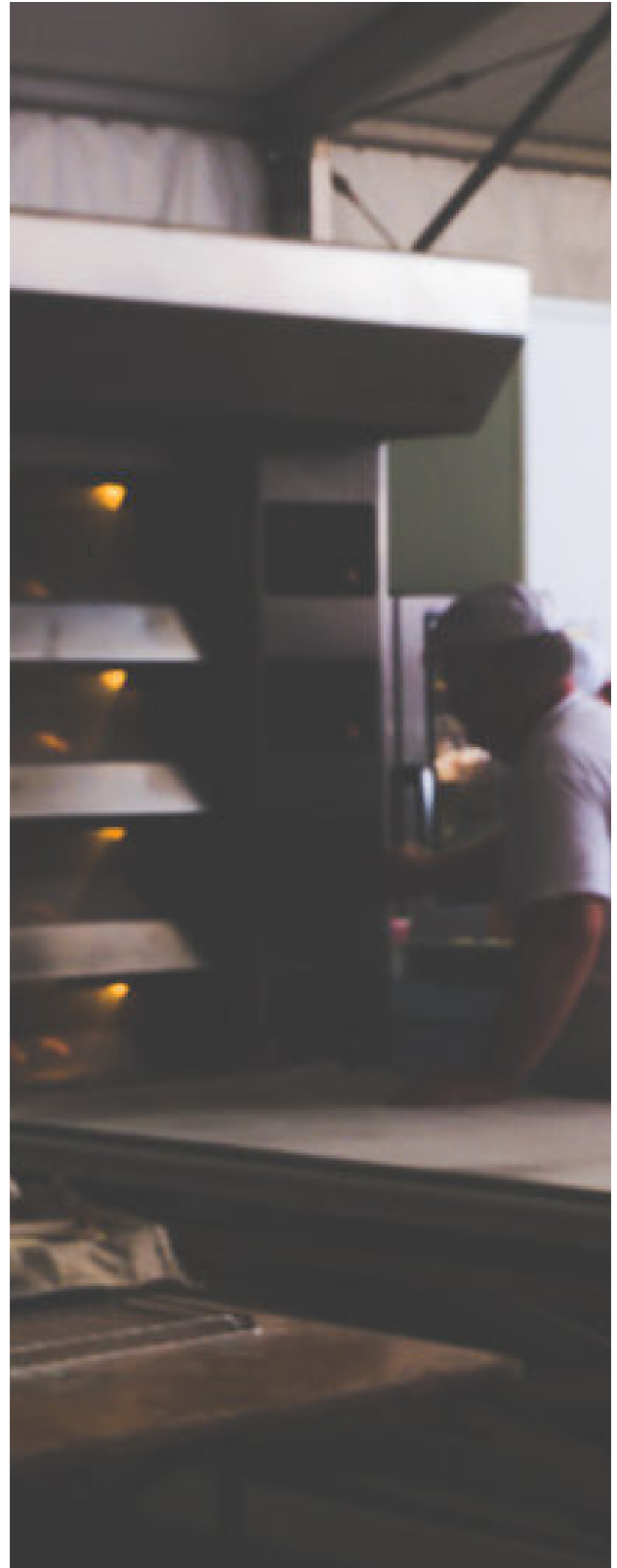
Implementation Steps[1]

1 Assemble the HACCP team

A HACCP team must be interdisciplinary composed. Employees from all departments should be involved in order to guarantee the success of the program. From management, R&D members, plant sanitation, QA, engineering positions to floor supervisors, all employees should be aware of the efforts being made to guarantee the safety of the product.

2 Description of the food product and its distribution

The food product must be defined in its entirety. Its formulation, physicochemical composition, processing, packaging and distribution conditions must be known and established.

3 Description of intended use and consumer profile of the product

The common use of the product must be established, and the consumer profile must be known (e.g elderly, infants, immunosuppressed) to avoid potential hazards for the final consumers.

4 Description of the process flow diagram (PFD) which describes the processing steps

The production process steps must be shown in a flow process diagram descriptive enough to understand the incoming and outgoing flows, main process variables, production conditions, control points and critical control points.

5 On-site verification of the flow diagram

Once the conceptual flow diagram is established and documented, it must be verified on site. Modifications should be made if necessary.

7 HACCP Principles[1,2]

1 Conduct Hazard Analysis

In this step potential hazards, their severity, likelihood of occurrence and control measures should be identified. The analysis of potential hazards should be thorough to guarantee the effective development of the HACCP plan, and must consider all potential chemical, physical and microbiological hazards related to food safety. The hazard analysis can be documented in two formats: A table or a narrative summary of the team's analysis and considerations.

2 Determine Critical Control Points (CCP)

CCPs are defined as potential significant hazardous steps to food safety, and so must be prevented or eliminated to avoid potential outbreaks. The identification of CCPs should be made using scientific expertise in the area. One useful tool commonly used is the CCPs decision tree. Some common CCPs in bakeries are sieving, filtering, thermal processing, chilling, raw material testing, formulation control, cleaning and sanitation, X-ray, metal detector, or testing for heavy metal contaminants.

3 Establish Critical Limits (CL)

A CL is the maximum or minimum value for a potential hazardous parameter within a CCP. This value establishes the safety or absence of it in a process step for a particular CCP. When CCPs are established, one or more control measures should be defined to assure the prevention or elimination of the potential hazards. CLs should be scientifically established by experts in the area, and should be easy to measure.

In a case example for bakeries, a CCP is the baking step. High temperature treatments are used as preventive control measurement of Salmonella that may be present in some ingredients (e.g eggs, milk, flour), and thus the conditions (e.g temperature and time) of this treatment are crucial to guarantee safety.

7 HACCP Principles (cont.)[1,2]

4 Establish Monitoring Procedures

Monitoring is defined as the systematic procedures and observations used to measure the compliance or noncompliance of a product for specific CCPs. These procedures include the analysis of CCPs parameters to verify their compliance/noncompliance, the personnel responsible for monitoring, and recordkeeping of the process CCPs parameter analysis, among other actions.

5 Establish Corrective Actions

Corrective actions should be taken when a deviation from the critical CLs occurs. These actions should be performed before the product leaves the plant and reaches consumers. Corrective actions should consider the cause of the nonconformance, disposition of the non-conforming product, and the record of the corrective actions taken.

6 Establish Verification Procedures

Verification processes and responsible personnel should be established during the development of the plan to guarantee the maintenance in the future. The verification plan must consider the periodic validation of the plan, CCPs, CLs and control measures; as well as the correct implementation of the plan. Each company must establish time frames for validation, and responsible personnel for each validation task according to the needs of the plant.

7 Establish Recordkeeping/Documentation Procedures

Documentation is an essential part of successful application and maintenance of a HACCP plan. Some of the basic documentation that should be kept includes:

- Summary of the hazard analysis, with the rationale behind the selection of the CCPs
- HACCP Plan, including listing of the team, description of the product, verified PFD, hazards analysis, critical control points and their correspondent limits, etc.
- Supporting documentation, such as validation records
- Records generated during normal operation of the plant

Considerations for Bakeries

Most of the potential hazards in bakeries are related to their dairy components and high moisture content fillings. However, this doesn't mean that HACCP plans are not strongly advised to maintain optimal security. Here are some of the most commonly perceived hazards in bakery production:[1,2,3]

Processing step	Biological hazard	Chemical hazard	Physical hazard
Bulk ingredient procuring and handling	Salmonella	Allergen cross contamination	Wood splinters, metal fragments, plastic pieces
Ingredient storage	Mold	Allergen cross contamination	
Scaling of ingredients	Mold	Allergen cross contamination	Metal
Sponge/dough mixing	Salmonella and Escherichia coli (from inappropriate operator's manipulation)	Allergen cross contamination and detergent contamination	Metal
Fermentation	Mold	Allergen cross contamination	Metal
Makeup and forming	Salmonella and Escherichia coli (from inappropriate operator's manipulation)	Allergen cross contamination and detergent contamination	Metal
Baking	Salmonella		Metal
Cooling	Staphylococcus aureus on conveyor surfaces	Detergent contamination	Metal
Packaging	Salmonella, Escherichia coli, and Staphylococcus aureus	Detergent contamination and migration of undesirable substances	Metal

IMPORTANCE OF HACCP PLANS

HACCP plans are a fundamental tool to guarantee food safety and so their development in a variety of areas of the food industry is expanding. Currently, bakeries are obliged to document and implement a HACCP program. However, their development guarantees the safety of the products made, and may have an influence in consumers' trust and preference of products by providing them with a sense of security towards the company. From a commercial perspective, HACCP plans improve companies' trust in their products, and reduce the potential risk of recalls due to unsafe product production.

Regulations

Implementation of HACCP plans in bakeries is not mandatory in the US. However, its development is strongly encouraged by the FDA in all food manufacturing processing industries. The Food Safety Modernization Act (FSMA) originated as an effort by the FDA to prevent potential foodborne illness by implementing actions that food companies must comply with to guarantee the safety of marketed products.[4] In the EU, most food product providers must follow HACCP procedures as established by the EU Commission Regulation N° 852/2008.[5]

Sanitation in Bakeries

Sanitation of bakery facilities is one of the most important considerations to have while building a HACCP plan, as it significantly reduces the risk of potential biological hazards. Some critical sanitary and safety practices for bakeries are:

- Traceability of raw materials and suppliers auditing
- Appropriate sanitation of pans, mixing hooks, vessels and conveyor surfaces to prevent buildup of bacteria and detergent residues
- Appropriate training for line workers
- Metal detection in the final stages of the production process
- Baking temperatures and heating times for deactivation of bacterial pathogens identified in the hazard analysis step
- Monitoring production process conditions for safety and quality critical points

References

1. US Food and Drug Administration. "HACCP principles & application guidelines." Retrieved on November 29 (2014): 2015."

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5. European Commission (EC). Commission Regulation (EC) NNo 852/2004 Of The European Parliament And Of The Council Of 29 April 2004 On The Hygiene Of Foodstuffs. Official Journal of European Communities, 29 April 2004.