HACCP Understanding Hazard Analysis and Critical Control Point – Quick Tips

Introduction

If you work in the U.S. food industry, it's important to have a clear understanding of the food safety system known as hazard analysis and critical control point (HACCP). The concepts of HACCP date back over fifty years. Simply put, HACCP is a science-based system used to ensure that food safety hazards are controlled to prevent unsafe food from reaching consumers. The Pillsbury Company first implemented this approach in collaboration with the National Aeronautics and Space Administration (NASA) during the development of food to be used in the U.S. space program.

Since then, numerous U.S. food companies have incorporated the system into their manufacturing processes. HACCP is required by the United States Department of Agriculture (USDA) for processing meat and poultry (9 Code of Federal Regulations (CFR) Part 417); it's also required by the Food and Drug Administration (FDA) for juice (21 CFR Part 120) and seafood (21 CFR Part 123) processors.

In 2011, the FDA passed the *Food Safety Modernization Act* (FSMA) (21 CFR Part 117) that regulates all other food manufactures who were not required to follow HACCP. These other food manufactures must now follow a close offshoot of HACCP called hazard analysis and risk-based preventive control (HARPC). This means that now, all U.S. food manufacturers regulated by the USDA and FDA are required to have proactive rather than reactive food contamination control measures in place.

The FDA is urging that HACCP principles be applied to retail and food service sectors of the food industry as well.

Why hazard analysis and critical control point is important

Before the HACCP, food inspection relied on the senses (sight,

smell and touch) to detect potential hazards. Guidelines were developed in the 1930s when the threat of physical contaminants and diseased animals were of great concern. However, the "process" of relying on senses failed to prevent hazards from occurring. Today, the challenges facing the food industry are predominantly microbiological and chemical in nature. Of the two, microbiological contaminants such as Salmonella, Clostridium botulinum, Listeria, Campylobacter and Escherichia coli O157:H7 pose the most significant threat. Since microbes cannot be detected by sight, a system that prevents the growth and spread of these organisms is required. Additionally, with the growth of the food industry; the increasing variety of products; and the number of processes used; federal, state and local agencies are continuously challenged to ensure food safety. HACCP places the responsibility for food safety on the processing plants, allowing them to develop a program that addresses their specific applications.

Fundamentals of HACCP

For HACCP to be most effective, its principles must be applied to all aspects of the food industry including growing, harvesting, processing, manufacturing, distributing, merchandising and preparing food for consumption. A successful HACCP program requires a strong management commitment to implement the principles. This management commitment provides employees with a clear understanding of the importance in producing safe food.

Prerequisites

HACCP must build upon a solid foundation of pre-existing programs for it to be successful. These programs provide the basic framework necessary for the production of safe food products. The National Advisory Committee on Microbiological Criteria for Foods states that programs such as current Good Manufacturing Practices (cGMP), personal hygiene, supplier control and cleaning/sanitation are critical in the development and implementation of an effective HACCP plan. Many of these programs and practices are outlined in federal, state and local regulations and guidelines.

Details of hazard analysis and critical control point

The concept of HACCP is relatively simple; however, application of the program can be challenging. HACCP is based upon seven basic principles.

- Conduct a hazard analysis
- Identification of Critical Control Points(CCP)
- Establishment of Critical Limits
- Monitoring of CCPs
- Application of Corrective Actions
- Documentation of the System
- Verification Procedures

(Specifics regarding these seven principles are mentioned later in this document.)

Prior to applying a HACCP plan to a specific product and process, five tasks must be accomplished:

- Establish a team of individuals with detailed knowledge and experience of the process to be analyzed.
- Describe the food involved and its distribution.
- Categorize the intended use and consumers of the food.
- Establish a flow diagram for the process outlining the steps involved (a simple block diagram is sufficient).
- Verify the flow diagram through on-site inspection of the operation.

Once these preliminary tasks have been completed, implementation of the HACCP principles can take place. The following is an overview of the seven HACCP principles. Please consult the references at the end of this document for additional information.

- **Conduct a Hazard Analysis**
  Identify potential food-related hazards and suggest appropriate control measures. A hazard is any biological (e.g., bacterium), chemical (e.g., toxin) or physical contaminant (e.g., broken glass) that could cause illness or injury if not properly controlled. During this step it is important to review the entire flow process of an item from

receipt, storage and preparation to its final distribution. After a thorough review is conducted and the potential hazards are identified, a list of control measures should be generated. Control measures are actions or activities that will prevent, eliminate or reduce the hazard. A detailed study of process hazards is critical for successful implementation of an effective HACCP plan.

- **Identify Critical Control Point**
  A critical control point (CCP) is defined as a point, procedure or step at which a food safety hazard could be eliminated, prevented or reduced. Examples of CCPs include testing for metal fragments, conducting thermal processing, preventing cross-contamination of microbes between different foods, chilling and testing for chemical residues. CCPs should be carefully developed and documented. Initially, there is a tendency to identify an excessive number of steps or procedures as CCPs thereby making the process unwieldy and less effective.
  Some questions to ask when developing CCPs are:
    - Can the CCP be monitored?
    - How will the CCP be documented or recorded?

Thorough analysis and identification of CCPs by knowledgeable professionals is fundamental in controlling food safety hazards.

- **Establish Critical Limits**
  Preventative measures with critical limits are established for each control point. Critical limits are maximum and/or minimum values that will prevent, eliminate or reduce a biological, chemical or physical hazard. A CCP will have at least one and possibly several control measures to achieve this goal. Critical limits or standards must be scientifically based and readily monitored. Examples of critical limits include time, temperature, pH, water activity, moisture and titratable (means of measuring) acidity. Potential sources for establishing critical limits are regulatory standards and guidelines, demonstrated results and expert consultants. An example of a critical

limit is the control of time and temperature in the cooking of hamburger patties to destroy enteric pathogens such as E. coli O157:H7.

- **Monitor the Critical Control Points**
  Established monitoring is a planned sequence of observations or measurements used to determine whether or not a CCP is under control. Ideally, monitoring should be continuous to assure accurate readings. In addition, most monitoring procedures require near-immediate results so that loss of control or deviations can be observed instantly. Tests related to microbiological observations are usually not practical due to the lag-time in producing results; chemical and physical measurements are frequently preferred because their results are achieved quickly and are generally more effective for assuring control of microbiological hazards. However, in some applications there may be no substitute for microbiological testing. Potential methods for monitoring CCPs include time and temperature recordings, pH measurements and observation of the procedure by sight or smell. Another important component of this step is to record and log the measurements, establishing a written record for later use in verification. The individual(s) chosen for monitoring should understand the purpose and significance of monitoring; be adequately trained in the monitoring procedure; be unbiased in their duties and reporting; and accurately report the monitoring data.
- **Define Corrective Action(s)**
  Prior to enforcing a HACCP plan, corrective actions should be established for each CCP. Unfortunately, deviations will likely occur and an individual must be empowered to prevent possible hazardous foods from reaching consumers. When a deviation is noted from established critical limits, immediate and documented corrective actions are crucial. Corrective actions should determine and correct the cause of deviation and establish whether a food product should be discarded. In addition, the actions taken to restore the procedure to compliance should be documented. Examples of corrective actions include adjusting thermostats for proper

temperature control, reheating or re-cooking a product and discarding a product that is deemed to potentially pose a health hazard.

- **Establish Record-Keeping and Documentation Procedures**
  Maintaining records of the HACCP plan is necessary to ensure that critical limits are working and being monitored. Documentation should be kept for the entire food process. These records should include a summary of the hazard analysis, a detailed listing of the HACCP plan, verification records and any documentation generated during the HACCP plan operation. The records associated with this process should be kept on file at the establishment and easily accessible.
- **Establish Verification Procedures**
  Verification activities determine the effectiveness of the HACCP plan and ensure the system is operating correctly. One of the most important aspects of this principle is the initial validation that the HACCP plan is scientifically and technically reliable. Using the verification procedures, an establishment should conduct frequent review of the HACCP plan and its components. In addition to in-house reviews, periodic verification by an independent expert or team should be performed. If deficiencies are noted during the verification step (in-house or independent), the HACCP plan must be modified to correct the problem(s).

Conclusion

HACCP is a proactive plan developed to prevent and reduce the incidents of food safety hazards. By monitoring and detecting potential problems throughout an entire process, identification of hazards and application of corrective measures can be implemented immediately. HACCP enables companies to apply prevention and detection methods to their specific application(s), giving them the freedom to adopt new techniques and technologies more rapidly. A successful HACCP plan is built upon a firm commitment from upper management with well-trained and motivated employees actively involved in the process. Under HACCP, responsibility for ensuring food safety is now appropriately placed on the food manufacturer

or distributor. Adoption of this plan will result in the reduced likelihood of hazards and assure consumers that the products they consume are as safe as science and technology allow.

Frequently Asked Questions

Q: What is the difference between a control measure, a critical control point and a critical limit?

A: A control measure is an action or procedure that will reduce, prevent or eliminate a potential hazard. A critical control point is a step at which a control measure is applied. A critical limit is a maximum and/or minimum value for controlling a chemical, biological or physical parameter.

Q: What is the greatest hazard in the food industry today?

A: Microbiological contamination is the chief hazard in the food industry. However, chemical and physical hazards should not be overlooked.

Q: Does end-product testing of bacteria play a role in HACCP?

A: Testing for microbes can play a valuable role in confirming the HACCP system is working properly. Testing is also useful in profiling and tracking products and processes. However, testing for microbes at the end of a process is not effective in identifying and eliminating contamination.

Sources

National Advisory Committee on Microbiological Criteria for Foods, HACCP Principles & Application Guidelines
U.S. Department of Agriculture Food Safety and Inspection Service (FSIS)
U.S. Food and Drug Administration International
HACCP Alliance, Texas A&M University

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