Loss Control TIPS
Technical Information Paper Series
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Hazard Analysis Critical Control Point Plan (HACCP): An Overview

Introduction

According to a recent combined report from the FDA, USDA, EPA and CDC, foodborne infections remain a major public health problem. The report references a report from the Council for Agricultural Science and Technology which estimates that as many as 9,000 deaths and 6.5 to 33 million illnesses in the United States each year are food-related. Hospitalization costs for these illnesses are estimated at over $3 billion a year. Costs for lost productivity for seven specific pathogens have been estimated to range between $6 billion and $9 billion.

Given this significant problem, the FDA and the USDA have been moving toward requiring food processors to implement Hazard Analysis Critical Control Point (HACCP) plans. This article reviews the basic elements of HACCP.

Background

Traditional inspection is relatively resource-intensive and inefficient. It is reactive rather than preventive. HACCP (pronounced "HASIP") systems are designed to prevent the occurrence of potential food safety problems. This is achieved by assessing the inherent risks attributable to a product or a process and then determining the necessary steps that will control the identified risks.

HACCP was developed by the National Advisory Committee on Microbiological Criteria for Foods (NACMCF). It was pioneered by the Pillsbury Company with the cooperation and participation of the National Aeronautic and Space Administration (NASA), Natick Laboratories of the U.S. Army, and U.S. Air Force Space Laboratory Project Group. As is evident, the application was for the U.S. space program.

Hazard Analysis Critical Control Point

HACCP is designed to identify and monitor biological, chemical and physical properties that are foodborne hazards. Although the intent is to provide assistance to the retail food industry, its concepts can be applied in any sector of the food industry, regardless of the size or complexity of the operation.

Critical Control Points (CCPs) identify those points in the process that must be controlled to ensure the safety of the food. The major thrust of HACCP is to identify the CCPs and develop effective controls to ensure that food quality and safety are maintained.

There are several advantages to establishing a HACCP program:

- A HACCP system will emphasize the industry's role in continuous problem solving and prevention rather than relying solely on periodic facility inspections by regulatory agencies.
- HACCP clearly identifies the food establishment as the final party responsible for ensuring the safety of the food it produces.
- A HACCP system allows the regulatory agency to more comprehensively determine an establishment's level of compliance.
- HACCP programs are preventive rather than reactive as are traditional approaches to ensuring food quality.

HACCP Principles

The National Advisory Committee on Microbiological Criteria for Foods (NACMCF) has developed seven widely accepted principles that outline the program:

Principle #1: Hazard Analysis

The most critical part of the HACCP program is analyzing the hazards associated with the production or processing operation. The hazard analysis process accomplishes three purposes:

1. Identify significant hazards
2. Provide a risk basis for selecting likely hazards
3. Develop preventive measures for identified hazards of a process or product to ensure or improve food safety

A hazard may be a biological, chemical, or physical property that can cause a food to be unsafe. The analysis requires the assessment of two factors with respect to any identified hazard:

1. The likelihood that the hazard will occur, and;
2. The severity if it does occur.

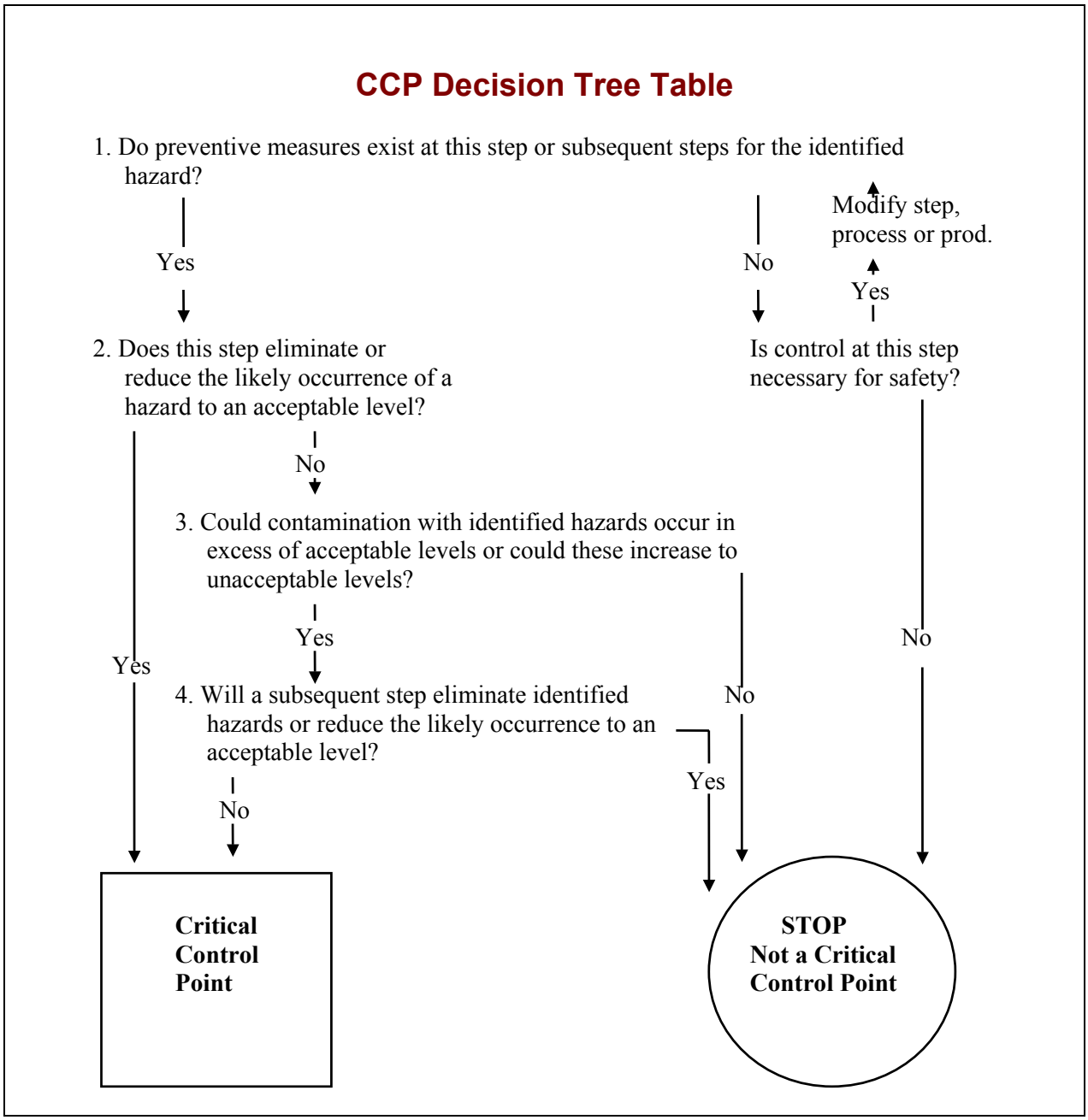
Hazard analysis also involves establishing preventive control measures. To effectively address them, hazard prevention, elimination or reduction to acceptable levels must be attained. To facilitate the application of the seven principles, a flow diagram that delineates the steps in the process, from receipt to sale or service, should be established.

Principle #2: Identify the Critical Control Points (CCPs) in Food Preparation

A Critical Control Point (CCP) is a point, step or procedure at which control can be applied and a food safety hazard can be prevented, eliminated or reduced to acceptable levels. Examples include cooking, chilling, specific sanitation procedures, product formulation control, prevention of cross contamination, and certain aspects of employee and environmental hygiene.

There may be many control points, but very few are actually critical control points. Operations that do not impact food safety may be addressed at control points; however, since these control points do not relate to food safety, they are not included in the HACCP plan.

CCPs must be carefully developed and documented. In addition, they must be used only for purposes of product safety. The following decision tree is helpful in verifying which of the food preparation steps should be designated as CCPs.



(Decision Tree adapted from NACMCF)

Principle #3: Establish Critical Limits for Preventive Measures

This step involves establishing a criterion that must be met for each preventive measure associated with a CCP. Critical limits can be thought of as boundaries of safety for each CCP and may be set for particular preventive measures. Criterion most frequently used for critical limits include the following:

- Time
- Temperature
- Humidity
- a_w
- pH
- Titratable acidity
- Preservatives
- Salt concentration
- Available chlorine
- Viscosity

Principle #4: Establish Procedures to Monitor CCPs

Monitoring is a planned sequence of observations or measurements to assess whether a CCP is under control and is used to produce an accurate record for use in future verification procedures. Three main purposes for monitoring include:

1. It tracks the system's operation so that a trend toward a loss of control can be recognized and corrective action can be taken to bring the process back into control before deviation occurs;
2. It indicates when loss of control and a deviation have actually occurred, and corrective action must be taken; and
3. It provides documentation for use in verification of the HACCP plan.

Examples of measurements for monitoring include the following:

- Visual observations
- Temperature
- Time
- pH
- a_w

Continuous monitoring is always preferred when it is feasible. Continuous monitoring is possible with many types of physical and chemical methods. Other monitoring procedures may include statistically designed collection or sampling systems and random checks.

Principle #5: Establish the Corrective Action to be Taken when Monitoring Shows that a Critical Limit Has Been Exceeded

A corrective action plan must be in place to:

1. Determine the disposition of any food that was produced when a deviation was occurring;
2. Correct the cause of the deviation and ensure that the critical control point is under control; and
3. Maintain records of corrective actions.

Corrective action plans must be developed for each CCP. The primary focus for the application of this HACCP principle will be on the correction of the procedure or condition which led to the noncompliance.

If a deviation should occur in food operations that are traditionally considered food processing operations (such as, cook-chill, curing and smoking, or reduced oxygen packaging), the food establishment must place the product on hold pending completion of appropriate analysis
and corrective actions.

Principle #6: Establish Effective Record Keeping Systems that Document the HACCP System

This principle requires the preparation and maintenance of a written HACCP plan by the food establishment. It also requires the maintenance of records generated during the operation of the plan. Correcting problems without record keeping almost guarantees that problems will reoccur. The level of sophistication of the record keeping necessary for the food establishment depends on the complexity of the food preparation operation. Examples of documents that can be included in the total HACCP system include:

- A listing of the HACCP team and their assigned responsibilities;
- A description of the product and its intended use;
- Flow diagrams of food preparation, indicating CCPs;
- Hazards associated with each CCP and preventive measures;
- Critical limits;
- Monitoring system;
- Corrective action plans for deviations from critical limits;
- Record keeping procedures; and
- Procedures for verification of the HACCP system.

Some examples of records obtained during the operation of the plan may include:

- Ingredients
- Preparation steps
- Packaging
- Finished product
- Storage and distribution
- Deviation and corrective action
- Employee training

Principle #7: Establish Procedures to Verify that the HACCP System is Working

There are four phases in establishing the verification procedures:

1. The first phase of the process is the scientific or technical verification that critical limits at CCPs are satisfactory. A review of the critical limits is necessary to verify that the limits are adequate to control the hazards that are likely to occur.
2. The second phase of verification ensures that the facility's HACCP plan is functioning effectively. Rather than relying on end-product sampling, food establishments must rely on frequent reviews of their HACCP plan, verify that the HACCP plan is being followed correctly, review CCP records, and determine that appropriate risk management decisions and product dispositions are made when preparation deviations occur.

3. The third phase consists of documented periodic revalidations, independent of audits or other verification procedures, that must be performed to ensure the accuracy of the HACCP plan. Revalidations are performed by a HACCP team on a regular basis and/or whenever significant product, preparation, or packaging changes require modification of the HACCP plan. The revalidation includes a documented on-site review and verification of all flow diagrams and CCPs in the HACCP plan. The HACCP team modifies the HACCP plan as necessary.
4. The fourth phase of verification deals with the regulatory agency's responsibility and actions to ensure that the establishment's HACCP system is functioning satisfactorily.

Training: HACCP works best when it is integrated into each employee's normal duties rather than added as something extra. Training plans should be specific to the establishment's operation rather than an attempt to develop HACCP expertise for a broad application. For all employees, the fundamental training goal should be to make them proficient in the specific tasks which the HACCP plan requires them to perform.

Reinforcement: Training reinforcement is also needed for continued motivation of the food establishment employees. The HACCP plan should include a feedback loop for employees to suggest what additional training is needed. Remember, "the customer's health is in the food handlers' hands."

Summary

According to recent reports, foodborne illness remains a major public health problem. HACCP systems are designed to prevent the occurrence of potential food safety problems. By identifying Critical Control Points, and developing effective controls that can be applied to prevent, eliminate, or reduce to acceptable levels food safety hazards, HACCP programs are preventive rather than reactive approaches to food safety.

There are seven principles in the HACCP program. Each principle, properly applied, acts to ensure the integrity of the food processing operation. HACCP programs can be applied to all phases of the food processing chain. As such, an effective national food safety program from production to consumer is enhanced by the implementation of HACCP.

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