

# HACCP (HAZARD ANALYSIS & CRITICAL CONTROL POINT): FOR A HOSPITALITY INDUSTRY. A REVIEW ARTICLE

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**Abstract:** Hazard Analysis and Critical Control Points is a standardized preventive measure to food safety from biological, chemical, and physical hazards in production processes or production area that make unsafe the food during the whole process of production and HACCP can be used at all stages of a food chain, from food production and preparation processes including packaging, distribution HACCP plan have seven principle and to apply these principles on whole process required a well trained HACCP team. Successful implementations of HACCP plan increases the food safety as well as increase the food quality standards.

**Index terms:** Food safety, food borne illness, HACCP, Salmonella.

## INTRODUCTION

Now a day's many food safety problems in the hospitality industry, as demonstrated by research and outbreaks of food borne diseases occurred due to the unhygienic condition of kitchens and illiterate caterers employed in food production areas in hotels (Kumar, 2009). In the hospitality industry all food establishment are aware that quality of their product must be important if they have to survive in the competitive market. So it is so necessary to maintain the quality of food. Providing safe food is the responsibility of all the food producers which provide food for their customers (Vaclavik, 2008). Maintaining the quality of food is very important during its production. But now a day's customer health concern is also linked with this, so there is a need of food safety food and it is an important issue today as there are many demands on the food production system and a variety of food handlers serving numerous individuals who are immune compromised (Russell, 1964). While efforts are made to educate the consumer regarding food safety, hazards in the food supply may be controlled prevented before foods reach the consumer. The effective use of the Hazard Analysis and Critical Control Point (HACCP) method of food safety, practiced in the hospitality, has been shown to yield safer foods (Pierson, 1992).

HACCP provides a framework for establishments to conduct science-based process controls that can be validated as effective in eliminating, preventing, or reducing to an acceptable level the food safety hazards. The customer want to be assured that the product is purchasing is safe and to maintain the standards of quality catering establishment adopted international standard like. ISO, HACCP etc. HACCP concept was born to ensuring the food safety "from the farm to plate". It is a system of food safety control that is accepted internationally (Mancini, 1994). HACCP itself was conceived in the 1960s when the US National Aeronautics and Space Administration (NASA) asked Pillsbury to design and manufacture the first foods for space flights. Since then, HACCP has been recognized internationally as a logical tool for adapting traditional inspection methods to a modern, science-based, food safety system.

*'Hazard analysis and critical control points or HACCP is a systematic preventive approach to food safety from biological, chemical, and physical hazards in production processes that can cause the finished product to be unsafe, and designs measurements to reduce these risks to a safe level'*

## Hazards and its types

A hazard is defined as a biological, chemical or physical agent that is reasonably likely to cause illness or injury in the absence of its control. Today food processors, and consumers are all interested in preventing the occurrence of food borne illness. Simulated food defence including training exercises with all levels of the government, nongovernment agencies, and the private

sector allow better preparation for and protection against possible contamination of the food supply from terrorist threats (Troller, 1993). Food borne illness represents disease carried to people by food and is the result of various biological, chemical, or physical hazards to the food supply. Food borne illness typically is due to ingestion of contaminated animal products. Plant foods may be implicated as a result of airborne, water, soil, insect, or even human contamination when these foods are grown. The risk of disease must be controlled throughout the steps of manufacturing, processing, storage, and distribution of foods. Today, there is a high interest in improving the safety net of the food supply and testing for bacteria such as *E. coli O157:H7* (Russell, 1964).

### Biological hazards

In case of biological hazards, bacteria are the main organism which cause food borne disease, and therefore are the primary microbial concern of many consumers, food processors, microbiologists, and others who are responsible for producing safe food. The food borne illnesses caused by bacteria by (1) infection, (2) intoxication, or (3) toxin-mediated infection (Vaclavik, 2008). Some food borne disease cases occur in the UK and Indian hospitality industry is presented in Table 1 & 2.

**Table 1. Some food borne disease cases occur in the UK hospitality industry.**

Year	Consequence	Incident and causal factors	Reference
1984	<i>Salmonella</i> , 19 deaths 355 ill	Hospital kitchen Cross contamination: cold meat salad Crown immunity lifted for hospitals	(Department of Health, 1986)
1988	<i>Salmonella</i> , 2 deaths	Restaurant Suspected faulty reheating: Rice£1 million out of court settlement by insurance	(O'Hara, 1997)
1996	<i>E coli O157</i> , 21 deaths, 100 ill	Outside catering Cross contamination and reheating: meat pie Fine £2,250	(Cox, 1998)
1997	<i>Salmonella</i> , 60- 100 ill	Restaurant function "Rogue egg". Chocolate mousse cleared	(Bozec, 1999)
2000	<i>Salmonella enteritidis</i> , 84 ill	Wedding function, Cross contamination: roast pork and raw egg. Fine £28,500	(Anon, 2002)
2001	<i>Salmonella</i> , 224 ill	Wedding reception, Unsafe raw egg: Marie Rose sauce and coleslaw. Chef custodial sentence four months	(Catersearch, 2001)
2003	<i>Salmonella enteritidis</i> , 324 ill	Take away, Cross contamination: Doner kebab. Custodial sentence 12 months and £34,000 costs	Reading Scientific Services Ltd, 2005)
2005	<i>Salmonella</i> , 15 ill	Michelin Star restaurant Unsafe raw ingredients: lightly cooked egg dishes. Fined £3,000, £534 costs	(Bill, 2005)
2005	<i>Salmonella</i> , 42 ill, critical illness observed in one patient	Chinese restaurant Insufficient reheating: fried rice Damages of £1,243,083	(English, 2005)

Source: from (Talyor and Forte, 2008)

### Physical hazards

Physical hazards are those hazard which contaminate the food and these are unwanted by the consumer. Certainly they should not be deliberate. They may be present due to harvesting or some phase of manufacturing due to the breakage of any material of machinery, or they may be intrinsic to the food, such as bones in fish, pits in fruits, egg shells, and insects or insect parts. Animals or crops which are grown in open fields are mostly subject to the physical contamination, although hazards may enter the food supply due to a variety of incidences that range from faulty machinery, to packaging wraps, to human error. An astute manager prevents the chance of physical contamination by following good manufacturing practices and using his/her

observational skills. Metal detectors are designed to detect metals in liquid, solid, granular, or viscous food products and in various packaging trays and wraps (Vaclavik, 2008). CCPs in food production process is presented in Table 1.

**Table 2. Some food borne disease cases occur in India during 1980-2015.**

Place	Incidences	Number of person affected	Microorganism	Food	References
Party	3	98	<i>Salmonella Paratyphi A Var Durazoo;</i> <i>S.aureus,</i> <i>V. parahaemolyticus</i>	Veg food  Coconut balls, Fish and meat, sandwiches	Lalitha et al., 1983; Choudhary et al., 1985; Aggarwal et al., 1985;
Mess	1	76	<i>E.coli serotype 020</i>	Dinner	Mandokhot et al., 1987;
Home	2	5	<i>Salmonella enteric serovar Weltevreden</i> <i>Salmonella bornum</i>	Stale rice  Chicken	Thekdi et al., 1980; Nayar et al., 1993; Fule et al., 1996;
Feast	2	303	<i>Yersinia enterocolitica</i> <i>Salmonella weltevreden and Vibrio fluvialis</i> <i>Vibrio fluvialis</i>	Butter milk Mutton- ghogni	Abraham et al., 1998; Sing et al., 1997; nema et al., 2007;
Religious ceremony	2	164	<i>Shigella sonnei</i>	Bread and vegetable curry Food item not identified	Antony et al., 2009; Bhunia et al., 2009; Dikid et al., 2009;
Military programs	2	78+43	<i>Salmonella enteritidis</i> <i>Non typhoidal Salmonella sp</i>	Frozen food Potato bitter gourd vegetable contaminated by rodents	Nandy et al., 2010; Vemula et al., 2012;
Marriage party	2	800	<i>Vibrio vulnificus</i> <i>Shigella sonnei</i>	Fish Food item not identified	Chowdhury et al., 2013;
School	2	135	<i>E coli</i> <i>Staph aureus</i>	Soyabean milk Bhalla	Kunwar et al., 2013; Saikia et al., 2015;
Hostel	2	184	<i>Salmonella weltevreden</i> <i>Salmonella weltevreden</i>	Fish Food item not identified	Dhama et al., 2013
Educational Institution	1	150	<i>Salmonella enteritidis</i>	Kheer	Dharma et al., 2013;
Hospital	10	10	<i>Salmonella wein</i>	Poultry products	
Slum area	1	103	<i>Salmonella typhi</i>	Yogurt and sweets	
Tea garden	1	72	<i>Salmonella weltevreden</i>	Contaminated drinking water	
Funeral reception	1	44	<i>Vibrio parahaemolyticus</i>	Food item not identified	

Source: (Monthly Newsletter of National Centre for Disease Control, Directorate General of Health Services, Government of India, March 2017)

### Chemical hazards

In food production systems chemical hazards occur due to accidental and perhaps unlabeled thing or ingredients, are mistakenly used in food. The main materials of concern as physical hazards include foreign objects such as glass, wood, metal, plastic, stones, insects and other filth, insulation, bones. Excessive quantities of additives become problematic especially when if an individual has a specific allergy. Also, included in the list of chemical hazards are toxic metals such as galvanized iron. Steel may bond permanently to zinc to the steel through galvanizing. Such zinc-coated material may be used for building fabrication; however, it should be avoided as a food contact surface since it is highly reactive with acids. In the past, containers used for beverages, temporary working surface, and shelving made of toxic galvanized iron had been part of restaurant operations.

### Seven principles of HACCP

HACCP is a systematic approach to the identification, evaluation, and control of food safety Hazards based on the following seven principles (www.cfs.gov.hk). Critical control points in a food production process are presented in Table 3.

**Principle 1: Conduct a hazard analysis.**

This is the first principal of HACCP in which analysis is done to check which type of hazard is present. It may be physical hazard, chemical hazard or biological hazards.

**Principle 2: Determine the critical control points (CCPs).**

Critical control point is a point, a step or a procedure in a food manufacture process at which control can be applied and, as a result, a food safety hazard can be prevented, eliminated, or reduced to an acceptable level.

**Principle 3: Establish critical limits.**

Limit for critical control point is a criterion which separates acceptability from unacceptability. It is the maximum or minimum value to which a physical, biological, or chemical hazard must be controlled at a critical control point to prevent, eliminate, or reduce to an acceptable level the occurrence of the identified food safety hazard. Examples of limits for critical control point are time, temperature, humidity, water activity and pH value.

**Principle 4: Establish monitoring procedures.**

Monitoring is a planned sequence of observations or measurements to assess whether a critical control point is under control and to produce an accurate record for future use in verification. Monitoring is very important for a HACCP system. Monitoring can warn the plant if there is a trend towards loss of control so that it can take action to bring the process back into control before the limit is exceeded.

**Principle 5: Establish corrective actions.**

Since HACCP is a preventive system to correct problems before they affect food safety, plant management has to plan in advance to correct potential deviations from established critical limits. Whenever a limit for critical control point is exceeded, the plant will need to take corrective actions immediately. The plant management has to determine the corrective action in advance. The employees monitoring the critical control point should understand this process and be trained to perform the appropriate corrective actions.

**Principle 6: Establish verification procedures.**

Verification is the application of methods, procedures, tests and other evaluations, in addition to monitoring, to determine compliance with the HACCP plan. Some examples of verification are the calibration of process monitoring instruments at specified intervals, direct observation of monitoring activities, and corrective actions. Besides, sampling of product, monitoring records review and inspections can serve to verify the HACCP system.

**Principle 7: Establish record-keeping and documentation procedures.**

In this principle record keeping and documentation is of all production process is done to maintaining proper HACCP records is an essential part of the HACCP system. Accurate and complete HACCP records can be very helpful for documentation of the establishment's compliance with its HACCP plan, tracing the history of an ingredient, in-process operations, or a finished product, when problem arise and help in product recall.

**Table3. Critical control points in food production process.**

Step	Process	CCPs
1	Menu planning	
2	Purchase	
3	Receiving and inspection	Yes (Physical, chemical and biological hazard)
4	Storage	
5	Issue to kitchens units	
6	Preparation	
7	Cooking	Yes (Cooking temperature)
8	Temporary storage	Yes (frozen storage temperature for frozen food products)
9	Service	

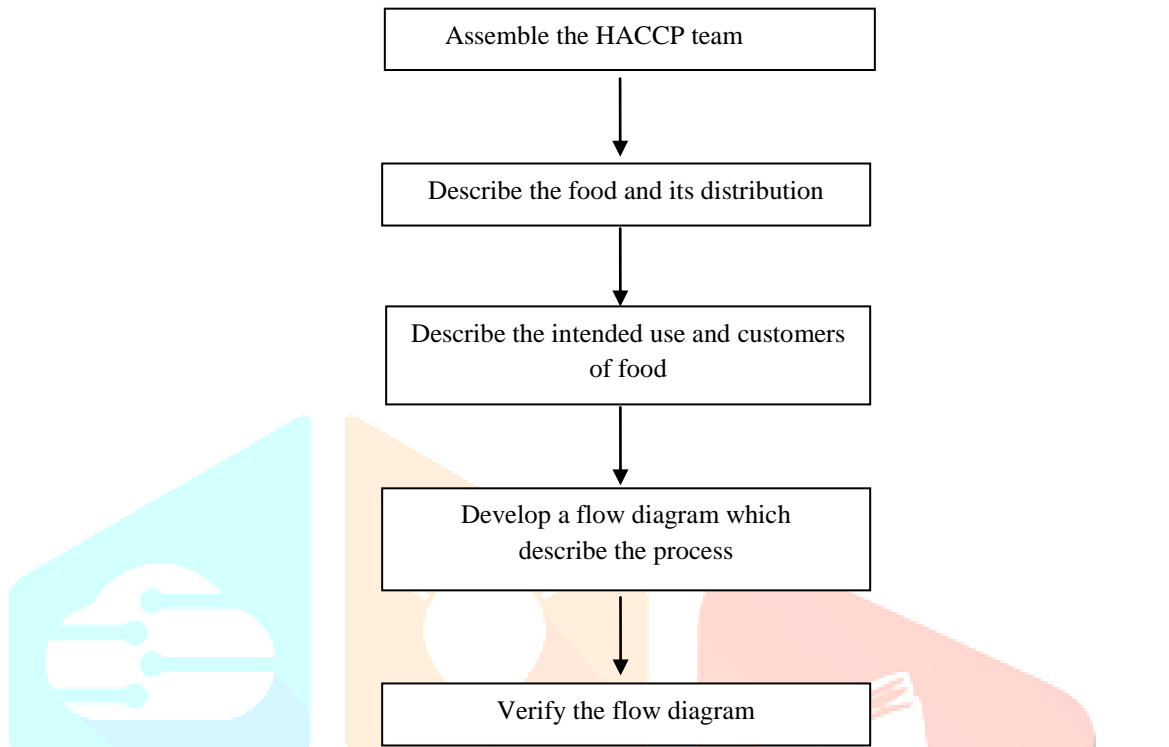
**Development HACCP plan and its team**

A first task in developing an HACCP plan is to assemble a HACCP team consisting of individuals who have specific knowledge and expertise appropriate to the product and process. The HACCP team could be formed of specialists from the hotel industry. In this team at least one member is included in HACCP team from below mentioned departments of hotel. The team members must have appropriate training and knowledge of the application of HACCP principles in practice. The HACCP team should report directly to the higher authority of the hotel (Kumar, 2009). Preliminary tasks in the development of HACCP plan were shown in Figure 1. HACCP teams include:

1. General Manager
2. Executive Chef
3. Food & Beverage Managers
4. Purchase Manager

5. Food & Beverage Controller
6. Personnel/HRD Manager
7. Training Manager

**Figure 1. Preliminary tasks in the development of HACCP plan.**



Source: HACCP and application guidelines. Journal of Food Protection, 1998

### Benefits of HACCP implementation

Hazard Analysis Critical Control Point – A system used to identify hazards associated with a food product and ensure control is established at critical points in the process. A systematic approach to the identification, evaluation, and control of food safety hazards (Kumar, 2009). The importance of HACCP includes:

- Saves your business money in the long run.
- Avoids you poisoning your customers.
- Food safety standards increase.
- Ensures you are compliant with the law.
- Food quality standards increase.
- Organizes your process to produce safe food.
- Organizes your staff promoting teamwork and efficiency.
- Focuses on identifying and preventing hazards from contaminating food is based on sound science.
- The recordkeeping allows investigators to see how well a firm are complying with food safety laws over a period rather than how well it is doing on any given day.
- Places responsibility for ensuring food safety appropriately on the food manufacturer or distributor.
- Helps hospitality industry compete more effectively in the world market.
- Reduces barriers to international customers.
- Reduce costs through reduction of product losses and rework.
- Increase focus and ownership of food safety.
- Simplify inspections primarily because of record keeping and documentation provide consistent quality of product.

### Conclusion

HACCP implementation in any food production system is very important for consumer safety, because the safe food is a first requirement of every consumer. HACCP is a system in which we can detect the harmful hazards at different stage of food production and we can prevent or permanently reduced these hazards by applying corrective actions or plans and measures. The main goal for HACCP is to develop a system, which is built on preventing problems before they occur. In Indian hospitality industry many hotels are ISO 9000 certified but none has gone for ISO 22000 Food safety Management system, which employ



HACCP as a quality tool. Successful implementation of HACCP in hospitality industry help in making a building brand image of industry and they can get their foothold in international markets making them more profitable.

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