



HACCP in hotel industry: A study on its application in food production

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Abstract

Hazards Analysis Critical Control Point (HACCP) was developed as a management tool to provide a structured approach to control identified hazards. It was jointly developed by Pillsbury organization and NASA in 1960's with an objective to provide food products for astronaut consumption in space. This is now widely used in food industry to ensure safe food for consumer. This paper describes the principles and procedures of HACCP. The purpose of this study is to design/modify the generic HACCP models for food production in hotel kitchen. If hotel intend to produce a good quality food, then hotel kitchens would have to implement a HACCP systems as well as GMPs. HACCP was jointly developed by Pillsbury Organization and NASA in 1960's with an objective to provide food products for astronaut consumption in space. It is a management tool used to ensure food safety. HACCP is a very useful commercial business tool that be used to improve the quality of food product; ensure safety of food products and reduce the risk of food poisoning. It is an internationally recognized methodology for preventing food safety hazards. HACCP uses a system of monitoring Critical Control Points (CCPs) at steps in a food production process where a potential critical hazard to food safety has been identified. If the monitoring result is outside the critical limit (a warning sign), a pre -determined corrective action is implemented to prevent the hazard from occurring. The goal for HACCP is to develop a system, which is built on preventing problems before they occur. The safety of the food product is built into the process of producing the product rather than relying on inspection only after food has been prepared. This system truly puts the responsibility for producing safe food in the hands of industry, including not only management but also individuals who handle food products. This is why staff training is such an important part of the HACCP implementation process.

Keywords: ISO 22000, HACCP, GMPs, CCPs, Food safety & quality

Introduction: Review of Literature

Food safety is a global concern. It is the responsibility of all individuals in the food chain. It starts on farm, continues with the food manufacturers and distributor, and ends with the consumer. To prevent food from being contaminated at any point of this 'Farm to table continuum', the international organisation for standardization (ISO) published a standard that describes the requirements for a food safety system. This standard (ISO 22001) links together the following requirements to ensure food safety.

HACCP (Hazard analysis and Critical Control Point) Pre-requisite Programmes and a formal management system.

While hazard analysis and critical point is an effective tool to prevent food from being contaminated with food safety hazards it is net a standalone system. It must be supported by a foundation such as GAP (Good Agricultural Practices) and GMP (Good Manufacturing practices) that are described as prerequisite programme. Food Safety is a scientific discipline describing the handling, Preparation and storage of food in ways that prevent food borne illness.

It is apparent that traditional quality control in completely unable to eliminate quality problems as such a preventative strategy based on thorough analysis of prevailing conditions which provides assurance that objective of the quality

assurance programme are met. This has been developed into Hazards Analysis Critical control Point. This primarily aims at guaranteeing food safety but can easily be extended to cover spoilage economic fraud.

What is HACCP?

Traditionally, industry and regulators have depended on spot-checks of manufacturing conditions and random sampling of final products to ensure safe food. This approach, however, tends to be reactive, rather than preventive, and can be less efficient than the new system. The new system is known as HACCP (Hazard Analysis and Critical Control Point). HACCP has been endorsed by National Academy of Sciences, the codex Alimentarius commission (an international food standard setting organization), and National Advisory committee on microbiological criteria for Foods. A number of U.S food companies already use the system in their manufacturing processes, and it is in use other countries including Canada. HACCP is a management system in which food safety is addressed through the analysis and control is biological Chemical and Physical hazards from raw material production procurement and handling to manufacturing, distribution and consumption of the finished product. Hence, HACCP is an effective and rational means of assuring food safety from harvest to consumption. HACCP is designed for use in all segments of the food industry from growing,

harvesting processing, manufacturing, distributing and merchandising to preparing food for consumption. Food safety systems based on the HACCP principles have been successfully applied in food processing plants, retail food stores, and food service operation. The seven principles of HACCP have been universally accepted by Govt. Agencies, trade associations and food industry around the world.

Emerging Role of Accreditation

Since foods is a highly regulated sector are around the world, and food safety is an issue of great concern, all countries have imposed standards by regulation be it USA or EC or even Nepal. These standards not only cover product requirements but increasingly HACCP. Compliance is being sought especially in high risk Sector live meat, fisheries, dairy products etc. Indian industry is required not only to comply with such standards but also demonstrate compliance through independent compliance through independent mechanisms. To ensure that certification/ inspection/ testing is recognized elsewhere in world, it would increasingly be necessary to go to accredited bodies.

Review of Literature

Anita Eves & Panagiota Dervisi (2005) ^[6] has studied 'Experiences of the implementation and operation hazard analysis critical control points in the food service sector' This study explored experiences of implementation and operation of hazard analysis critical control points (HACCP) in food service sector through in depth interviews with seven food service outlets in the south-east of England. Experiences highlighted a number of barriers to the successful implementation and operation of HACCP, and also perceived benefits. Barriers included difficulties of identifying hazards, inadequate knowledge, time related issues related to monitoring and recording, excessive documentation, convincing staff of importance of the system, and increased costs. Perceived benefits included protecting the business from otherwise unforeseen problems and providing evidence of 'due diligence'. There was however, an attitude of compliance, rather than true recognition of the value of the system. Chichy (1982) ^[4] has presented paper on 'HACCP as a quality assurance tool in a commissary food service system'. He has started that critical control point analysis of the production of ground nut in a commissary food service system revealed deficiencies in coming raw product handling practices, weight control, sanitation and sensory evaluation that are susceptible to correction levy the application of quality assurance/quality control?(QA/QC) principles.

A review of food safety and food hygiene training studies in the commercial sector Egan M.B & Dean M.S (2005) ^[5], identified methods on the effectiveness of food safety and food hygiene training in the commercial sector of the food Industry. In particular it focuses on those studies that have tried to evaluate the effectiveness of such training. Forty six studies of food hygiene training are included which used some outcome measure to assess the effectiveness of training. The short term nature and variety of measures used limited the majority of studies. The need for the development of evaluation criteria of effectiveness of food hygiene training is discussed. Murat Bas, Azmi Safak Ersun & Gokhan kiranc

(2000) have evaluated knowledge attitudes and practices concerning food safety issues among food handlers in Turkey. they conducted face to face interview and administrating questionnaire of the 764 food handlers who responded 9.6% were involved in touching or distributing unwrapped foods routinely and use protective gloves during their working activity. A majority of participants (47.8%) had not taken basic food safety training. The mean food safety knowledge scores were 43.4 +/- 16.3. The study demonstrated that food handlers in Turkish food businesses often have lack of knowledge regarding the basic food hygiene (critical temperatures of hot or cold ready to eat foods, acceptable refrigerator temperature ranges and cross-contamination etc.). There is an immediate need for education and increasing awareness among food handlers regarding safe food handling practices. Bark Seung-Hee, Ham II Sunny and yang sun (2006) ^[2] have studied 'a cross cultural comparison of fast food restaurant selection criteria between Korean and Filipino college students' and mentioned, despite the globalization of the hospitality and tourism industry present cross cultural research is limited to examining consumer behaviors or perception on the products and services the industry provides. The analysis of the data for the study, and the analysis revealed that both Koreans and Filipinos viewed Menu price as most important attributes. Next important attribute in Korea was followed by brand. This type of study is requisite for globalization of the food service industry in developing effective marketing strategies by understanding the different components of Asian food service industry relative to the U.S market.

Seaman Phillip and Eves Anita (2005) ^[6] have presented research paper on 'The management of food safety-the role of food hygiene training in the U.K service sector. This paper reviews the literature pertaining to the role of food hygiene training in a strategy to manage food safety. Traditional assumption that the provision of knowledge alone will lead to changes in attitudes and performance has been shown to be ill founded. A multitude of factors relating to the course itself, and events pre and post-training have shown to mitigate the effectiveness of training in bringing about desired changes in behaviour. Effective and relevant food hygiene training delivered with the support of the organization, adequate resources and the peer support of the colleagues will have a greater effect on intention and actual behaviour of the food handler, increasing the likelihood that safe working practices are carried out all times. Such approaches are necessary if hygiene training is to have impact on food safety management. Further investigation into the motivational factors and beliefs of food handler in relation to food hygiene training, its relevance in their working environment and its effectiveness are needed to aid the development and delivery of more effective food hygiene training methods. Jennifer (1998) pointed out that a small hygiene management survey of catering managers is described. The main difficulties managers encounter are poor building design and problems associated with staff training and competence. Monitoring and control methods focus on staff performance and objective monitoring of cleaning chemicals is rare. The overall conclusion is that qualitative and quantitative monitoring is needed to facilitate the service of clean, safe food. further,

Cengizhan Acikel, Recai Ogur, Hakan Yaren, ErcanGocgeldi, Muharrem Ucar and Tayfun kir (2000) highlighted that food related infection is an important health problem in many countries.

India has just started understanding the importance of hygiene and food safety in food/hospitality sector. Hospitality industry is yet to make it part of their day to day business so researches are also in its primitive stage. So, very few studies are conducted. At present Govt. of India is fully geared up its machinery to create awareness about the importance of hygiene and food safety. Government of India bodies like CFTRI and QCI is involved in carrying out sole research work. Few NGO's are also coming up to further take it to grass root level. Amitava (2008) explored how the Indian food industry is taking on the HACCP challenge. He mentions that there was plethora of safety codes advising on every aspect of food production all over the world. And the need for having them has been felt more acutely too. But the few codes have had such a wide impact on modern food production as HACCP. More Indian companies are gunning for HACCP Certification nowadays. Thus, in recent times, several medium and large food companies in India have gone ahead got themselves certified – among these are MTR Foods, Nirula's, Dabur Real, and Niligiri Dairy Farm. On the other hand hospitality majors like the Taj group have also taken the lead in earning the HACCP label. Among the states, kerala has taken lead by opening a national centre for food quality hygiene Safety programme certification in Thiruvananthapuram. The centre aims to develop a team of experts in the design, implementation, audit and certification of food safety systems. Sharad Hasamnis of Bureau Veritas Quality International, which claims to have about 25 of Indian HACCP Certification market, says, there are several Indian specific problems like issues of pesticides residue in food. As far as the GMP norms are concerned, people are picking up but there is a scope of improvement.

The current version of the Recommended International Code of Practice-General Principles of Food Hygiene (1) on HACCP System and Guidelines for its Application was adopted by the CAC in 1997. Amendments regarding rinsing adopted in 1999. HACCP Guidelines were revised in 2003 (2). The Code has been sent to all Member Nations and Associate Members of FAO and WHO as an advisory text, and it is for individual governments to decide what use they wish to make of the Guidelines. CAC is the originator of the Codex methodology. The methodology was developed to address food safety issues. Prior to application of HACCP to any sector of the food chain, that sector should have in place pre-requisite programs such as good hygienic practices according to the Codex General Principles of Food Hygiene, the appropriate Codex Codes of Practice, and appropriate food safety requirements.

Assemble a HACCP Team

The food operation should assure that the appropriate product specific knowledge and expertise is available for the development of an effective HACCP plan. Optimally, this may be accomplished by assembling a multidisciplinary team. Where such expertise is not available on site, expert advice must be obtained from other sources, such as, trade and

industry associations, independent experts, regulatory Authorities, HACCP literature and HACCP guidance (including sector -specific HACCP guides). It may be possible that a well-trained individual with access to such guidance is able to implement HACCP in-House (Codex HACCP guidelines, 2003) (1).

- Composition of HACCP team:
- The HACCP team could be formed of specialists from the hotel industry:
- General Manager
- Executive Chef
- Food& Beverage Managers
- Purchase Manager
- Food& Beverage Controller
- Personnel/HRD Manager
- Training Manager

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 company's management.

Construction of Flow Diagram

The HACCP team should construct the flow diagram. The flow diagram should cover all steps in the operation for a specific product. The same flow diagram may be used for a number of products that are manufactured using similar processing steps. When applying HACCP to a given operation, consideration should be given to steps preceding and following the specified operation. A flow diagram for food production process has been shown in table 1.

Table 1: Food Production Process

Step	Process
1	Menu Planning
2	Purchase of ingredients
3	Receipt/Receiving
4	Inspection
5	Storage
6	Issue to kitchen units
7	Preparation for cooking (Mis-en -place)
8	Cooking
9	Temporary storage/ Holding
10	Portioning into containers
11	Service
12	Cleaning& Maintenance

On-site Confirmation of Flow Diagram Steps must be taken to confirm the processing operation against the flow diagram during all stages and hours of operation and amend the flow diagram where appropriate. The confirmation of the flow diagram should be performed by a person or persons with sufficient knowledge of the processing operation.

Hazard Analysis: Identification of Potential Hazards List all potential hazards associated with each step, conduct a hazard analysis, and consider any measures to control identified hazards (Codex 2003). The term "hazard" is used to describe a potential adverse health effect for the consumer, which may be of a biological, chemical or physical nature. The HACCP team should list all of the hazards from the flow diagram that

may be reasonably expected to occur at each step according to the scope from primary production, processing, manufacture, and distribution until the point of consumption. The HACCP team should next conduct a hazard analysis to identify for the HACCP plan, which hazards are of such a nature that their elimination or reduction to acceptable levels is essential to the production of a safe food. In conducting the hazard analysis, wherever possible the following should be included: The likely occurrence of hazards and severity of their adverse health effects, The qualitative and/or quantitative evaluation

of the presence of hazards, Survival or multiplication of micro-organisms of concern, production or persistence in foods of toxins, chemicals or physical agents; and Conditions leading to the above.

Consideration should be given to what control measures, if any exist, can be applied to each hazard. More than one control measure may be required to control a specific hazard(s) and more than one Hazard may be controlled by a specified control measure. A flow diagram of potential risks in food production has been shown in table 2.

Table 2: Potential Risks in Food Production

Step	Process	Potential Risks
1	Menu panning	Forecasting/Intrinsic factors
2	Purchase	Ingredients
3	Receiving	Equipment/facility design
4	Inspection	Standard specification
5	Storage	Facility design
6	Issue to kitchen units	Condition of storage/ Packaging
7	Preparation for cooking	Hygiene& procedures used for pre-cooking
8	Cooking	Staff hygiene, health& education
9	Temporary storage	Microbial content of food
10	Portioning into containers.	Equipment design & hygiene
11	Service	Intended consumer
12	Cleaning& Maintenance	Sanitation

Determination of Critical Control Points (CCPS)

A CCP is a point, process or procedure for which control measures can be applied and which is essential to prevent or eliminate a health hazard posed by a finished product or to reduce it to an acceptable level. There may be more than one CCP at which control is applied to address the same hazard. The Determination of a CCP in the HACCP system can be facilitated by the application of a decision tree (e.g., Diagram 2) (2), which indicates a logic reasoning approach. Application of a decision tree should be Flexible, given whether the operation is for production, processing, storage, distribution or other. It should be used for guidance when determining CCPs. This example of a decision tree may not be applicable to all situations. Other approaches may be used. Training in the application of the decision tree is recommended. If a hazard has been identified at a step where control is necessary for safety, and no control measure exists at that step, or any other, then the product or process should be modified at that step, or at any earlier or later stage, to include a control measure.

- Critical Control Points (CCP'S) In Food Production Process
- Inspection of goods on delivery and before use. This includes temperature checks. Correct and separate storage.
- Proper handling of ingredients and finished products.
- Correct temperature ranges for refrigerated and frozen products.
- Cleaning of equipments and utensils.
- Cross-contamination with other Menu Items.
- Personal hygiene and health standards.
- Establishing Critical Limit(s) for Each CCP

Critical limits must be specified and validated for each Critical Control Point. In some cases more than one critical limit will

be elaborated at a particular step. Criteria often used include measurements of temperature, time, moisture level, pH, Aw, available chlorine, and sensory parameters such as visual appearance and texture.

Where HACCP guidance developed by experts has been used to establish the critical limits, care should be taken to ensure that these limits fully apply to the specific operation, product or groups of products under consideration. These critical limits should be measurable.

Establishing a Monitoring System for each CCP

Monitoring is the scheduled measurement or observation of a CCP relative to its critical limits. The monitoring procedures must be able to detect loss of control at the CCP. Further, monitoring should ideally provide this information in time to make adjustments to ensure control of the process to prevent violating the critical limits. Where possible, process adjustments should be made when monitoring results indicate a trend towards loss of control at a CCP. The adjustments should be taken before a deviation occurs. Data derived from monitoring must be evaluated by a designated person with knowledge and authority to carry out corrective actions when indicated. If monitoring is not continuous, then the amount or frequency of monitoring must be sufficient to guarantee the CCP is in control. Most monitoring procedures for CCPs will need to be done rapidly because they relate to on-line processes and there will not be time for lengthy analytical testing. Physical and chemical measurements are often preferred to microbiological testing because they may be done rapidly and can often indicate the microbiological control of the product. All records and documents associated with monitoring CCPs must be signed by the person(s) doing the monitoring and by a responsible reviewing official(s) of the company.

Establishing Corrective Actions

Corrective actions are established for use in cases when a CCP is no longer under control. These actions stipulate what should be done with the product produced during this period and how the CCP should be brought back under control. Specific corrective actions must be developed for each CCP in the HACCP system in order to deal with deviations when they occur. The actions must ensure that the CCP has been brought under control. Actions taken must also include proper disposition of the affected product. Deviation and product disposition procedures must be documented in the HACCP record keeping.

Need for HACCP in Future

New Challenges to the world food supply have prompted us to consider adopting a HACCP based food safety system on wider basis one of the most important challenges is the increasing number of new food pathogens. There is also increasing public health concern about chemical contamination of food e.g. the effects of lead in food on the nervous system. Another important factor is size of the food industry and the diversity of products and processes have grown tremendously in the amount of domestic food manufactured and the number and kinds of foods imported. The need for HACCP in future is further fuelled by the growing trend in international trade for worldwide equivalence of food products and codex alimentations commission adoption of HACCP as the international standard for food safety.

Conclusion

HACCP is a very useful commercial business tool that be used to improve the quality of food product; ensure safety of food products and reduce the risk of food poisoning. It is an internationally recognized methodology for preventing food safety hazards. HACCP uses a system of monitoring Critical Control Points (CCPs) at steps in a food production process where a potential critical hazard to food safety has been identified. If the monitoring result is outside the critical limit (a warning sign), a pre-determined corrective action is implemented to prevent the hazard from occurring. The goal for HACCP is to develop a system, which is built on preventing problems before they occur. The safety of the food product is built into the process of producing the product rather than relying on inspection only after food has been prepared. This system truly puts the responsibility for producing safe food in the hands of industry, including not only management but also individuals who handle food products. This is why staff training is such an important part of the HACCP implementation process. In India, many hotels are ISO 9000 certified but none has gone for ISO 22000 FSMS, which employ HACCP as a tool, and at the same time prescribes 5 prerequisites of HACCP before doing actual HACCP. Thus for Indian Hotel industry, it is high time to embrace HACCP based food safety management system and to comply with regulations of FSSA, 2006. It will also help in building brand image of industry and they can get their foothold in international markets making them more profitable.

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