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 product's 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.
Keywords: ISO 22000, HACCP, GMPs, CCPs, Food safety & quality

Introduction

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.

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 stand alone 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 safet y 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 else where in world, it would increasingly be necessary to go to accredited bodies.

Review of Literature

Anita Eves & Panagiota Dervisi (2005) 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) 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 sensor y evaluation that are susceptible to correction levy the application of qualit y 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), 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 asses the effectiveness of training. The short term nature and variet y 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%) gad 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) 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 s or perception son 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) 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 aide 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..

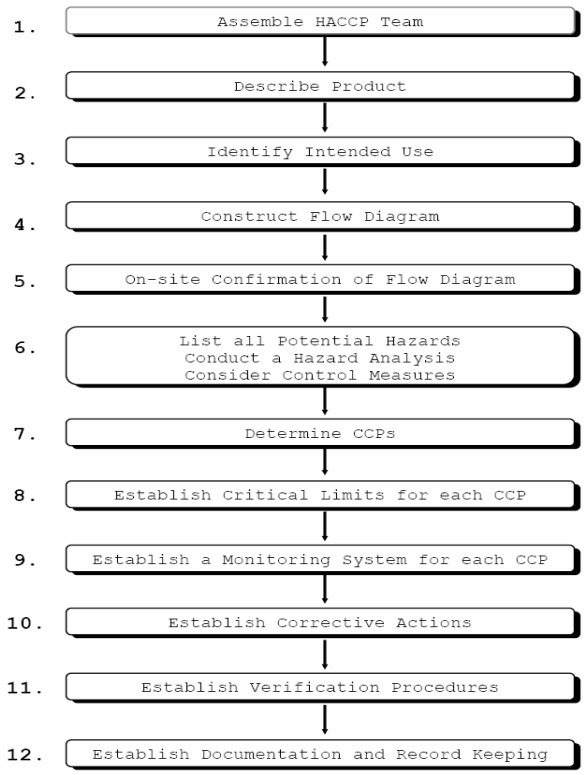
India has just started understanding the importance of hygiene and food safety in food/hospitality sector. Hospitality industry is yet to make it part of their day to da y business so researches are also in its primitive stage. So, very few studies are conducted. At present Govt. of India is fully geared 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. These prerequisite programs to HACCP, including training, should be well established, fully operational and verified in order to facilitate the successful application and implementation of the HACCP system. The application of HACCP principles consists of the following tasks as identified in the Logic Sequence for
Application of HACCP (Diagram 1, Codex) (2).

DIAGRAM 1

LOGIC SEQUENCE FOR APPLICATION OF HACCP



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For food production Process the scope of the HACCP concept (1) covers the production and storage of raw materials as well as its transportation.

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:

i. General Manager
ii. Executive Chef
iii. Food& Beverage Managers
iv. Purchase Manager
v. Food& Beverage Controller
vi. Personnel/HRD Manager
vii. 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.

Description of Product

A full description of the product should be drawn up, including relevant safety information. Within businesses with multiple products, it may be effective to group products with similar characteristics or processing steps, for the purpose of development of the HACCP plan.

The product description may contain such information's as:

- Product characteristics (physical/chemical structure (including Aw, pH, etc), microbial/static treatments (heat-treatment, freezing, brining, smoking, etc)
- Product composition
- Storage requirements
- Packaging
- Method of distribution
- Placing on the market.

Identification of Intended Use

The intended use should be based on the expected uses of the product by the end user or consumer. In Specific cases, vulnerable groups of the population, e.g. institutional feeding, may have to be considered.

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 Planning	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

1. Inspection of goods on delivery and before use. This includes temperature checks.
2. Correct and separate storage.
3. Proper handling of ingredients and finished products.
4. Correct temperature ranges for refrigerated and frozen products.
5. Cleaning of equipments and utensils.
6. Cross-contamination with other Menu Items.
7. 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 authorit y 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 the y 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.

Establishing Verification Procedures

This is a procedure which is used to confirm the effectiveness of the HACCP concept. Verification and auditing methods, procedures and tests, including random sampling and analysis, can be used to determine if the HACCP system is working correctly. The frequency of verification should be sufficient to confirm that the HACCP system is working effectively. Verification should be carried out by someone other than the person

who is responsible for performing the monitoring and corrective actions. Where certain verification activities cannot be performed in house, verification should be performed on behalf of the business by external experts or qualified third parties. Examples of verification activities include:

- Review of the HACCP system and plan and its records;
- Review of deviations and product dispositions;
- Confirmation that CCPs are kept under control.
- Internal audits,
- Factory tours / site visits,
- Evaluation of complaints.

Where possible, validation activities should include actions to confirm the efficacy of all elements of the HACCP system.

Establishing Documentation and Record keeping

Efficient and accurate record keeping is essential to the application of a HACCP system. HACCP procedures should be documented. Documentation and record keeping should be appropriate to the nature and size of the operation and sufficient to assist the business to verify that the HACCP controls are in place and being maintained. Expertly developed HACCP guidance materials (e.g. sector-specific HACCP guides) may be utilized as part of the documentation, provided that those materials reflect the specific food operations of the business. Documentation examples are:

- Hazard analysis;
- CCP determination
- Critical limit determination.

Record examples are:

- CCP monitoring activities;
- Deviations and associated corrective actions;
- Verification procedures performed;
- Modifications to the HACCP plan

An example of a HACCP worksheet for the development of a HACCP plan is depicted in diagram 3(Codex). A simple record-keeping system can be effective and easily communicated to employees. It may be integrated into existing operations and may use existing paperwork, such as delivery invoices and checklists to record, for example, product temperatures.

DIAGRAM 3

EXAMPLE OF A HACCP WORKSHEET

1. Describe Product

2. Diagram Process Flow

3.

LIST							
Step	Hazard(s)	Control Measure(s)	CCPs	Critical Limit(s)	Monitoring Procedure(s)	Corrective Action(s)	Record(s)

4. Verification

Process of HACCP in Food production

Step1 : Menu Planning

The menu that is offered, impacts purchasing, receiving, storage, equipment, cooking personnel and methods. It is therefore essential that great care is taken in what establishment wishes to offer. From the food safety point of view, restrict the number of raw materials purchased, as each would have its special condition for storage. The establishment would like to control storage conditions so that raw materials are fresh and edible at the time of service. The standard for all the raw materials have to be set. The correct quality or grade of food products must be stated and available all the times.

Step 2 : Purchase

- For purchasing, if unreliable and unhygienic suppliers are used then there are chances of food becoming contaminated? To control this purchase should be done from reliable and hygienic supplier.

Step3: Receiving /Receipt

-If the packaging of the product is damaged then food becomes contaminated with pathogens or foreign bodies such as strings, staples and wood splinters
- If the food product is expired then there is a possibility of contamination.
-If the delivery temperature is to high , allowing any pathogen to increase in number.
To control above hazards, following measures have to be taken-
-Reject deliveries with damaged packaging.
- Check the date stamps.
-Check the temperature of delivered frozen products. It must not be higher than-15C.
-The receiving facilities have to be well sanitized and equipments and tools should not create cross contamination.

Step 4: Inspection

Perishable items such as Meat, Fish, Poultry, Milk& Milk products, Fruits &Vegetables are brought by supplier on daily basis in hotels. These items have to be inspected by chef (Food/ Kitchen expert) to ensure quality as per standards and then received. It is generally not stored, directly issued / transferred to kitchen units.

Step 5: Storage

- Frozen deliveries are left at room temperature for too long; could lead to an increase in contamination.
-Frozen products are stored in freezers, which are too warm; could allow some pathogens to multiply.
- No stock rotatation is observed; products get out of date, leading to an increase in contamination.
- The product packaging is inadequate/ damaged leading to the food becoming contaminated.
To check above hazards, following control measures have to be taken-
- Store frozen products immediately in freezers.
- Check the temperature of the freezer, frozen products must be stored at –18C.
-Stack stored food to allow the first in to be used before the last in. Avoid over stocking.
- Check that the packaging of the food is clean and adequate.
-Dry stores are kept at 20C to 25C away from any stem or gas pipes.
-Perishables are kept in deep freezes at 0 C to 25 C while cold storage are maintained between 0 C to 5 C.

Step 6 : Issue to Kitchen Units

The control point of issuing is to ensure that authorized persons withdraw items from the store and that spoiled items from the store are not issued. The FIFO method is employed to ensure that items are kept in store for along time.

Step 7 : Preparation for Cooking

Food preparation control is most important from safety point first items are received from the stores are unwrapped and exposed to room temperature of kitchen, a potential source of cross- contamination. The temperature danger zone for all food items are5 C to 60 C.
-Raw vegetables& fruits must be washed before the use.

-Thaw frozen food in cold refrigerator first. Never thaw in at room temperature.
-All equipments should be properly cleaned; rusty tools& equipments must be discarded.
- All preparation surfaces must be sanitized after each preparation
-The size, weight and portion advertised on the menu must be accurate.
- Portion sizes must be accurate.

Step 8 : Cooking

-Sensory tests should be used to repeatedly to evaluate the quality of food.
-All items used for preparation of a dish must be assembled to introduce at the right time in the food preparation.
- Food preparation must strictly follow the standard recipe instructions.

Step 9 : Temporary Storage

-Holding is the time period between the completion of food preparation and service. Ideally food should be served immediately.
-Hot food should not be allowed to cool. They must be kept in hot cases at 60 C or above.
- Left food from buffet must be cooled fro 60 C to 21 C within 2 hr. or 70 C to 5 C within 4hr.
-Leftovers must be chilled for future use in pans that are no more than 4 inches deep to manage heat transfer.
-The pots used must be properly sealed.
- Leftovers must be stored in stainless steel pots.
-Cold items like salad and deserts can be held in cold refrigerator.
- When reheating the food must attain a minimum internal temperature of 74 C for 15 seconds.
-Establishments should use proper holding equipment with temperature gauge, such as Bain Marie for food, warming drawers for breads and infrared lamps to keep pre-plated food warm, cold holding equipments for salads and desserts and hot cases.
-Holding equipments such as Bain Marie must be replenished frequently to keep food fresh.
-Staff must use thermometers to monitor temperature of food and holding equipment.
- Holding equipment must be cleaned and sanitized immediately after use.

Step 10 : Portioning into Containers

- Proper tools like plastic gloves, ladles, scoops etc must be used while portioning.
-Ensure that these equipments are cleaned& sanitized before & after use.
-Portion size for portioning should be standardized.
-Containers in which food to be served after portioning has to be cleaned & sanitized.

Step 11 : Service

-If service is delayed then there may be an increase in contamination.
-If hands of delivery staff are not clean, cross- contamination is possible.
The control measure for above are-
- Delivery staff to wrap meal during transit.
-Meals should not left unattended on side-table.
-Temperature checks of sample meal to be taken at the end of delivery on regular basis.

-Service should maintain standard of personal hygiene.
-Tableware& service ware must be cleaned, polished and sanitized before use.

Step 12: Cleaning and Maintenance

The cleaning and maintenance of kitchen and service equipment need special care-
- Handle cleaning agents as per the labels, potency & toxic qualities.
-Cleaning agents must be locked in separate cupboards away from cooking areas.
-Kitchen and service equipments must be sanitized every day at the end of the shift.
- Manual cleaning systems must have the three sink approach- wash, rinse and sanitize. Hot water must be brought at least at 77 C for minimum of 30 seconds to bring effective sanitization.
-The water used for washing, rinsing, and sanitizing must be changed frequently.

Table 4; Food production Flow process in hotels

Process/Steps	**Hazard**	**Control**	**Critical Limit**	**Monitoring**	**Corrective Action**
Menu planning	Forecasting/Intrinsic factors	Proper planning	-	F & B Manager & Executive Chef should operate in close co ordination	-
Purchase	Contamination, Pathogens, moulds or foreign bodies present	Approved supplier	-	G.M & Department Head/ should monitor all purchases/scan suppliers.	Change Supplier
Transportation /Receiving	Multiplication of harmful bacteria, chemical etc.	Refrigerated Vehicle	-	Check delivery vehicle, date, marks, temperature etc.	Reject if above 8 C or Out of date
Inspection	Standard Purchase specification	Daily check by chef	-	Check delivery daily while receiving	Reject if not as per specificatio n
Storage	Bacterial growth& further contamination, bacteria, chemicals	Store below 5 C, separate raw & cooked foods, stock rotation	Food below 5 C	Check & record temperature; twice a day; check date mark	Discard if sign of spoilage or past date mark
Issuing	Condition of storage/ packaging	FIFO method	-	By use of tool like Bin card & Meat tag	-
Pre-preparation (Mis-en-place)	Bacterial growth & further contamination	Good personal hygiene, clean equipment & hygienic premises	-	Supervisor to audit at regular intervals; visual check, cleaning schedule	Discard if mis-en-place kept for more than 6 hr.

Cooking	Survival of harmful bacteria.	Thorough cooking	75 C	Check and record temperature & time	Continue cooking to 75 C
Temporary Storage	Multiplication; contamination	Proper temperature & clean –sanitized holding equipments	Holding for longer duration	Ensure holding temperature.	-
Portioning into containers	Multiplication; contamination	Proper clean & sanitized portioning equipments	-	Ensure hygienic surrounding and conditions.	-
Service	Cross-contamination.	Good personal hygiene, clean equipment & hygienic premises	-	Check staff grooming/ hygiene	-
Cleaning & Maintenance	Survival of harmful bacteria & contamination	Proper cleaning schedule and usage proper cleaning agents, pest control.	-	Ensure cleaning & sanitizing of entire kitchen at the end of each shift.	-

Significance of HACCP

HACCP offers a number of advantages over the system-

1 Focus on identifying and preventing hazards from contaminating food
2 Is based on sound science.
3 Pursuits more efficient and effective govt. oversight, primarily because the recordkeeping allows investigators to see how well a firms is complying with food safety laws over a periods rather than how well it is doing on any given day
4 Places responsibility for ensuring food safety appropriately on the food manufacturer or distributor.
5 Helps food companies compete more effectively in world market.
6 Reduces barriers to International trade.

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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