UNIT 9 HISTORY, BACKGROUND AND STRUCTURE OF HACCP

Structure

9.0 OBJECTIVES

This unit contains the information necessary for you or a team to:

- have a basic understanding of the principal HACCP activities and terminology;
- adopt a common approach for the identification of hazards, critical control points and critical limits; and
- understand and be aware of food safety practices.

9.1 INTRODUCTION

Hazard Analysis and Critical Control Point (HACCP) is a process control system designed to identify and prevent microbial and other hazards in food production. It includes steps designed to prevent problems before they occur and to correct deviations as soon as they are detected. Such preventive control system with documentation and verification are widely recognised by scientific authorities and international organisations as the most effective approach available for producing safe food.

- HACCP is a preventive system of hazard identification and control rather than a reactive one.
- Food processors can use it to ensure safer food products for consumers.
- To ensure safer food, the HACCP system is designed to identify hazards, establish controls, and monitor these controls. (Hazards can be in the form of harmful micro-organisms, chemical adulterants, or physical contaminants.)

Dr. Bernard Schwetz on October said, "HACCP systems represent a systematic approach to the identification and control of the biological, chemical, and physical hazards that are reasonably likely to occur in a particular food in a particular production process." He also noted that "(implementation of HACCP regulations for fruit and vegetable juices) will prevent at least 6,000 illnesses per year." In defining the roles of industry and the regulatory agencies in HACCP, the NACMCF document indicates "It is the responsibility of the food industry to develop and implement HACCP plans and for regulatory agencies to facilitate this process." Or, in other words, the role of the government is to ensure that industry adheres to their role. HACCP involves a system approach to identification of hazard, assessment of chances of occurrence of hazards during each phase, raw material procurement, manufacturing, distribution, usage of food products, and in defining the measures for hazard control. In doing so, the many drawbacks prevalent in the inspection approach are provided and HACCP overcomes shortcomings of reliance only on microbial testing. HACCP enables the producers, processors, distributors, exporters, etc., of food products to utilize technical resources efficiently and in a cost effective manner in assuring food safety. Food inspection too would be more systematic and therefore hassle-free. It would no doubt involve deployment of some additional finances initially but this would be more than compensated in the long run through consistently better quality and hence better prices and returns. HACCP has been endorsed worldwide by organisations such as *Codex Alimentarius* (a commission of the United Nations), the European Union, and by several countries including Canada, Australia, New Zealand and Japan. HACCP is a preventive system for ensuring food safety, but it is 'not a stand-alone system'. HACCP must be built upon key pre-requisite programs, such as Good Agricultural Practices (GAPs) and mandatory Good Manufacturing Practices (GMPs) (e.g., sanitation and personal hygiene programs) to make it work. The HACCP concept is used by regulators during inspections of food processors to focus their attention on the parts of the process that are most likely to affect the safety of the product. The inspection of plants operating under HACCP plans differs from traditional inspection methods of food safety control i.e.:

- Traditional methods evaluate processing practices on the day or days of inspection, while;
- The HACCP approach allows regulators to look at what happens in the plant through time by also examining the firm's monitoring and corrective action records.

9.2 FOOD CHAIN STEPS

There are different steps in the food chain:

1) Agrarian origin,

2) Transportation,

3) Storage,

4) Industrial processing, and

5) Handling by the consumer.

Every step must be covered by to ensure a high level of food safety. The whole food chain must be monitored. Various examples are cited to emphasize the care needed in the journey of the food from farm to the fork. This includes also the environment from which the food/ raw material has been sourced. Contamination/ spoilage/ bruising can occur during transportation. During faulty storage chambers/ conditions, mycotoxins can develop in cereals. During industrial processing, a minor fault in processing can lead to a major food infection outbreak for e.g. Tapeworm infection in under processed pork. Even the consumer may miss-handle the product, as in the packet needs to be stored under refrigeration but the product is kept at room temperature for a few days leading to development of bacterial toxins, or consumption after expiry date, etc.

Check Your Progress Exercise 1

Note: a) Use the space below for your answers.

b) Compare your answers with those given at the end of the unit.

1) What is the difference between HACCP and the traditional quality and safety evaluation procedures?

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2) Discuss HACCP approach in brief.

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3) What are the prerequisites in implementation of HACCP?

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4) What is meant by the term 'Farm to Fork'?

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9.3 FOOD HAZARDS

The safety of a food can be related directly to certain harmful substances that are present in food; these substances are food safety hazards. Hazard is defined as a biological, chemical, or physical agent in, or condition of, food with a potential to cause an adverse health effect. *Or* a biological, chemical or physical agent that is reasonably likely to cause illness or injury in the absence of its control.

There are three recognised categories of hazards. Biological hazards; Chemical hazards; and Physical hazards. The origin of these hazards can be from naturally occurring substances or agents in foods, from deterioration or decomposition of foods, or from contamination of foods with the hazard at various stages of their production, harvesting, storing, processing, distribution, preparation, and utilisation. For many hazards, government regulatory authorities have established acceptable level of the hazard in food. For some hazards, such as the pathogenic bacteria, there is zero tolerance i.e., the detection of the hazard in food is unacceptable.

The strategies used to address hazards in foods include:

1) The prevention or elimination of hazards, or
2) Reduction of the hazards to acceptable levels.

9.4 BIOLOGICAL HAZARDS

9.4.1 Bacteria

It is estimated that 30% of the food borne diseases in US are because of bacteria. In view of this, a brief discussion of the water borne/food borne bacterial pathogens is necessary before we proceed to the other type of hazards.

Gram negative pathogenic bacteria include:

1) Species of genera *Campylobacter*: *Campylobacter jejuni* and *C. coli* leading to *Campylobacter* enteritis, i.e., onset of gastroenteritis, fever, malaise, abdominal pain, headache, watery or sticky diarrhoea with minor traces of blood etc. The clinical symptoms may last for 10 days.

2) Salmonella: S*almonella typhimurium, S. paratyphi A and C* serotype*, S. sendai* can cause serious blood infection known as typhoid fever. The non-typhoidal strains of salmonella can cause intestinal infection lasting 1-2 days.

3) Diarrhoeagenic *Escherichia coli*: There are four categories of pathogenic *E.coli* viz.

   i) Enterohaemorrhagic *E. coli* (O157:H7)

ii) Enterotoxigenic *E. coli*

iii) Enteropathogenic *E.coli* (Diarrheagenic *E.coli*)

iv) Enteroinvasive *E.coli*

4) Shigella: *S. dysenteriae*

5) *Yersinia enterocolitica*: *Y. pestis* is the causative agent of plague, *Y. pseudotuberculosis* is primarily an animal pathogen but may infect humans after ingestion of contaminated food. They cause human yersiniosis, with bloody diarrhoea.

6) *Vibrio parahemolyticus*: cause gastro-enterititis including watery diarrhoea, headache, cramps

*Vibrio vulnificu*s

Vibrio cholerae: They produce heat stable enterotoxin too.

7) *Listeria monocytogenes*: Listeriosis is characterized by a severe syndrome causing meningitis, infection of central nervous system. It has a long incubation period of 2-3 months.

8) *Staphylococcus aureus*: causes infections involving the skin such as boils, wound infection, in severe cases may associate with pneumonia, meningitis, etc.

9) *Clostridium botulinum:* results in botulism causing neurological symptoms including visual disorders, paralysis.

Clostridium perfringens: may lead to symptoms ranging from simple wound infections to myonecrosis, postabortal infection, intravascular hemolysis, bacterimia, pneumonia, brain abscesses.

10) *Bacillus cereus*: Ingestion of contaminated food may lead to either diarrhoeal or emetic (nausea and vomiting) gastroenteristis. The spores are able to survive the cooking process, after which germination and subsequesnt proliferation of vegetative cells occurs at some point during storage.

11) Others like *Aeromonas* (dysentery)*, Brucella (*Brucellosis)*, Helicobacter* (Gastroenteristis, peptic/ gastric ulcers)*, Mycobacterium* (tuberculosis), *Streptococcus* (Bacteremia, endocarditis, meningitis, septic arthritis, respiratory tract and skin infection), *Pseudomonas* (infections of skin, ear, respiratory, urinary tract, bacterimia).

9.4.2 Parasites

Cyclospora cayetanensis: It is capable of causing prolonged illness with symptoms including non-bloody diarrhoea, nausea, vomiting, anorexia, bloating, malaise, fever and fatigue.

Cryptosporium parvum: In an immuno-competent individual, the symptoms may last till 23 days and be accompanied by watery diarrhoea associated with epigastric cramping, nausea and anorexia. In an immuno-compromised person, profuse diarrhoea may last for months or even years.

Giardia lamblia: After an incubation period of 12-20 days, individuals can experience subacute or chronic infections with symptoms including nausea, chills, low fever, watery diarrhoea, heartburn and reduced pancreatic function.

Sacrocystis hominis: Symptoms may include nausea, stomache and diarrhoea.

Toxoplasma gondii: Toxoplasmosis symptoms include fever, rash, headache, muscle aches and pain, swelling of lymph nodes and may persist for months.

Trichinella spiralis: It is typically associated with uncooked pork or pork products contaminated with encysted larvae. The symptoms after incubation period of 3-14 days include gastroenteritis, nausea, vomiting, headaches, fever, visual deficiencies, difficulty in breathing, chills, night sweating etc.

9.4.3 Viruses

Hepatitis A: It is associated with the fecal-oral route, and is prevalent in under-developed areas with poor sanitation. The onset of the infection is characterized by fever, malaise, nausea and vomiting. Later phase symptoms include a yellowish discoloration of mucous membranes, conjunctivae, sclera and skin, excretion of golden brown urine, and stool which is pale in colour.

Norwalk virus: Raw or slightly cooked fish and contaminated water are the major sources of this virus. Symptoms may include gastroenteritis like symptoms associated with nausea and vomiting.

Rotavirus: It is mostly associated with infection of infants and children. Infected individual, water or food may lead to this infection. Vomiting and diarrhoea for 3-8 days along with abdominal pain or fever are the major symptoms and may lead to even death.

9.5 CHEMICAL HAZARDS

Chemical contamination can happen at any stage in food production and processing. Some chemicals can be helpful and are purposefully used with some foods, such as pesticides on fruits and vegetables. These chemicals are not hazardous if properly used or controlled. Potential risks to consumers increase when chemicals are not controlled or the recommended treatment rates are exceeded. The presence of a chemical residue may not always represent a hazard. The amount or type of the chemical may determine whether it is a hazard or not. Some may require exposure over prolonged periods to have a toxic effect. Regulatory limits are set for some of those contaminants.

Chemical hazards can be separated into three categories:

1) Unintentional or incidental chemical contaminants
2) Naturally-occurring chemicals
3) Intentionally-added chemicals

Incidental Chemical Contaminants

Chemicals can become part of a food without being intentionally-added. For example, certain juices containing a high level of nitrate can cause excessive levels of tin from the container to leach into the juice. These incidental chemicals might already be part of a food ingredient or packaging material when it is received. Incidental chemicals, such as sanitizers, may come into direct contact with ingredients or the product. Most incidental chemicals have no effect on

food safety, and others are only a concern if present in excessive amounts. Incidental chemicals may also include inadvertent addition of prohibited substances such as poisons or insecticides that may not be allowed at any level.

Hazards from Environmental Contaminants in Food

The United Nations Environmental Program (UNEP) identifies the 'Persistent Organic Pollutants' with two major pathways- Terrestrial and Aquatic. Some major industrial chemicals which end-up being a part of our food are listed in Table 9.1. Apart from these, radionuclides, veterinary drug residues are also important hazards to look for. Maximum residual limits are set for drug residues in milk in most countries.

Table 9.1: Major Food Contaminants of Industrial Origin

Chemical	Source	Food Contaminated
Polychlorinated biphenyls	Electric industry	Fish, Human milk
Dioxins	Impurities in chlorophenols, Incinerator emission	Fish, Milk, Beef fat
Pentachlorophenol	Wood preservative	Various foods
Dibenzofurans	Impurities in Poly Chlorophenols (PCP) and Poly Chlorobiphenyls (PCB)	Fish
Hexachlorobenzene	Fungicide by-product	Animal fat, Dairy products, Human milk
Mirex	Pesticide	Fish, Edible mammals, Human milk
DDT and related halogenated hydrocarbons	Pesticides	Fish, Human milk
Alkyl mercury compounds	Manufacture of chlorine-soda lye, acetaldehyde, seed dressing	Fish
Lead	Automobile exhaust emission, coal combustion, lead industry	Vegetables, Fruits
Cadmium	Sewage sludge, Smelter operations	Grains, Vegetables, Meat products
Arsenic	Smelter operations	Milk, Fruits, Vegetables
Tin	Canning industry	Canned foods

Naturally – Occurring Chemicals (including allergens)

These chemicals are derived from a variety of plants, animals or micro-organisms. In most cases, these naturally-occurring chemicals are found prior to or during harvest. Naturally occurring chemicals include: allergens, mold toxins and naturally occurring toxins in food.

Allergens: The common sources of allergens in food are Egg, milk, nuts, seafood and soy. Certain varieties or species produce an allergic reaction in sensitive people. It is particularly important that foods containing components that have these ingredients clearly identify on the label. Controls might also be necessary

to prevent contamination of foods with allergens, e.g. when juice is processed on lines that are also used to process dairy foods such as milk. Such cross-contamination of foods may be classified in unintentional contamination of foods.

Mold toxins: Molds may produce aflatoxins in some foods, most common among them are apples, nuts and cereal grains. Examples are Alternaria toxins, Fumonisin, Ochratoxin, Patulin and Vomitoxin. Most countries have regulations governing their presence in foods.

Toxic components in food: Some plants/ food have toxic parts or chemicals naturally e.g. certain mushrooms, algae etc.

Intentionally – Added Chemicals

Some chemicals are intentionally-added to food at some point during production and processing. These chemicals are intended to be used at safe levels, but could present a hazard if those levels are exceeded.

- **Direct additives**
  - Preservatives (e.g., sodium benzoate and sulfiting agents)
  - Nutritional additives (e.g., calcium, vitamins)
  - Color additives
- **Indirect**
  - Packaging materials
  - Processing plant chemicals like lubricants (food grade) and sanitizers

9.6 PHYSICAL HAZARDS

Physical hazards include any potentially harmful extraneous matter not normally found in food. When a consumer mistakenly eats the foreign material or object, it is likely to cause choking, injury or other adverse health effects. Physical hazards are the most commonly reported consumer complaints because the injury occurs immediately or soon after consumption, and the source of the hazard is often easy to identify. Physical hazards present in foods are classified as glass, plastics and metals. The common sources of these agents are also mentioned below.

Glass: Bottles, jars, light fixtures, thermometers, gauge covers

Plastic: Bottles, jars, equipment and packaging material

Metal: Machinery, agricultural fields, buckshot, wire, staples, building materials, employee personal effects like jewellery (bracelets, bangles, rings, earrings), pen and its cap.

Appropriate controls like filtering, magnetic separators may need to be used to avoid these hazards in food.

Check Your Progress Exercise 2

Note: a) Use the space below for your answers.

b) Compare your answers with those given at the end of the unit.

1) Define Hazard and classify them.

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2) Which biological hazards may occur in foods? What are the reasons for them being present?

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3) What are incidental chemical hazards?

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4) Give three examples of physical hazards in food.

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9.7 HISTORY OF HACCP

The development and the initial use of HACCP can be traced to joint effort of the Pillsbury Company, together with the National Aeronautics and Space Administration (NASA) and the U.S. Army Laboratories at Natick. Their objective was to develop a strategy that would ensure that foods required for the space program were free from any unacceptable health risk. The Pillsbury Company, along with NASA and the US Army Natick laboratories pioneered the development of the HACCP approach for preventing unacceptable levels of food safety hazards.

Pillsbury decided that their existing quality control techniques did not provide adequate assurance against contamination during food production. The company found that end-product testing necessary to provide such assurance would be so extensive that little food would be available for space flights. The only way to ensure safety, Pillsbury concluded, would be to develop a preventive system that

kept hazards from occurring during production. Since then, Pillsbury's system has been recognised worldwide as the method of choice for control of food safety hazards. It is not a zero-risk system, but it is designed to minimize the risk of food safety hazards. The FDA first required HACCP-based controls for food processing in 1973 for canned foods to protect against *Clostridium botulinum*, the bacterium that causes botulism.

Table 9.2: Chronology of HACCP Development

Year	Event
1958	Foundation of the NASA (National Aeronautics and Space Administration)
1959	Development of the HACCP concept to assure one hundred per cent safety of food to be used in space.
1971	HACCP system was published and documented in the USA.
1985	National Academy of Science (NAS) recommended the use of the system. Worldwide the system became used and the FAO/WHO Codex Alimentarius (Food and Agriculture Organisation/World Health Organisation) cited the system in the Codex.
1993	The European regulation 93/43 EG from 14.7.93 provides the use of the system for the production of food.
1997	The *Codex Code on General Principles of Food Hygiene* was revised and included recommendations for the application of the Codex HACCP Guidelines.
1998	With coming into force on the August the 8th of 1998 the Hygiene Verordnung (German Hygiene Rule) demands the use of the HACCP system in Germany.
2007	Integration of HACCP with ISO 9001 to formulate Food Safety and Standards Act (ISO 22000).

Since then, the HACCP system has become the internationally-recognised and accepted method for food safety assurance. In an assessment of the effectiveness of food regulation in the United States, the National Academy of Sciences (NAS) recommended in 1985 that the HACCP approach be adopted by all regulatory agencies and that it be mandatory for food processors. This recommendation led to the formation of the National Advisory Committee on Microbiological Criteria for Foods (NACMCF). This committee standardized the HACCP principles used by industry and regulatory authorities. The committee's work is the basis of this standardized curriculum.

While it was originally developed to ensure microbiological safety of foodstuffs, it has been further broadened to include chemical and physical hazards in foods. The recent growing worldwide concern about food safety by public health authorities, consumers and other concerned parties, to a great extent due to WHO's advocacy in this field, and the continuous reports of food borne outbreaks have been a major impetus in the application of the HACCP system.

The European hygiene rule defined in the paper 94/356/EG demands for an HACCP-concept which can be integrated in a quality management system. This HACCP concept has to be developed for all products of every factory.

The application of HACCP is compatible with the implementation of quality management systems, such as the ISO 9000 series, and is the system of choice in the management of food safety within such systems. While the application of HACCP to food safety was considered here, the concept can be applied to other aspects of food quality.

9.8 BENEFITS AND BARRIERS IN IMPLEMENTING HACCP

Worldwide, it is recognised that the application of the HACCP system to food production and preparation has clear benefits and the potential of enhancing food safety and preventing many cases of food borne diseases. HACCP is a tool to assess hazards and establish control systems that focus on prevention rather than relying mainly on end-product testing. Any HACCP system is capable of accommodating change, such as advances in equipment design, processing procedures or technological developments.

HACCP can be applied throughout the food chain from the primary producer to final consumer and its implementation should be guided by scientific evidence of risks to human health. As well as enhancing food safety, implementation of HACCP can provide other significant benefits. In addition, the application of HACCP systems can aid inspection by regulatory authorities and promote international trade by increasing confidence in food safety. Let us now enumerate the benefits of implementing HACCP system.

9.8.1 Benefits

There are clear benefits of implementing HACCP for all sectors: government, food industry and consumers alike. The following benefits should encourage businesses and governments to implement HACCP:

I) Benefits to consumers

- Reduced risk of food borne disease;
- Increased awareness of basic hygiene;
- Increased confidence in the food supply; and
- Improved quality of life (health and socio-economic).

II) Benefits to industry

- Increased consumer and/or government confidence;
- Reduced legal and insurance costs;
- Increased market access;
- Reduction in production costs (reduced recall/wastage of food);
- Improved product consistency;
- Improved staff-management commitment to food safety; and
- Decreased business risk.

III) Benefits to governments

- Improved public health;
- More efficient and targeted food control;
- Reduced public health costs;
- Trade facilitation; and
- Increased confidence of the community in the food supply.

9.8.2 Barriers

A number of barriers impede the implementation of HACCP in small or less developed businesses. These barriers vary from country to country or from sector to sector. Some may be due to internal factors in individual businesses, e.g. the level of knowledge or resources available to a business. Others may be due to external factors, such as the availability of government or industry support.

The barriers may include:

- Lack of government commitment;
- Lack of customer and business demand;
- Absence of legal requirements;
- Financial constraints;
- Human resource constraints;
- Lack of expertise and/or technical support;
- Inadequate infrastructure and facilities; and
- Inadequate communications.

9.9 HACCP PRINCIPLES

The HACCP system consists of the following seven principles:

Principle 1

Conduct a hazard analysis.

Principle 2

Determine the Critical Control Points (CCPs).

Principle 3

Establish critical limit(s).

Principle 4

Establish a system to monitor control of the CCP.

Principle 5

Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.

Principle 6

Establish procedures for verification to confirm that the HACCP system is working effectively.

Principle 7

Establish documentation concerning all procedures and records appropriate to these principles and their application.

In brief, we need to first identify the likely food safety hazards in food processing beginning from the time food is harvested or animals are reared (in case of animal foods) to transportation, storage, processing, packing, warehousing, display till consumption. Thereafter, we need to see how these hazards relate to operational steps i.e., at which points of the production chain, these hazards may enter/affect the food. Then appropriate control measures are devised to prevent these hazards from entering/ affecting the food. Critical control points are identified in the processing line such that extra care is taken to ensure the absence of the hazard at that step. In case of each hazard or important step of processing, critical limits need to be set. For e.g. in case of qualitative point, whether the glass is present in the ice-cream or not, the critical limit is zero. In case of quantitative measure, say for example, the pasteurisation temperature of milk, it must not be below 71.6 ^{o}C, so this temperature is the critical limit for pasteurisation temperature else the *Mycobacterium tuberculosis* and *Coxiella burnettii* may survive in the milk. Now, we need to check whether the milk reached 71.6 ^{o}C or not so we design and incorporate some monitoring procedures like thermostats to verify it. If however, the milk does not reach the pasteurisation temperature, then corrective actions are also detailed and system is installed for the same. In case of milk, if the thermostat detects lesser temperature of the heated milk, the milk is sent to a tank and processed again. In the end, procedures for verification that the hazard is not present are laid out.

The successful application of HACCP requires the full commitment and involvement of management and the workforce. It also requires a multidisciplinary approach; this multidisciplined approach should include, when appropriate, expertise in agronomy, veterinary health, production, microbiology, medicine, public health, food technology, environmental health, chemistry, and engineering according to the particular study.

Guidelines for the Application of the HACCP System

Prior to application of HACCP to any sector of the food chain, that sector should be operating according to the Good Manufacturing Practices. Management commitment is necessary for implementation of an effective HACCP system. During hazard identification, evaluation, and subsequent operations in designing and applying HACCP systems, consideration must be given to the impact of raw materials, ingredients, food manufacturing practices, role of manufacturing processes to control hazards, likely end-use of the product, categories of consumers of concern, and epidemiological evidence relative to food safety.

The intent of the HACCP system is to focus control at CCPs. Redesign of the operation should be considered if a hazard which must be controlled is identified but no CCPs are found. HACCP should be applied to each specific operation separately. The HACCP application should be reviewed and necessary changes made when any modification is made in the product, process, or any step.

It is important when applying HACCP to be flexible where appropriate, given the context.

Check Your Progress Exercise 3

Note: a) Use the space below for your answers.

b) Compare your answers with those given at the end of the unit.

1) Define critical control point, control, critical limit.

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2) Enlist the principles of HACCP.

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3) How does industry benefit from implementing HACCP?

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4) Who pioneered HACCP and for whom?

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9.10 PROCESS OF HACCP CERTIFICATION

In India, BIS offers two Certification schemes to the food industry.

i) HACCP Stand-alone Certification against IS 15000:1998; and

ii) HACCP based Quality System Certification provides for two Certification through one audit Certification of Quality System against IS/ISO 9000 and Certification of HACCP against IS 15000:1998.

How to obtain licence?

1) Establish a documented quality system and /or HACCP implementation plan and ensure its effectiveness.

2) Submit application on prescribed proforma (Form IV of the BIS) along with the questionnaire (Form XI of the BIS) and necessary fees to Dy. Director General (of respective region).

3) Submit the quality manual and/ or concerned documents, when asked for.

4) Arrange audit by BIS Assessment Team.

5) Take actions on non-conformities observed by assessment team and get them verified. If found satisfactory, grant of licence is recommended.

6) Obtain the Licence.

The licence will enable the company to compete effectively in national and international markets.

1) **The Marine Product Export Development Authority**
MPEDA House, Panampilly Avenue
P.B.No.4272
Kochi- 682036
Export Inspection Agencies/Export Inspection Council

2) **Kerala Bureau of Industrial Promotion**
TC IX/2197, Kurups Lane,
Sasthamangalam P.O.
Thiruvananthanpuram-695 010
Tel: 0471-2311882
Fax: 0471-2311883

3) **QSI (India) Certification P. Ltd.**
557, Sector-1, Vidyadhar Nagar
Jaipur-302023
Rajasthan
Tel. No.0141-2236895
Fax: 91-141-2236133
E-mail: qsicert@gmail.com
Website: www.qsi.india.com

9.11 LET US SUM UP

HACCP is a safety management system which involves a systematic approach for identification of hazard, assessment of chances of occurrence of hazards during each phase, raw material procurement, manufacturing, distribution, usage of food products, and in defining the measures for hazard control. The safety of a food can be related directly to certain harmful substances that are present in food; these substances are food safety hazards. Hazard is defined as a biological, chemical, or physical agent in, or condition of, food with a potential to cause an adverse health effect. The HACCP system consists of the following seven principles, i) Conduct a hazard analysis, ii) Determine the Critical Control Points (CCPs), iii) Establish critical limit(s), iv) Establish a system to monitor control of the CCP, v) Establish the corrective action to be taken when monitoring

indicates that a particular CCP is not under control, vi) Establish procedures for verification to confirm that the HACCP system is working effectively, and vii) Establish documentation concerning all procedures and records appropriate to these principles and their application. Thus HACCP is a tool to assess hazards and establish control systems that focus on prevention rather than relying mainly on end-product testing. Any HACCP system is capable of accommodating change, such as advances in equipment design, processing procedures or technological developments.

9.12 KEY WORDS

Checklist : A list that contains points/elements that may be considered during assessment. It is used as an aidememoire to promote uniformity in assessment.

Control (noun) : The state wherein correct procedures are being followed and criteria are being met.

Control (verb) : To take all necessary actions to ensure and maintain compliance with criteria established in the HACCP plan.

Control Measure : An action and activity that can be used to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

Corrective Action : Any action to be taken when the results of monitoring the CCP indicate a loss of control.

Critical Control Point (CCP) : A step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

Critical Limit : A value which separates acceptability from unacceptability.

Deviation : Failure to meet a critical limit.

Flow Diagram : A systematic representation of the sequence of steps or operations used in the production or manufacture of a particular food item.

HACCP : A system which identifies, evaluates, and controls hazards which are significant for food safety.

HACCP Plan : A document prepared in accordance with the principles of HACCP to ensure control of hazards which are significant for food safety in the segment of the food chain under consideration.

Hazard : A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.

Hazard Analysis : The process of collecting and evaluating information on hazards and conditions leading to their presence to decide which are significant for food safety and therefore should be addressed in the HACCP plan.

Monitor : The act of conducting a planned sequence of observations or measurements of control parameters to assess whether a CCP is under control.

Step : A point, procedure, operation or stage in the food chain including raw materials, from primary production to final consumption.

Validation : Obtaining evidence that the elements of the HACCP plan are effective.

Verification : The application of methods, procedures, tests and other evaluations, in addition to monitoring to determine compliance with the HACCP plan.

9.13 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Your answer should include the following points:

Check Your Progress Exercise 1

1) Traditional methods evaluate processing practices on the day or days of inspection, while; HACCP approach allows regulators to look at what happens in the plant through time by also examining the firm's monitoring and corrective action records.

2) HACCP involves a avoided approach to identification of hazard, assessment of chances of occurrence of hazards during each phase, raw material procurement, manufacturing, distribution, usage of food products, and in defining the measures for hazard control. In doing so, the many drawbacks prevalent in the inspection approach are avoided and HACCP overcomes shortcomings of reliance only on microbial testing.

3) Good Agricultural Practices (GAPs) and mandatory Good Manufacturing Practices (GMPs) (e.g., sanitation and personal hygiene programs) to make it work.

4) Agrarian origin, Transportation, Storage, Industrial processing, and Handling by the consumer.

Check Your Progress Exercise 2

1) A biological, chemical or physical agent that is reasonably likely to cause illness or injury in the absence of its control.

2) Bacterial hazards/ Pathogenic bacteria; Virus infections and Parasites.

   Poor sanitation, infected water or food, fecal contamination, improper storage, and Improper cooking.

3) Chemicals can become part of a food without being intentionally-added.

4) Broken glass piece; Plastic cap or strand; nail.

Check Your Progress Exercise 3

1) Control (noun): The state wherein correct procedures are being followed and criteria are being met.

Control (verb): To take all necessary actions to ensure and maintain compliance with criteria established in the HACCP plan.

Critical Control Point: A step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

Critical limit: A value which separates acceptability from unacceptability.

2) i) Conduct a hazard analysis.
   ii) Determine the Critical Control Points (CCPs).
   iii) Establish critical limit(s).
   iv) Establish a system to monitor control of the CCP.
   v) Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.
   vi) Establish procedures for verification to confirm that the HACCP system is working effectively.
   vii) Establish documentation concerning all procedures and records appropriate to these principles and their application.

3) Increased consumer and/or government confidence; Reduced legal and insurance costs; Increased market access; Reduction in production costs (reduced recall/ wastage of food); Improved product consistency; Improved staff-management commitment to food safety; and Decreased business risk.

4) The Pillsbury Company, along with NASA and the US Army Natick laboratories.

9.14 SUGGESTED READING

HACCP *Introducing the Hazard Analysis and Critical Control Points System* (1997) Food Safety Series, Food Safety Unit, World Health Organisation.

Inteaz Ali (2004). *Food Quality Assurance: Principles and Practice*. CRC Press LLC, Florida, USA.

Schmidt, R.H. and Rodrick, G.E. (2003). *Food Safety Handbook*. Wiley Inter Science, A John Wiley and Sons Publication, New Jersey, Canada.