Module 3. Principles of Food Plant Sanitation

Thermal Processing for Meat and Poultry Products Training

USDA

Introduction

- The term “sanitation” is often applied to just the cleaning and sanitizing of equipment and production areas
- Sanitation has much broader applications:
  - includes activities designed to prevent product adulteration
  - includes activities designed to minimize spoilage (economic loss)
  - includes activities designed to prevent contamination with materials that may offend consumers (aesthetic senses)

Introduction

- Food plant sanitation addressed in federal regulations
  - FDA – CGMP regulation (21 CFR 110)
  - Specific sanitizer formulations approved by FDA are listed in 21 CFR 178.1010
  - FDA – fish and fishery products (21 CFR 123)
  - FDA – juice and juice products (21 CFR 120)
  - FSIS – meat and poultry (9 CFR 416)

Introduction

- Thermally processed foods are safe and stable because they are given a final heat treatment designed to destroy or inactivate microorganisms
- The hermetically sealed containers protect the foods against microbial recontamination before, during and after the thermal process

Introduction

- It is important to remember that the thermal processes are not designed to destroy an infinite number of microorganisms
- Canning operations must include appropriate steps to minimize the number of microorganisms that are present on the food before those foods are placed in the container

Introduction

- A comprehensive sanitation program is essential for controlling microorganisms in a food processing plant
- Chlorine and other sanitizing agents are necessary chemicals for this purpose.
- Sanitizers alone cannot ensure food safety
- Effective cleaning, proper operating procedures and practices, and appropriate controls are all important

Sources of Microbial Contamination

- The thermal process must destroy or inactivate all microorganisms capable of growing and reproducing in that product at normal conditions of storage and distribution
- Thermal processes are established to accomplish this task effectively, resulting in production of commercially sterile products
- A thermal process may be ineffective if there are excessive numbers of microorganisms present on or in the food

Sources of Microbial Contamination

- Numbers and types of microorganisms in a product depend on whether they are:
  - brought into the plant on raw products
  - picked up by the food as it passes through or over equipment or by employee contact
  - contributed by water during washing, conveying, or preparation
  - contained in ingredients added to the product
  - in the cooling water for thermally processed containers

Control of Microbial Contamination

- Because microorganisms are present on raw agricultural products, all raw products must be cleaned and washed as thoroughly as possible when they enter the plant
- Effectively cleaning and washing raw products is also essential to maintaining a clean plant

Control of Microbial Contamination

- Equipment must be cleaned frequently
  - to minimize growth on food-contact surfaces and
  - thereby minimizing transfer to the food
- Cleaning is especially important for heated equipment where a potential exists for spore build-up, particularly thermophiles:
  - Wash raw product that has passed through heated equipment, preferably in cold water
  - Keep temperature above 170°F

Control of Microbial Contamination

- Ingredients such as starch, sugars, powdered milk, and spices used in formulation are potential sources of contamination
- Most important are the thermophiles that become incorporated into the ingredients during manufacture
  - These may be controlled by using ingredients that are guaranteed by the supplier to be free of thermophilic micro-organisms

Control of Microbial Contamination

- Water used for washing, conveying, and preparing food or for cooling must be of good sanitary quality (or rendered so)
- The use of appropriate sanitizing agents is an effective method of controlling microorganisms in water, on raw product, and on equipment surfaces

Sanitizers

- Using sanitizers is important in preventing spoilage of prepared foods and in maintaining a sanitary food processing environment
- Sanitizing is defined as adequately treating food-contact surfaces by a process that is effective in
  - destroying vegetative cells of microorganisms of public health significance and
  - substantially reducing the numbers of other microorganisms

Sanitizers

- Sanitizing treatment must not adversely affect food products or their safety for consumers
- Until recently, agents most widely used in establishments were chlorine, iodine, and quaternary ammonium compounds
- Other sanitizers have received regulatory approval and have found applications in the food industry
- Chlorine compounds are still the most widely used sanitizers in the industry

Sanitation of Container Cooling Water

- With the speed of container handling operations and the vacuum in containers, small deformities in the closure cannot be completely avoided
- This may be a factor in the incidence of product spoilage due to post-process contamination

Significance of Bacteria in Cooling Water

- The bacterial condition of water in which containers are cooled is extremely important
  - Because there are 20 drops per ml, cooling water containing 100 bacteria per ml would have 5 per drop
  - The seal must protect against the entrance of 1/5 of a drop to prevent contamination.
  - Most unchlorinated cooling waters contain more than 100 bacteria per ml

Significance of Bacteria in Cooling Water

- The bacterial condition of water is important
  - However, if cooling water contained one million bacteria per ml, it would have 50,000 per drop
  - The seal must protect against the entrance of 1/50,000 of a drop to prevent contamination
  - Even the best closure would not guarantee protection against leaker spoilage at this level
- Sanitary quality of the water must be maintained

Container Cooling Water Regulations

- The FSIS regulation 9 CFR 431.6(h)(2) and (3) states that cooling water in canals or re-circulated systems must be chlorinated or otherwise sanitized
- For cooling canals, there must be a measurable residual of sanitizer where water discharged from the cooling system

Container Cooling Water Regulations

- Recirculation systems:
  - must be designed, operated and maintained so there is no buildup of organic materials
  - information on design, construction, operation and maintenance, and water quality must be provided (see 9 CFR 431.6(h))

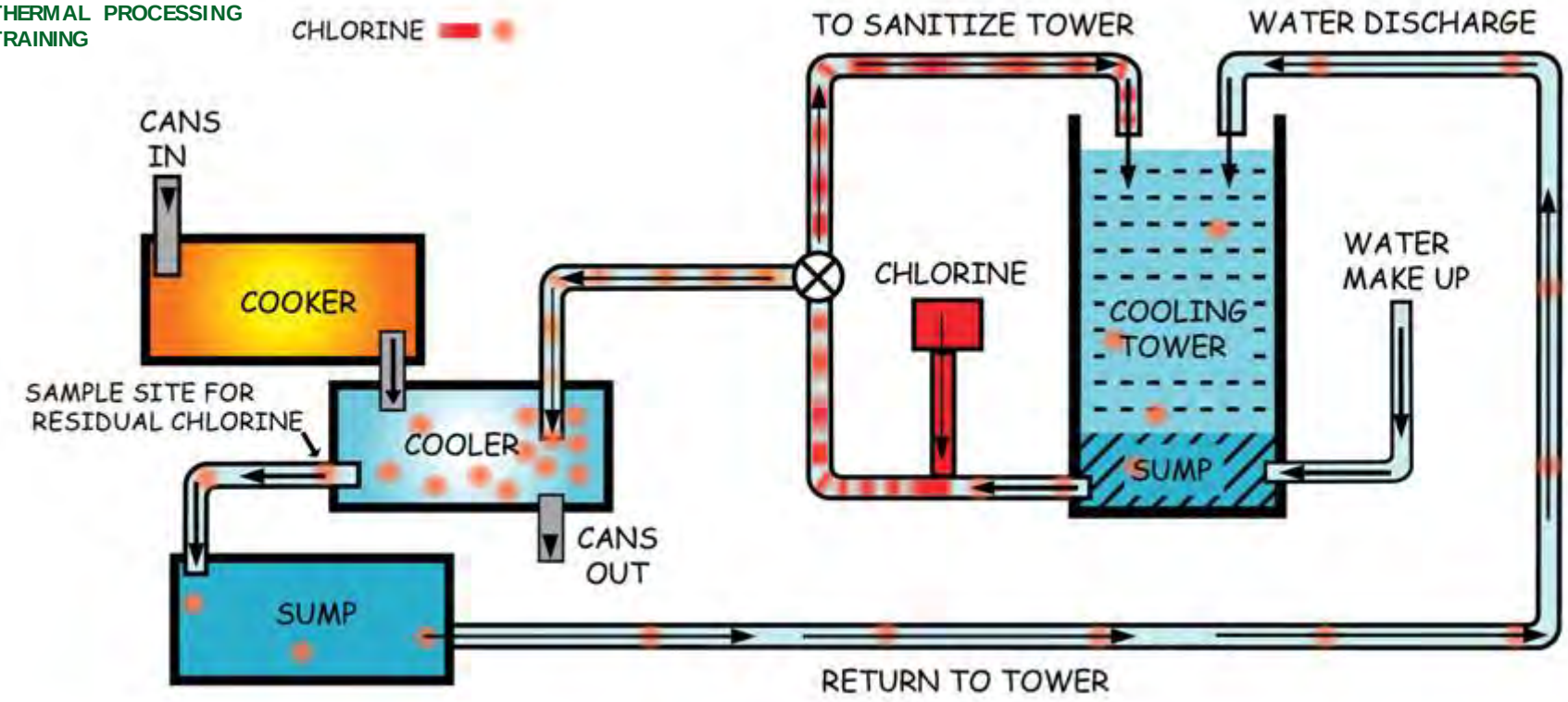
Recirculation of Container Cooling Water

- As a water conservation procedure, water is often re-circulated over a cooling tower
  - Reduces the temperature so the water can be reused for cooling
  - Microbial count can increase in a very short time
- Water must be chlorinated or otherwise sanitized before returning to the cooler

Recirculation of Container Cooling Water

- It is also desirable to sanitize the water being pumped to the cooling tower to prevent or minimize the growth in microorganisms within the tower
- When the water is chlorinated prior to the tower, some chlorine may remain
- Only minimal rechlorination is then needed to achieve the recommended chlorine level at the discharge end

Schematic of Cooling Tower Recycling System



Chlorine is added in an amount required to maintain a measurable residual of chlorine at the water discharge of the container cooler. Periodically, highly chlorinated water may be recycled through the cooling tower to “burn off” microbial slime growth from the tower surfaces.

Recirculation of Container Cooling Water

- One advantage of treating recycled cooling water with a sanitizer is that spores are exposed for a prolonged period of time to the germicidal action of the sanitizer

Questions

Questions?