Module 12. Hydrostatic Retorts

9 CFR 431.6(b)(5) Hydrostatic Retorts

USDA
Purpose of Module 12

- Provide an understanding of components and operation of equipment used for hydrostatic retorts.

Performance Objective

- Assess compliance of hydrostatic retort equipment and perform inspections
Hydrostatic Retort

Drive motor for inner can conveyor

Upper platform

Cooling tower

Discharge leg

Steam dome

Feed leg

Outer can conveyor

Inner can conveyor

Feed/discharge complex (inner)

Feed/discharge complex (outer)

Control console

Operator’s platform
Introduction

- Constant process temperature
- Continuous container conveyor
- Steam or cascading water with overpressure
- Hydrostatic pressure of water columns counterbalance steam pressure
- Maximum process temperature limited by maximum height of legs
Description of System

Container-Conveyor:

- Carriers for holding containers
- Carriers limit container sizes
- Multiple container-conveyors
A variety of mechanisms are used to load and unload containers from conveyor.
Feed and Discharge Stations (2)
In-Feed Section

- Extends from feed station to entry into first water column
- Section may be covered
Feed or Inlet Leg

- Water column(s) prior to entry into processing chamber
- Independent temperature control
- Steam injection at base
Processing Chamber (Steam Dome)

- Temperature control independent of water legs
- In steam retorts referred to as "steam dome"
Discharge or Exit Leg

- Water column(s) prior to return to atmospheric pressure
- Independent temperature control
Discharge Leg Temperature

- Steam injection to heat
- Maintained by container heat (primary)
- Cross-circulation between legs (usually done)
- Heat exchanger to cool leg if more rapid cooling is desired
Water Circulation and Temperature Control
Container Cooling

- Cascading water
- Water sprays
Installation and Operation of Retorts
Temperature Indicating Device

- Each processing chamber **must** have temperature indicating device and temperature/time recorder

- **Must** be installed near steam-water interface 3 inches above maximum water level
When minimum temperature in the water legs is specified in process schedule there **must** be:

1. Temperature indicating device

2. Temperature/ time recorder
Bulb **must** be installed in processing chamber

Between steam-water interface and lowest container position
Steam Controller

- **Must** have an automatic steam controller
- May be recorder-controller
Preparation for Processing

- Operating procedures must be documented by manufacturer or processing authority
- Steam dome must be vented – The firm should refer to the equipment manufacturers’ instructions for venting or have a written vent schedule from their Process Authority
Bleeders must be:

- 1/4-inch or larger opening
- Located opposite steam entry
- Wide open during processing
- Arranged to observe functioning
Water Level Control

- Level defines conveyor length in processing chamber(s) or steam dome
- Level affected by height of water legs and processing chamber temperature/pressure
- Called steam-water interface
Water Level:

- Maximum level established by manufacturer

Water level fluctuations:

- Affect process time
- Caused by containers entering and leaving water legs
- Level controlled by system that adds and removes water to the legs
Process Timing

- Container-conveyor is driven by variable speed motor
- Changing container-conveyor speed changes process time
The Container Conveyor Speed must:

- Be checked and recorded at start of processing and must be checked and recorded at intervals not to exceed 4 hours to ensure correct chain speed.
- Provide means to prevent unauthorized changes.
Processing Considerations

Feed and Discharge Legs

- Time in heated water legs may be included in scheduled process
- May reduce process time
If the water leg is included in process schedule, the temperature must be above specified temperature.
Water Level Fluctuation

- Process time shortened if above maximum level
- Automatic device (high water sensor) should stop container-conveyor
Water contacting containers in bottom loops:

- May result in underprocessing
- Containers **must** be segregated
- Processing authority evaluation
- Numbered carriers/diagram
Initial Temperature

- Measure using method and frequency in the establishment’s written procedure
- Feed leg temperature must be considered
• Critical factors must be measured and recorded in accordance with the method and frequency in the written procedure

• Records **must** include conveyor (chain) speed
Key Points

- Hydrostatic retorts use water columns to counterbalance the pressure in the steam dome.
- Each retort must be equipped with at least one MIG and time-temperature recording device, in the steam dome as well as in the water legs, if applicable.
- The water level in the base of the steam dome must be controlled below the maximum to prevent process deviations.
- Process time is dependent on the length of the conveyor chain and the speed of the chain.
Questions?