Module 12. Hydrostatic Retorts

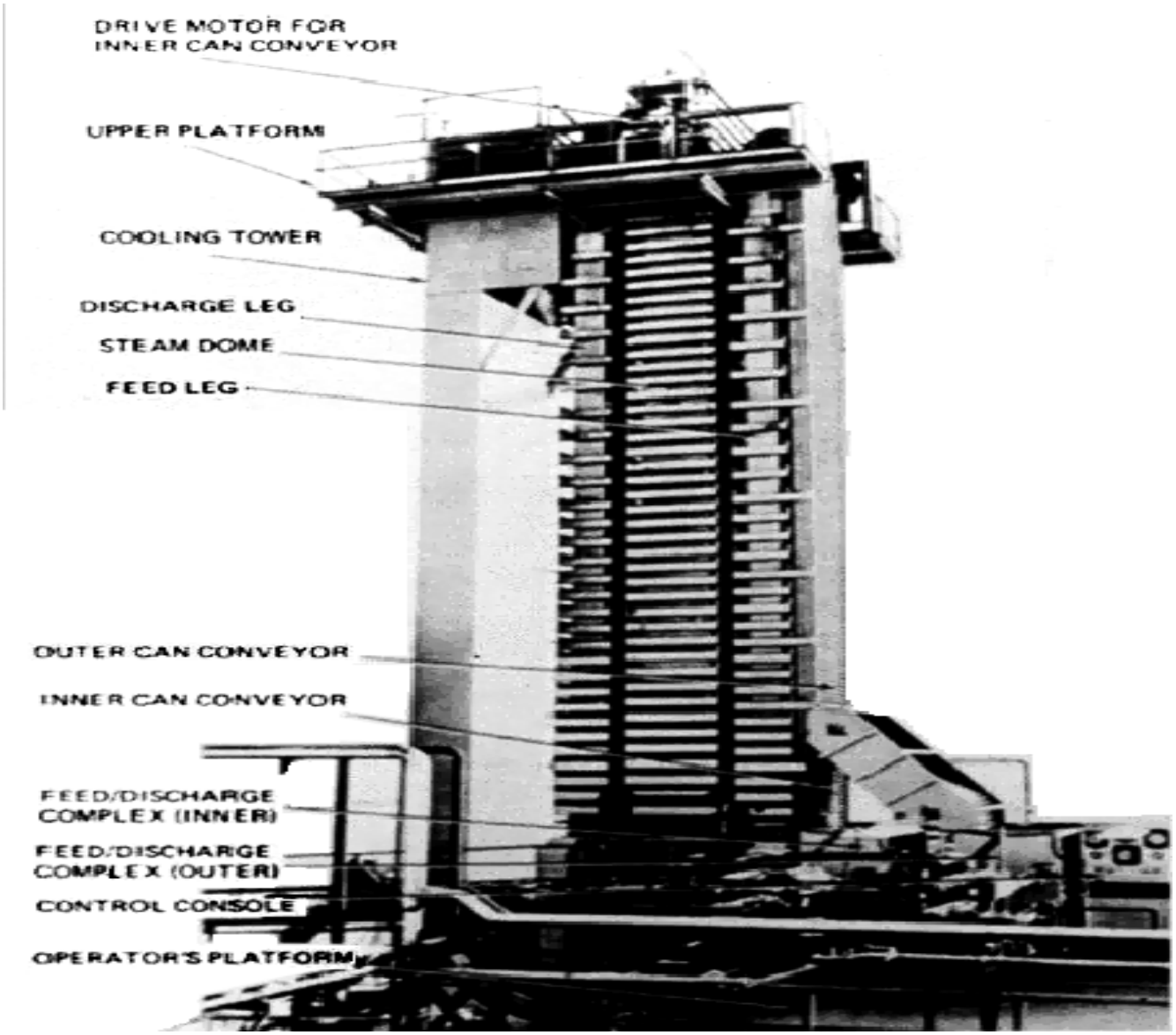
9 CFR 431.6(b)(5) Hydrostatic Retorts

USDA

Purpose and Objectives

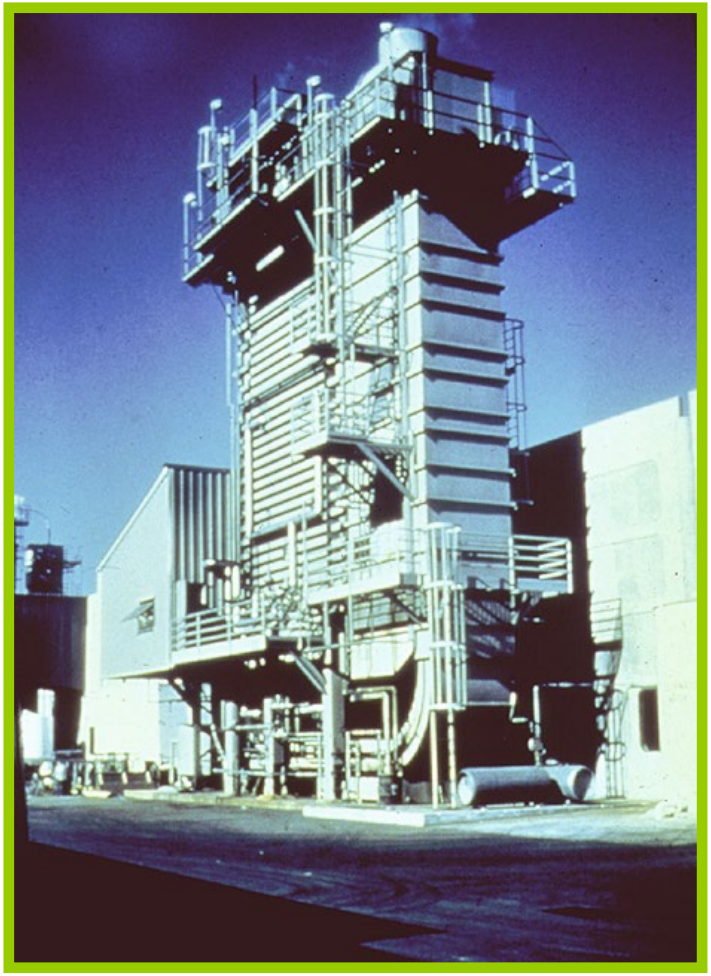
- Purpose of Module 12
  - Provide an understanding of components and operation of equipment used for hydrostatic retorts.
- Performance Objective
  - Assess compliance of hydrostatic retort equipment and perform inspections

Hydrostatic Retort



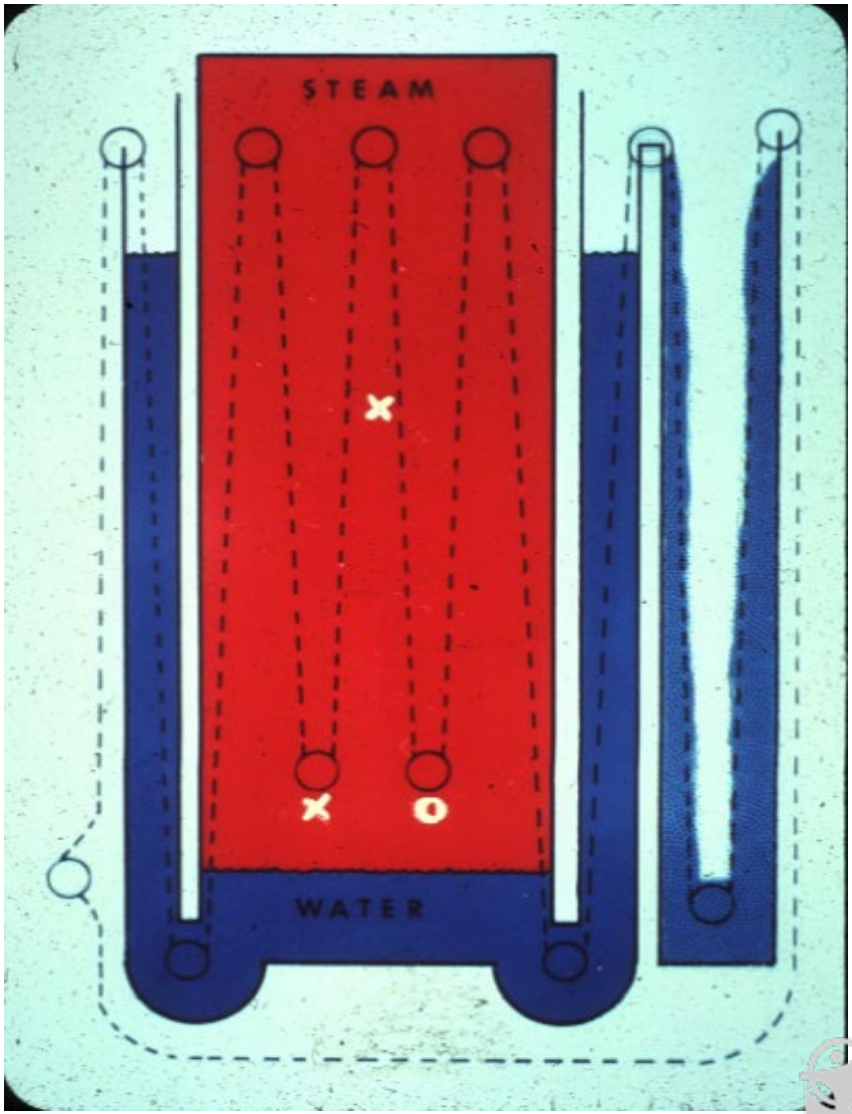
Introduction

- Constant process temperature
- Continuous container conveyor
- Steam or cascading water with overpressure



Processing Chamber Pressure

- Hydrostatic pressure of water columns counterbalance steam pressure
- Maximum process temperature limited by maximum height of legs



Description of System

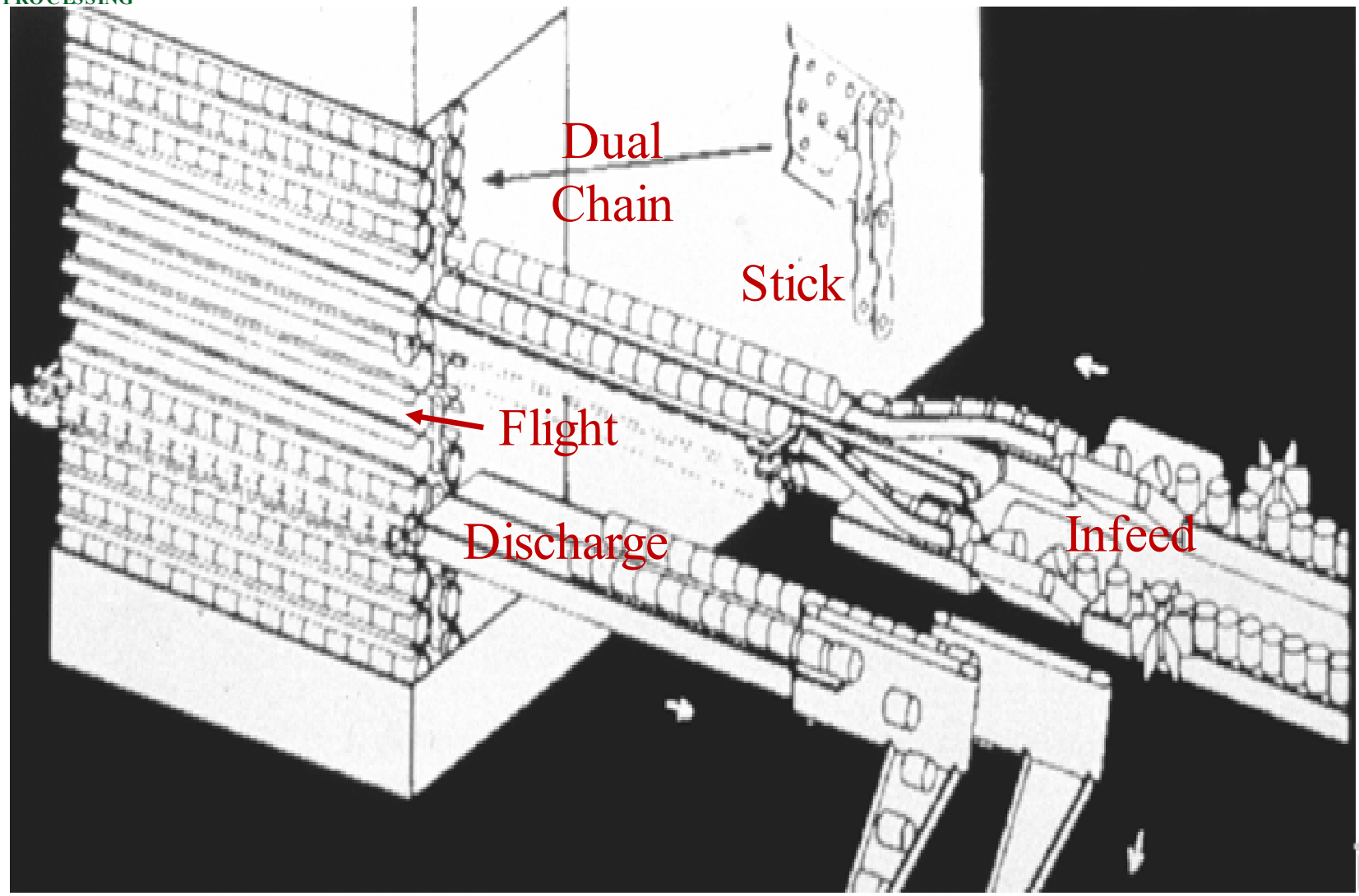
Container-Conveyor:

- Carriers for holding containers
- Carriers limit container sizes
- Multiple container-conveyors

Feed and Discharge Stations

A variety of mechanisms are used to load and unload containers from conveyor.

Feed and Discharge Stations (2)



In-Feed Section

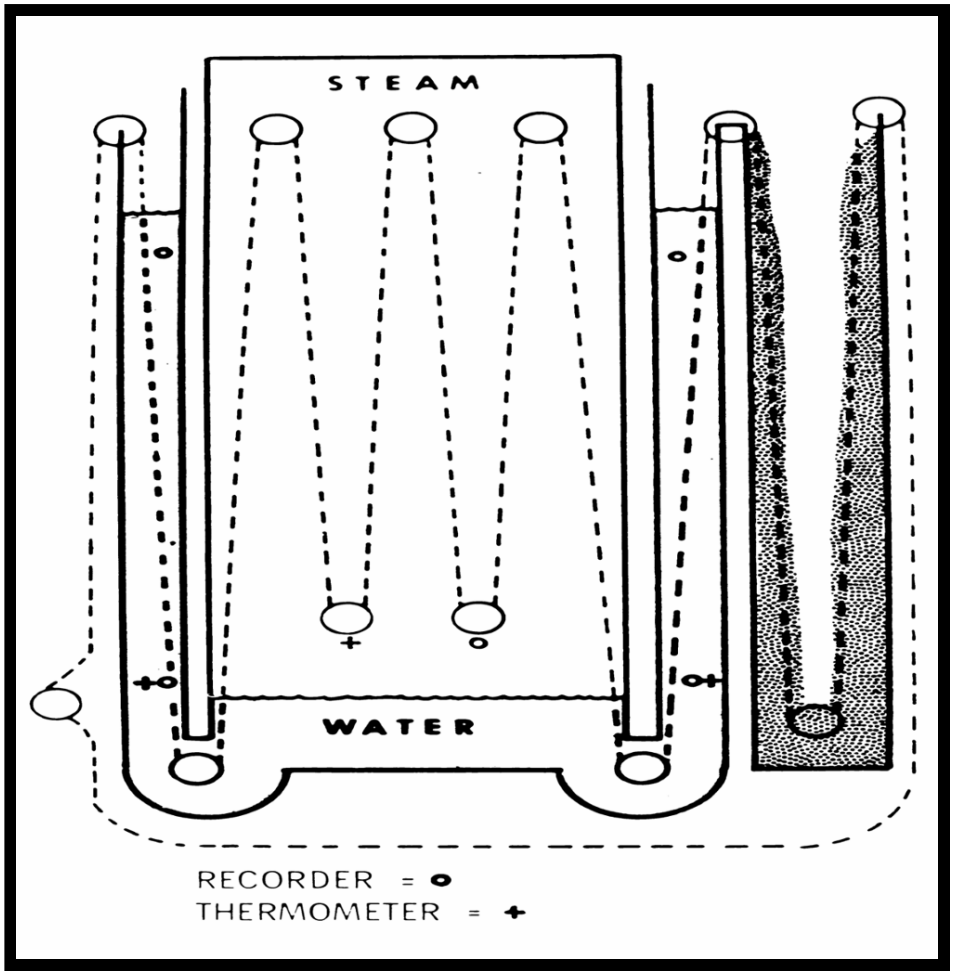
- Extends from feed station to entry into first water column
- Section may be covered

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"



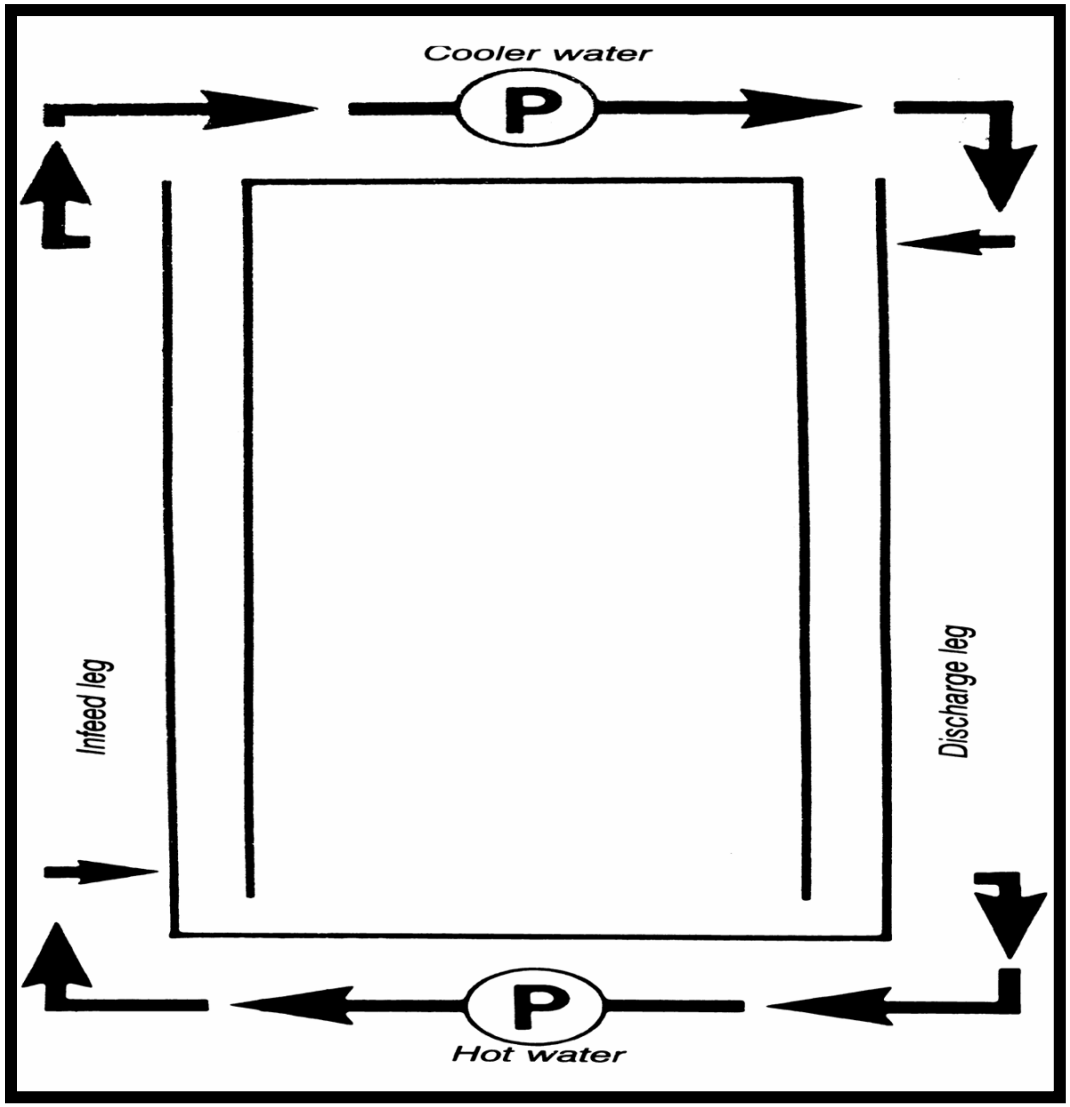
Discharge or Exit Leg

- 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

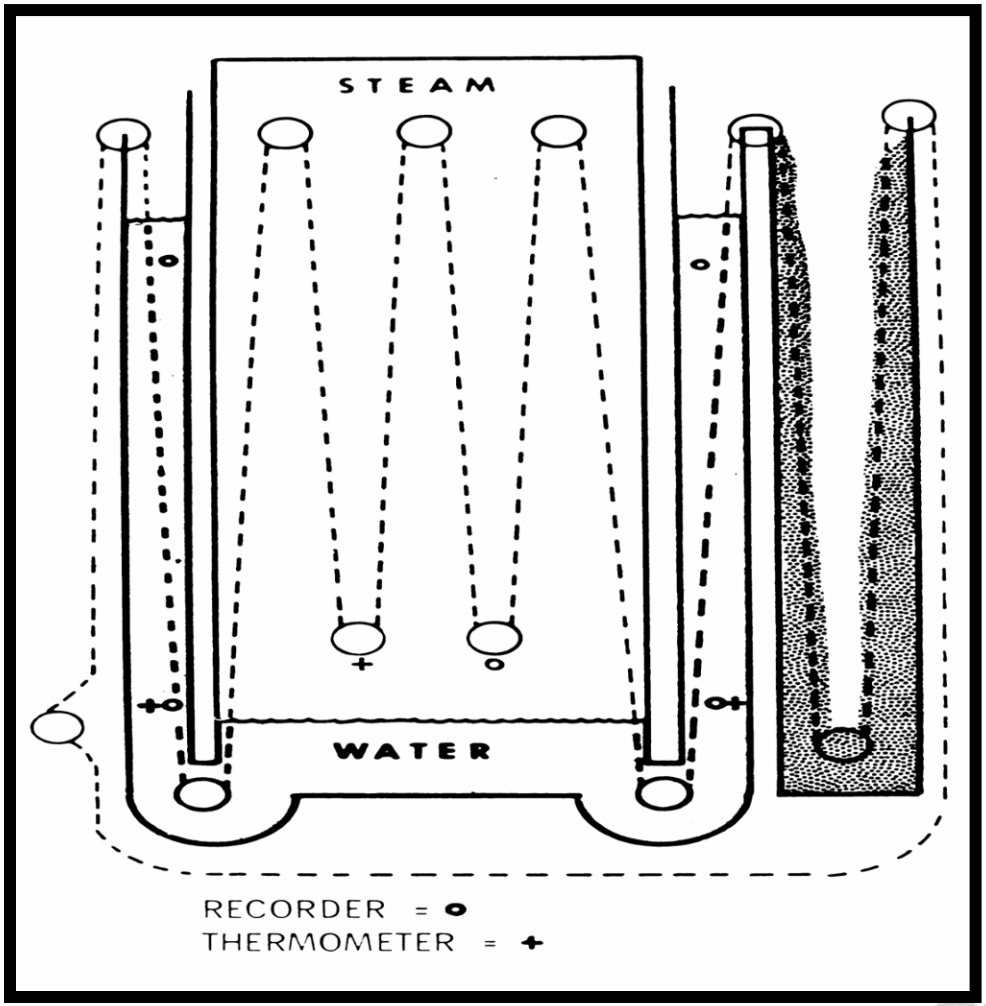
Water Leg Temperature

When minimum temperature in the water legs is specified in process schedule there **must** be:

1. Temperature indicating device
2. Temperature/ time recorder

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

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

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

Container Conveyor Speed

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

Water Leg Temperature

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 Level Fluctuation (2)

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

Record Requirements

- 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?

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