Module 9. Steam, Batch, Agitating Retorts

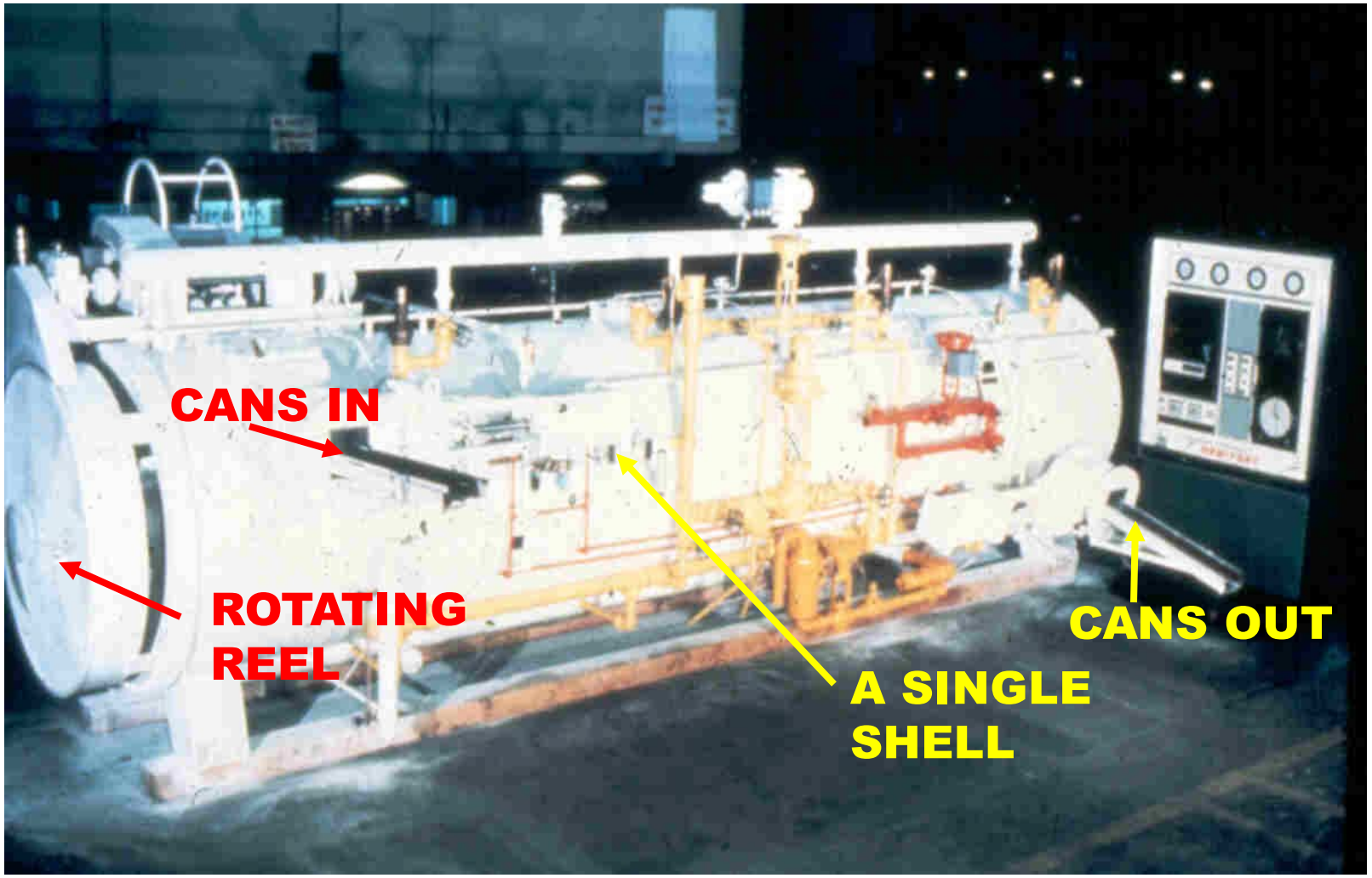
Thermal Processing for Meat and Poultry Products Training

USDA

Common Features

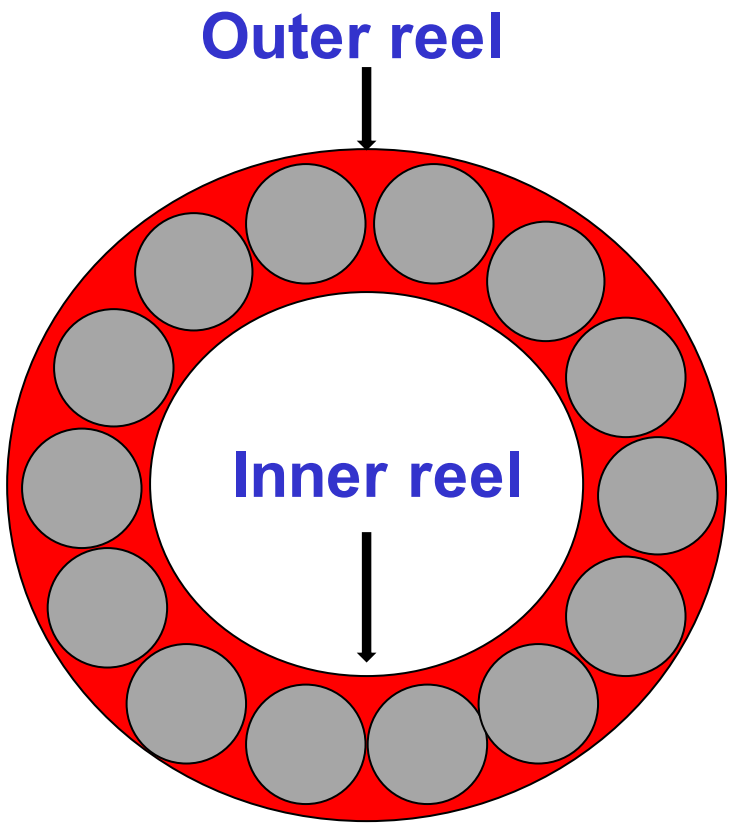
- Use steam as the heating medium
- Batch container handling
- Product agitation
- End-over-end, side-over-side (axial), and back and forth agitation (Shaka®process)
- COMMON EXAMPLE: FMC Orbitort Sterilizer

Orbitort Sterilizer



Orbitort Features

- Designed to process medium consistency products in large institutional size (#10) cans
- Pressure process and cool in ***one*** horizontal shell
- Shell contains an inner and outer reel
- The inner reel contains the can steps



Loading/Unloading the Orbitort

- Unprocessed cans are loaded and processed cans are unloaded at the same time through air-operated gate valves
- Cans enter high on one end of the retort wall and exit low on the other end of the retort wall
- During loading/unloading, the outer reel is locked to the retort shell

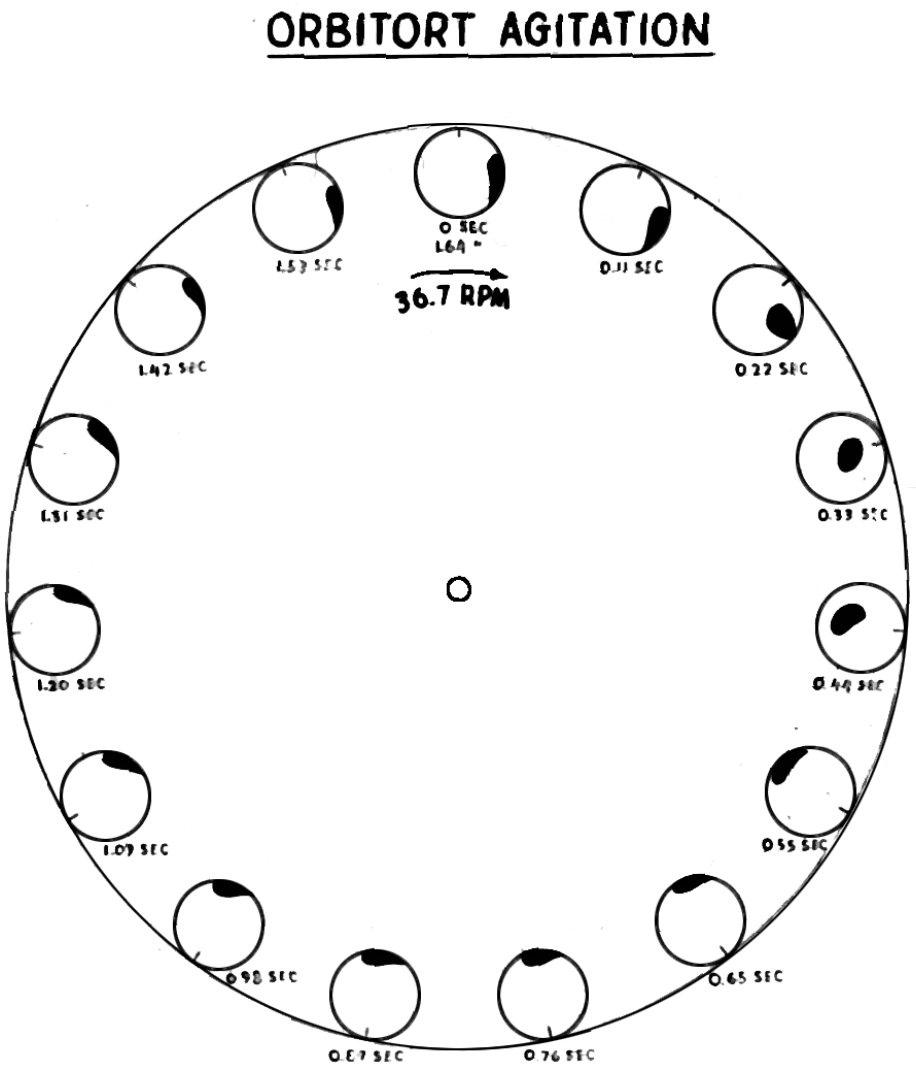
Loading/Unloading the Orbitort

- The inner reel turns during loading/unloading moving unprocessed cans toward the exit end and processed cans out of the retort
- A counter keeps track of the cans loaded into the retort
- A second counter advances the cans two turns separating processed and unprocessed cans by two spiral turns

Loading/Unloading the Orbitort

- When the retort is full the loading/unloading gates are closed
- The outer "spiral" reel is locked to the inner "channel" reel holding the containers in place during thermal processing and cooling

Side-Over-Side Agitation



Continuous Agitation

- Certain products heat faster when agitated
- Product and headspace bubble mix during rotation
- Dependent on headspace, consistency, reel speed and fill-in weight
- Reel speeds are faster than continuous rotary retort reel speeds

Continuous Agitation

- Advantages:
  - Shorter process time
  - Better product quality and uniformity due to shorter process times
- Disadvantages:
  - Batch handling
  - More critical factors to measure, control and record

Retort Operation - Venting

- **Must** provide for air removal before process timing begins
- Procedures **must** be supported by heat distribution data

Retort Operation - Pressure Cooling

- Needed to prevent container distortion (buckling)
- At the end of thermal processing cycle, cooling water is introduced into the retort shell while the containers are still being agitated
- When the product is cooled the retort is ready for emptying and reloading

Critical Operating Parameters

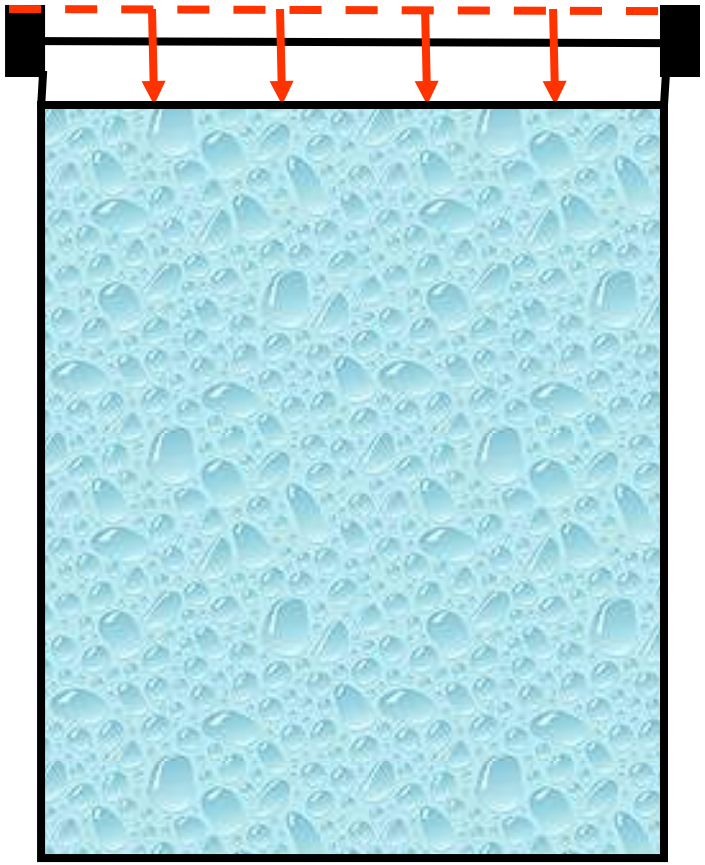
- Headspace and/or fill-in weight
- Consistency/thickness
- Reel speed
- Condensate build-up in the bottom of the shell

Headspace

- Area not occupied by product
- Critical factor for agitation
- Net or gross headspace

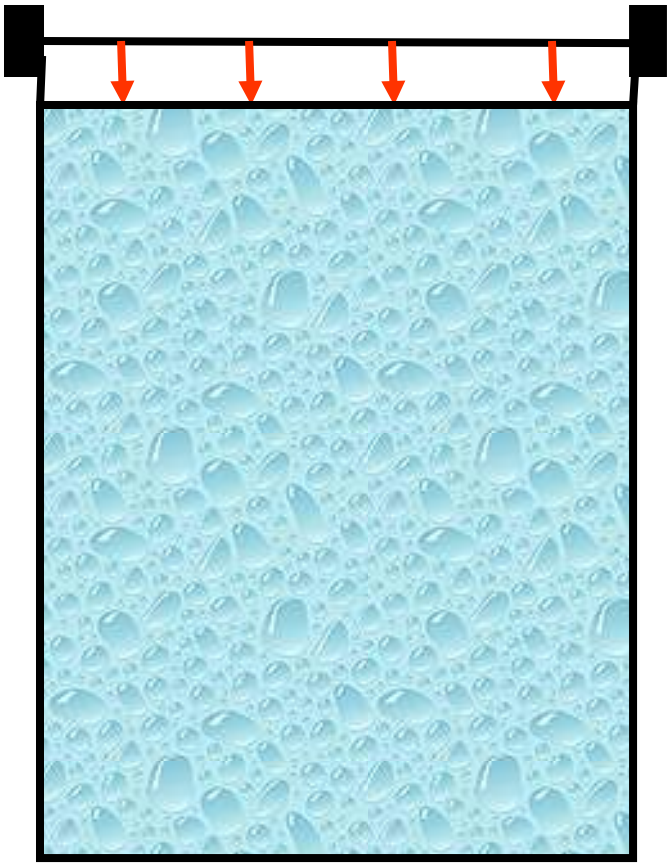
Headspace

GROSS HEADSPACE 0.250”



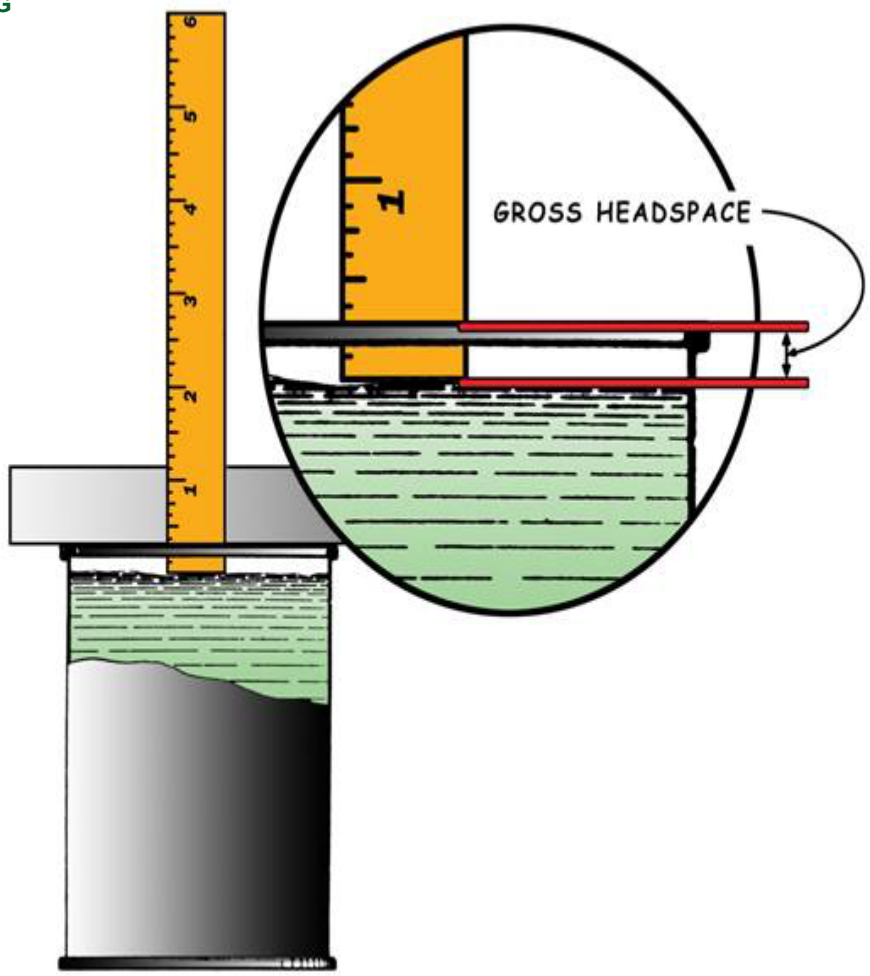
MEASURED FROM TOP OF DOUBLE SEAM TO LIQUID

NET HEADSPACE 0.180”



MEASURED FROM LID TO LIQUID

Headspace



Measuring Gross Headspace:

A straight edge is placed over the top edges of an open container. The distance is measured from the bottom of the straight edge to the top of the product surface.

Headspace

One Type of Headspace Gauge

Consistency

- Measure of product thickness
- Thicker product may reduce agitation
- Measure consistency at location specified in the process schedule and in accordance with a written procedure

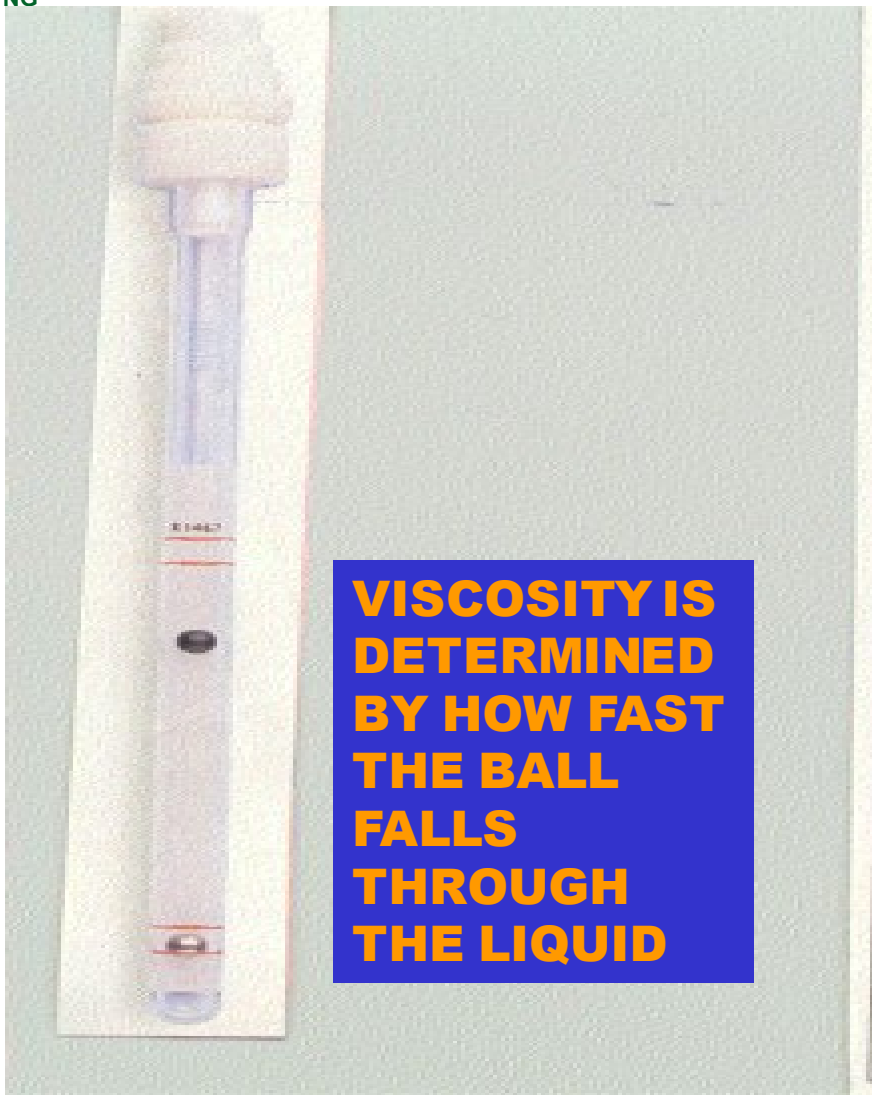
Consistency

Consistency

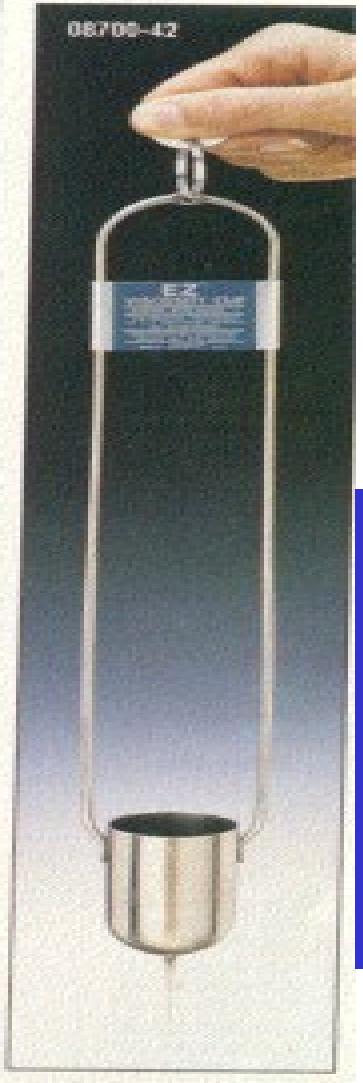
Viscometer

The spindle is immersed into the test liquid. The viscometer measures the additional torque required for the spindle to overcome viscous resistance and regain constant speed. This value is then converted to centipoise and displayed on the readout.

Consistency



VISCOSITY IS DETERMINED BY HOW FAST THE BALL FALLS THROUGH THE LIQUID



VISCOSITY IS DETERMINED BY HOW FAST THE LIQUID FLOWS THROUGH THE HOLE IN THE CUP

Retort Operation - Rotational Speed

- Affects product agitation
- Affects the process time
- Specified by PA in the process schedule

Rotational Speed

The rotational speed **must** be:

- Checked and adjusted when the retort is brought up to temperature
- Determined and recorded at least once for each retort load

Notice to prevent unauthorized changes

Recordkeeping Requirements

- Critical factors must be measured and recorded in accordance with the method and frequency in the written procedure
- Must include reel speed

Retort Operation - Condensate Removal

- Required to remove condensate
- Drain open for sufficient time
- Provide for continuous or intermittent removal
- Bleeder arranged for observation
- Observe and record frequently

Questions?

Questions?