Module 10. Continuous Rotary (Agitating) Retorts

Thermal Processing for Meat and Poultry Products Training
Introduction

- Uses steam as the heating medium
- Continuous container handling
- Intermittent product agitation
- At least two shells
- Configuration will vary
Typical Arrangements of Continuous Rotary Retorts

Two Shell Line Arrangement

Three Shell Line Arrangement

Three Shell Line Arrangement
CANS IN CARRIER STEPS ARE FORCED THROUGH RETORT BY SPIRAL T’S WELDED TO RETORT SHELL IN
End View of Continuous Rotary Retort
Retort Description

- Rotating reel with steps to hold containers
- Spiral T attached to shell to move containers through
Spiral T
### Number of Reel Steps for Can Diameters

<table>
<thead>
<tr>
<th>Can Size</th>
<th>Steps Per Turn of Reel</th>
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<tbody>
<tr>
<td>211</td>
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<tr>
<td>300-303</td>
<td>47</td>
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In-Feed

CUP FEED DIRECT TO FEED VALVE (WITH FREE ROLLER FEEDER)
Transfer Valve
Retort Description

- **Advantages:**
  - Short process time
  - Continuous input

- **Disadvantages:**
  - Extra critical factors
  - Container size limits
  - Larger investment than a still steam retort
Multiple feeder lines to trough at bottom of shell

Must be large enough for proper operation
Retort Operation - Condensate Removal

- Required to remove it
- Condensate interferes with container rotation
- May reduce product agitation leading to under processing
Retort Operation - Condensate Removal

Must:

- Open drain for sufficient time during venting
- Provide for continuous or intermittent removal
- Have bleeder arranged for observation
- Be observed and recorded frequently
May be needed to prevent container distortion

Cooler pressure should be slightly below cooker pressure so water does not enter cooker
Rotational Speed and Process Timing

- Reel speed must be set as stated in process schedule before containers enter retort
Rotational Speed

- Determines process time
- Affects product agitation
- Faster than calculated time results in shorter process time
- Slower than required minimum speed reduces agitation
The rotational speed must be:

- Specified by process authority in the process schedule
- Checked and adjusted when the retort is brought up to temperature and determined and recorded at intervals not to exceed 4 hours
Process Considerations:

- Intermittent agitation provides more rapid heating and cooling when compared to no agitating
- Container rotation is divided into carried, sliding and free phases
Intermittent Agitation

- Product and headspace bubble mix during rotation
- Solid pack items like beef stew and chili do not benefit from agitation
- Brine-packed items, soups and sauces may benefit by faster heating and shorter processes
- Dependent on headspace, consistency, reel speed and fill-in weight
Important Critical Factors

- Condensate build-up
- Headspace
- Consistency
- Reel speed
Headspace

- Area not occupied by product
- Critical factor for agitation
- Net or gross headspace
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, e.g., at the cooking kettle of filler at 160 F or higher temperature
Reel Speed

THERMAL PROCESSING TRAINING

RETORT REEL TIMING
Reel Speed

- For reel speed calculation you need:
  - Process time
  - Total container capacity of processing shells
  - Number of reel steps
# Reel Speed

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Calculations

• Reel Speed
  
  \[ \text{RPM} = \frac{\text{capacity}}{\text{reel steps}} \times \text{process time} \]

• Cans Per Minute
  
  \[ \text{CPM} = \frac{\text{capacity}}{\text{process time}} \]
Reel Speed

Seconds for 10 Revolutions of Reel =

\[
10 \text{ revs} \times 60 \text{ sec/min} \times \text{reel steps} \times \text{process time}
\]

Shell Capacity

\[
10 \times 60 \text{ sec/min} \times 47 \times 14 \text{ min} = 39.48 \text{ secs}
\]

10,000 (303 diameter)

\[
10 \times 60 \text{ sec/min} \times 24 \times 10 \text{ min} = 28.8 \text{ secs.}
\]

5,000 (603 diameter)
Initial Temperature (IT)

- Critical heating parameter specified in the process schedule

- Measured on containers taken from line prior to inlet valve
Recordkeeping Requirements

- Critical factors and IT must be measured and recorded in accordance with the method and frequency in the written procedure.
- Must include reel speed checks.
Retort Jam or Reel Breakdown In-Process:

- Must reprocess, repack and reprocess, or destroy all containers
- May use emergency still process before retort is cooled
Handling Process Deviations

Emergency Still Process:

- Obtained from a processing authority, if not process must be reviewed by a processing authority
- Must reprocess, repack and reprocess or destroy containers in inlet and transfer valves
- Records must be kept of actions including the time the retort stopped and the time retort was used for the still process
Handling Process Deviations

Alternative Procedures in Case of Temperature Drop in the Retort:

- **< 10°F drop**
  - Stop reel and use emergency still process on file
  - Stop container entry and use emergency agitating process on file
  - Have process evaluated by processing authority
  - Empty retort and reprocess, repack and reprocess, or destroy all containers
Handling Process Deviations

Alternative Procedures in Case of Temperature Drop in the Retort:

- \( \geq 10^\circ\text{F} \) drop
  - Stop reel and use emergency still process on file
  - Have process evaluated by processing authority
  - Empty retort and reprocess, repack and reprocess, or destroy all containers
  - Records must be kept of actions
Double can handling system
Different can sizes or products can be introduced into custom reels. Spirals can be custom designed to handle different length cans or can be designed to provide different thermal process times to different cans.
Questions?