Module 8. Steam, Batch, Still Retorts

Thermal Processing for Meat and Poultry Products Training
Advantages of Steam

- Excellent Medium for Heat Transfer
- Temperature Easily Regulated
- Pressure Can Counter-balance Internal Can Pressure
- Easy to Produce and Stored for Instant Use
Description of the Retort

- Pressure Vessel
- Batch-type
- Non-agitating
- Vertical or horizontal
- With or without crates
Construction

- Boiler plate
- Riveted or welded
- Doors or lids
- Lugs or locks
Installation and Operation

- Adequate steam supply
- Adequate water supply
- Proper venting
Vertical Retort

**RETORT HOOK-UP AND SPECIFIC OPERATING INSTRUCTIONS**

**VERTICAL RETORTS** — Simple Process Without Pressure Cooling

**COLOR LEGEND**

- **Steam**
- **Water**
- **Drain, Overflow**
- **Vents, Bleeders**
- **Air**
- **Safety Valves, Pressure Relief Valves**

**MANUAL VALVES**

- Globe
- Gate

1. Steam Inlet
2. Steam Control Valve
3. By-pass
4. Air, Instrument
5. Filter
6. Pressure Regulator
7. Drain
8. Water Inlet
9. Steam Spreader
10. Basket Supports
11. Bleeders
12. Thermometer
13. Pressure Gauge
14. Safety Valve
15. Overflow
16. Vent
17. Control, Steam
18. Control Element
Crateless Retort
Crateless Retort

Cooling Canal
Instrumentation

- Temperature indicating device (Mercury-in-Glass - MIG) or equivalent device (e.g., Resistance Temperature Device – RTD or Digital Temperature Gauge-DTG)
- Temperature/time recording device
- Installed in retort shell or external well
External Well

- Must be connected through at least a 3/4” opening
- Must have at least a 1/16” bleeder opening
Steam Inlet

- Must be large enough for proper operation
- Must facilitate air removal
- Must be located opposite the vent
Steam Spreaders – Vertical Retorts

- Not required for vertical retorts
- If used, usually in form of a cross
- Perforations along the top or side
Number of Spreader Perforations

Total cross-sectional area should be equal to 1.5 to 2 times the cross-sectional area of the smallest part of the steam inlet line.
Steam Spreaders

Number of Holes in Steam Spreaders for Steam Inlet Pipe Sizes

<table>
<thead>
<tr>
<th>Size (inches)</th>
<th>1 inch pipe</th>
<th>1¼ inch pipe</th>
<th>1½ inch pipe</th>
<th>2 inch pipe</th>
<th>2½ inch pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>27–36</td>
<td>46–61</td>
<td>63–83</td>
<td>103–137</td>
<td>147–196</td>
</tr>
<tr>
<td>1/2</td>
<td>—</td>
<td>12–16</td>
<td>16–21</td>
<td>26–35</td>
<td>37–49</td>
</tr>
</tbody>
</table>
Steam Entry Into Vertical Retort
Steam Entry Into Horizontal Retort
A RETORT OVER 30 FEET NEEDS TWO STEAM SPREADER INLETS.
Vents

- Large valve-controlled openings to remove air from the retort
- Located opposite steam inlet
- Controlled by a full flow valve or equivalent
- Atmospheric break between vent and closed drain required
Inadequate Removal of Air is Serious

- Less efficient as a heating medium
- Insulates containers
- Air and moisture may cause rusting of cans

240 on MIG

235
240
220
MAY USE TWO VENT PIPES FOR RETORTS OVER 30 FEET IN LENGTH
Vents

Vent Manifold:

• Connects several vent pipes from same retort
• Cross-sectional area of manifold pipe must be larger than cross-sectional area of all connecting vents
Come Up Time (CUT) = Vent time + the time it takes to bring the retort to processing temperature

- Venting removes air from the retort
- Air transfers heat less efficiently than steam
Venting and Come Up Time

- Established by process authority
- May require both a set time and temperature
- Can be established on the basis of reaching a certain temperature
- Venting schedule must be met to assure adequate air removal
- Retorts with unusual piping, loading or operating procedures must be tested for proper heat distribution
Construction of Crates, Carts and Divider Plates

- Constructed of suitable materials
- Perforations shall be 1” holes on 2” centers or equivalent (27% open area)
- May require longer venting time
- May inhibit steam flow among containers
- Venting adequacy documented by heat distribution data
Effects of Divider Plates on Venting and CUT
Effects of Divider Plates on Venting and CUT

Heat Distribution Based on Open Area

- Jumble loaded-100%
- 40% open
- 20% open
Bleeders

- Remove air to provide circulation of steam
- Must be opposite steam entry
- Wide open during entire process
- Arranged to observe functioning
- Condensate bleeder requirement when steam entry is above the containers
Bleeders

- Small openings, normally 1/16 to 1/8 inch in diameter used to remove air from steam retorts and circulate the steam while they are in operation.
- Open during come up and processing.
- Bleeders must be within 1 foot of outermost containers and no more than 8 feet apart along the top of the horizontal retort.
Bleeders

Retort Bleeder with Valve
Mufflers

- Used on bleeders and vents to decrease noise
- Must not impede normal operation
Air Supply

- For air-operated automatic steam controllers
- For pressure cooling to prevent can buckling
- Equip with a suitable valve to prevent leakage
Water Supply

- For cooling containers in retort
- Equip with suitable valve to prevent leakage
- Cool carefully to avoid condensing steam
Temperature and Timing

Initial Temperature — Must be determined for the coldest container

Process Timing — Must not start until the venting schedule is completed and the process schedule retort temperature is achieved
Container Cooling

- May need pressure cooling
- Cool to at least 104°F
- Suggest complete flooding of retort
Container cooling is done first by overhead sprays and then by flooding.
Valves must be tight fitting and maintained on water pipes to prevent leaking water into retort during thermal processing.
Container cooling water shall be chlorinated or otherwise sanitized for cooling canals and re-circulated water supplies.
Recordkeeping Requirements

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

- Suggest 15 minute intervals
Questions?