RETORT AND ITS OPERATION

Aim: To study the various parts of a retort and its operation

Retort: It is the equipment used to appertise the canned foods under steam pressure. Saturated steam under pressure is the most common medium used for the heat processing of canned foods to achieve commercial sterility. The greater the pressure inside the retort, the greater will be the temperature at which the steam condenses on the external walls of the can. These retorts are usually subjected to stringent safety laws and must be tested frequently. Tested pressure (TP) and safe working pressure (WP) are usually stamped on to each retort, which must be equipped with a safety valve set to open and vent the retort, if the WP is exceeded. Safety devices are now mandatory for ensuring that the retort can neither be opened while the retort is under pressure nor while the steam entry valve is open.

There are two types of static batch retorts that are commonly used, viz.,

1. Vertical and 2) Horizontal Types

Sl.No.	Vertical Retorts	Horizontal Retorts
1.	Takes less floor space	Takes more floor space
2.	Convenient for small-scale operation	Convenient for large-scale operation
3.	Steam consumption is less	Comparatively more
4.	Cranes/lifting devices are needed to load and unload cans	Trolley is used to load cans which are simply pushed in
5.	Internal steam distribution is uniform	Non uniformity in the internal steam distribution

Essential Requirements of Retort:

1. Steam inlet: It is a valve-controlled pipe of suitable size and the opening through which steam is admitted to the retort. The steam inlet to each retort shall be large enough to provide steam for proper operation of the retort, and shall enter at a point to facilitate air removal during venting.

2. Steam Spreader: It is a pipe with perforations for uniform distribution of steam inside the retort. Perforated steam spreaders shall be maintained to ensure that they are not blocked during operation.

3. Safety Valve: It is set no open, when the working pressure has exceeded the safety limit pressure of the retort.

4. Vent: These are large valve, openings through the retort shell controlled by gate, plug cock, or other adequate valves used for the elimination of air during the venting period before timing of the thermal process is started.

5. Bleeder: It is a small opening used to remove air entering the retort with the steam and to provide circulation of steam in the retort and shall be open during the entire process, including the come-up time. Bleeder should be positioned at sufficient distances and also near the thermometer and pressure gauges.

6. Drain Valve: It is an opening used to remove the condensed or cooled steam (water). A non-clogging, water tight drain valve shall be used; screens shall be installed over all drain openings.

7. Pressure gauge: is used

- To maintain correct processing pressure corresponding to the temperature
- To show the pressure inside the retort at all times.

8. Thermometers: To maintain correct processing temperature and to show the temperature inside the retort at all time during heat processing.

9. Rails: In case of horizontal retorts only, used for pushing the trolley.

10. Water inlet and spreader: It is used for spraying cold water on the can for cooling after heat process is over.

11. Crates, baskets and devices: To hold the cans**.**

Retort operation

Clean the retort

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Check the pressure gauge, thermometer, recorder etc.

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Load the filled cans and close, keep vent and bleeder open

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Steam on, bring up the process temperature check complete venting, and close the vent

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Keep temperature and pressure steady till end of process (115.6^0C / 121.1^0C)

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Bring down pressure by venting

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Open the door when pressure gauge showing **"zero"** reading

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Cool the cans

The main steps in retort operation are as follows:

a) **Preparing the Retorts:** Cleaning by washing and steaming for a short time, checking the thermometer, pressure gauge, recorder, inlet, outlet valves etc. before loading the cans are necessary.

b) **Loading:** Jumble stacking the cans is better for steam circulation and distribution than orderly arrangement of cans. However, this reduces the retort capacity by about 25% and care should be taken to avoid denting.

c) **Venting:** Removal of air from the retort before process timing begins.

d) **Come-up-time**: This is the time required to bring up the retort to processing temperature after steam is turned on. Most important thing is to see that all air is driven out through vents before processing starts. Too quick bringing up will leave steam–air mixture inside the retort with no agreement between thermometer and pressure gauge readings. It may also cause

paneling of larger sized, high vacuum cans. Vent should be closed (but bleeders to be kept open throughout the processing period) when process time starts.

e) **Processing:** When there is no automatic control, it should be seen that the retort temperature does not fluctuate more than 0.5^0C, throughout the process.

f) **Blowing Down:** Stopping steam supply and opening the vents. The retort pressure should be gradually brought to ***'zero'***. Too quick blowing down may result in buckling of cans. Open the retort only after pressure reaches zero.

g) Unloading: Unload the cans and cool outside promptly.

Note:

(1) For cooling inside the retort without pressure, after blow down to bring pressure to ***'zero'***, allow water in side so that the whole load is submerged. Then let out water. Again fresh water can be filled in if necessary and this can be repeated twice or thrice to cool the cans completely.

(2) For cooling under pressure, the above procedure can be followed with maintaining super imposed steam pressure over water level until cooling is complete. Air pressure can also be used instead of steam.

(3) Cooling the canned product to such a level that just one degree above the ambient temperature. It helps to dry the surface moisture present on the container and prevents can corrosion.

Precautions to be followed while Retort operation:

1) The time gap from reporting or closing the cans until retorting should not be greater than ½-1 hour, otherwise ***'Pre-process spoilage'*** occurs due to the fall in the initial minimum temperature.
2) Never use gunny bags or trays for separating the batch, otherwise access to steam, will be reduced. Fishnets of mesh size greater than ½ inch or any sheet of good perforations can be used.
3) Do not keep one can over the other, follow jumble stacking
4) The vent valve should not be kept wide open for at least 4 minutes and at least till a temperature of 220^0F (105^0C) is reached.

5) The pressure gauge and thermometer readings must be in total agreement.
6) Bleeders should be kept open throughout the process.
7) Do not increase pressure in the retort too slowly otherwise ***paneling*** of large sized cans may occur.
8) Strictly maintain the temperature throughout the process. Keep 0.5^0C clearance above the recommended temperature. Give correctly recommended process time. Accurate timing device is to be used. The process time starts only after retort attains the recommended temperature. Do not decide the process time based on memory.
9) After completing the process time, close the source of steam supply and reduce the pressure gradually so as not to cause strain on seams (Buckling). If necessary use air pressure while reducing steam pressure. Do not open the door until gauge reading shows zero. Do not introduce cooling water until pressure reading is also showing zero.