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What is Steam Water Spray Technology?

Years ago, retort technology for canning was very simple, but served the same purpose as it does today; to destroy all spoilage and pathogenic organisms. Then, as now, a particular organism of concern for low acid products, typically defined as those with a pH of 4.6 or above, was Clostridium Botulinum. This is a particularly bad actor for canned foods. It can survive very high temperatures, will not affect taste or smell, will not form gas to swell a can, and produces a neurotoxic waste compound that, even in miniscule amounts, can be deadly.

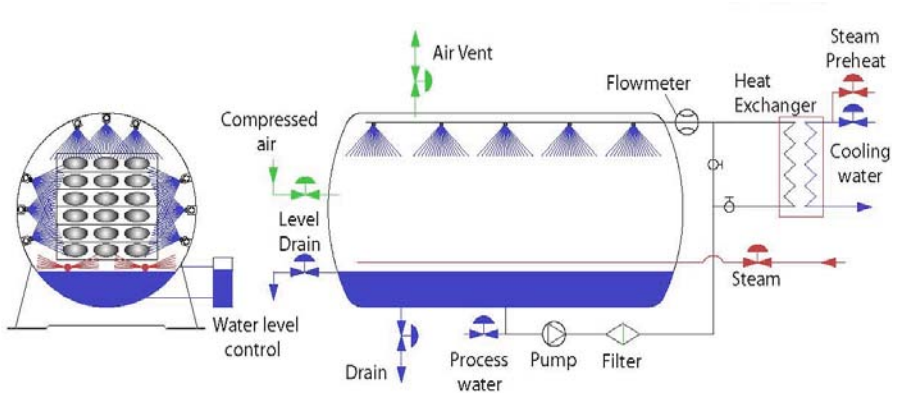
These simple, early retorts consisted of a heavy duty pressure vessel with a door for product loading and unloading. Raw, unprocessed cans were loaded into the machine, and heated by saturated steam at pressures up to 20 PSIG (260 F). A critical part of this process, when steam is first introduced, was called "venting". Simply, for the first 15 minutes or so of the process, a number of small valves on the top of the vessel were left open to the cookroom to ensure the incoming flow of steam pushed out all trapped air. This prevented the air, with well-known insulative properties, from forming cold spots in the

vessel which would likely result in unsterilized, under-processed, and potentially deadly product. Following the venting, and fully closed vessel heating for the prescribed time, the steam was turned off, and the still sealed vessel was flooded with cold water to cool the cans prior to removal from the machine.

The transition point between heating with pressurized steam, and cold water cooling was a bit tricky, and if not handled properly by the operator could result in an entire batch of cans exploding. The difficulty was that the cans were not just hot, but superheated to the same temperature and internal pressure in the retort during the heating process. In other words, there could be up to 20 PSIG pressure inside the can! Fortunately, the cans of yesterday were made of heavy gage tinplated steel, sometimes soldered closed with lead, and strong enough to handle the high pressure.

These days, to reduce cost and conserve materials, cans are manufactured with much thinner steel, and consequently have much less resistance to internal pressure. In addition, modern packaging materials such as flexible plastic cups and pouches are becoming more popular. To process these products effectively, without container damage, a different method of heating was needed. Steam Water Spray Technology was the solution.

Steam Water Spray, or SWS, works by using a high intensity sprays of recirculating superheated water to deliver heat to the product, instead of direct steam. This eliminates the need to remove air from the vessel, and in fact, actually uses compressed air to compensate for internal container pressure, both during heating and cooling. The fully automatic process, in a simplified manner, is described in the following diagram and steps:



1. Product is loaded into the vessel, door is closed and sealed.
2. Steam is introduced and water recirculation pump starts. Water is now being sprayed on the product. Simultaneously, compressed air is introduced to the vessel at a controlled pressure.
3. The steam quickly heats the spraying water, which delivers heat to the product.

4. At the end of the prescribed heating cycle, steam is turned off, removing it as a source of pressure in the vessel. Air pressure, however, is maintained to counteract the internal pressure in the containers.
5. Valving on the discharge of the water recirculation pump automatically switches to send the hot, sterile, water to a heat exchanger where it is cooled by a separate, isolated supply of cooling water.
6. Gradually, as the product cools and internal container pressure diminishes, the compressed air is turned off.
7. Finally, product is fully cooled and product can be removed from the vessel.

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