STERISTIR®

A new steam sterilization system
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www.fcd-system.com
Decontamination overview

What is decontamination?

PASTEURIZATION
- removes pathogens (such as coliforms, Yeasts, molds, salmonella etc.) and other pathogens (Enterobacteria)

This can be achieved without pressure.

STERILIZATION:
- Reduces TPC (Total plate count) below 1000 – even the most virulent sporulated forms (min $10^{-6}$)

Without pressure, sterilization is achievable. However, there is no guarantee before proper tests and study.

On the other hand little steam and a lower temperature, give better results in keeping essential oils, colors and vitamins...

This is the paradox we are facing for setting the parameters
1st generation: Autoclave technology

**Imtech**
- Phase 1 - Air elimination
- Phase 2 - Heating
- Phase 3 – Sterilization (steam)
- Phase 4 - Emptying/Drying
- Phase 5 - Aeration

**Napasol** fills the machine with containers on a rail before creating a vacuum. Steam and heat are injected. And product is cooled.

**Hosokawa**: batch system in a cone-shaped chamber

**Advantages:**
- Sterilization ensured
- Parameters controlled
- Can treat powders and big particles size
- Can treat small lots

**Limitations:**
- Equipment, labor and maintenance costs (moving parts, filters, cleaning)
- Batch system
Ventilex also specializes in steam sterilization, decontamination of spices, herbs, seeds (almonds) and other organic materials.

**Advantages:**

- Vibration: no damage to particles
- Easy scale up as thickness of bed is regular, increasing capacity is increasing width.
- Can treat powders of big forms
- Can achieve sterilization.
- Perfect for a customer treating only one product like pepper (lot of sporulated forms)

**Limitations:**

- No small lots
- Cleaning time is 50% of production time.
- Quantity of steam: roughly 10 times more than other technologies in continuous. So fragile products like thyme, sage or rosemary don't have any more essential oil at the outlet
- Hygroscopic products like pistachios get very wet
1. Product is fed through spiral tube
2. Product is heated by direct contact with hot tube going up by vibration
3. A very amount of steam is injected to preserve organoleptic properties
4. Product is cooled down by the second spiral tower by cold dry and filtered air
5. Product exits at room temperature

**Advantages:**

- Transport by vibration, no damage to particles
- Product is heated by contact with tube, 10 times less steam than Ventillex or Tema
- Can achieve pasteurization (not sterilization).

**Limits:**

- Minimum of quantity is 250 KG, no small lots
- Cannot treat powders (due to rheologic effect)
- Cannot treat too big particles like cinnamon sticks
- Can only feed the tube to 1/3
- Impossible to guarantee the inside is clean
- Long cleaning time (8 hours for 2 people to clean the line)
- Bad bacteriological results when the sizes of particles have a big range: vibrations make segregations, fines go down, big particles go up, there’s no mixing in the tube so steam cannot treat the bottom products.
Conveying by mechanical way and heat by contact and add steam in the chamber to pasteurize. To ensure the best mixing he added to the screw some paddles to take product from bottom (stir), lift it into the steam, then gravity makes it fall, again and again.

**Advantages:**
- Can treat powders
- Heat by contact, less steam is injected.
- Product is heated by contact with tube, 10 times less steam than Ventillex or Tema
- Can achieve pasteurization (not sterilization).

**Limitations:**
- Transport by screw, risk of damage the particles when big especially in the bypass section
- Minimum of quantity is 250 KG, no small lots
- Cannot treat too big particles like cinnamon sticks
- Can only feed the auger to 1/3
- Long time to clean 8 hours for 2 people to clean the line
2011
FCD SYSTEM

4th Generation: Steristep Unit

**STEPS, HEAT and STEAM**
Two sources of energy for more flexibility and efficiency

**STEPS:**
- Ensure mixing
- Treat all types of products
- Allows controlled residence time (vibration’s frequency)

**DIRECT HEAT**
Particles heated by contact with a heated stainless steel surface (simple electrical resistances)

- Avoid condensation
- Low energy consumption (90kWh/ton – 30% less)
- High heating surface/m² (Fast rise of product temperature)
- Short residence time
- Preserves the organoleptic properties of products

**STEAM (100 – 120°C)**
Injected with nozzles at the bottom of each step

- To slightly condense on the product
- To increase heat conductivity
- To control the moisture of the product during treatment
2015
FCD system

5th Generation: STERISTIR

2 sources of energy for a greater flexibility

Heat
Particles heated by contact with a heated stainless steel surface (simple electrical resistances)
- Avoid condensation
- Low energy consumption (70kWh/h – 30% less)
- High heating surface/m2 (Fast rise of product temperature)
- Short residence time
- Preserves the organoleptic properties of products

Steam
(100 – 120°C)
Injected with nozzles at the top of each zone (x6)
- To slightly condense on the product
- To increase heat conductivity
- To control the moisture of the product during treatment

Mechanical conveying
Paddles are adjustable for even more flexibility
- Economic
- Ensures mixing
- Determines residence time
## Comparison Steristep vs Steristir

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<th>Steristep</th>
<th>Steristir</th>
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<td><strong>Cost</strong></td>
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Can I treat only small lots with Steristir?

Applications

Yes, absolutely, as there is no minimal quantity required

- Possibility to treat **small lots (5 – 10 kg) 10-22lbs**

... and still have **big capacities (20 – 40 metric tons)** ... on the same unit!
3. Process description

General design

Decontamination Unit

Cooling Unit

Product inlet

Steam Extraction

Steam inlet

Air Extraction

Temperature Sensor

Product Outlet

Air inlet

1,6m (4.8ft) wide w/ platforms

2,5m (7.54ft) adjustable

7 m (21ft)
3. Process description

Inside Steristir

Steam injection pipes

Heating Surfaces

Temperature sensors
The paddles are adjustable.
Double Envelope Principle

- Chilled water inlet
- Recycling from process water
- Dry, cold air injection
Plug and play system easy to install on a 380v 50 Hz or 480 60H 3 phase network as a turn-key project for your plant.
Pilot LAB in France

Contact us for trials

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