Industrial sterilizer ï¿½ UHT tubular, scraped-surface and retort systems

Target application: industrial sterilizer

Reference configuration: Industrial steriliser, 3,000ï¿½15,000 l/h UHT / aseptic duty

Sterilisation is the step that makes ambient-stable, low-acid products possible. MCF Technology supplies continuous UHT sterilizers (tubular, plate, scraped-surface, direct steam injection) and batch retorts for packed products, always with a holding section sized on the target F0 value and a validation dossier that auditors and lenders can read.

SCOPE OF SUPPLY

- Tubular or scraped-surface sterilizer with regeneration and controlled cooling
- Direct steam injection with vacuum flash cooling for dairy and plant-based drinks
- Holding tube / holding cell sized on the validated F0 target
- Aseptic surge tank, sterile air and steam-barrier valve clusters
- Batch or continuous retorts (water immersion, spray, rotary) for packed products
- SIP/CIP sequences, temperature recording and thermal validation documentation

TYPICAL OUTPUTS

UHT milk, cream and plant-based drinks (138ï¿½145 ï¿½C, 2ï¿½6 s) ï¿½ Tomato paste, purï¿½es and sauces (95ï¿½110 ï¿½C) ï¿½ Ready meals, pet food and baby food in retort packs ï¿½ Aseptic bulk product for drums, IBC and bag-in-box ï¿½ Low-acid beverages and coffee-based drinks

PROCESS, STEP BY STEP

1. Feed and deaeration ï¿½ Balance tank ï¿½ vacuum deaerator
Product is fed at constant pressure and dissolved oxygen is removed, which protects colour and vitamins during the high-temperature step.

2. Preheating and regeneration ï¿½ 70ï¿½90 ï¿½C ï¿½ up to 90% heat recovery
Regeneration against the outgoing sterile product is the main lever on steam consumption per tonne treated.

3. Homogenisation (when required) ï¿½ 150ï¿½250 bar, one or two stages
Emulsions are stabilised before or after the sterile block, depending on whether an aseptic homogeniser is used downstream.

4. Sterilisation ï¿½ Tubular / scraped-surface / DSI ï¿½ 138ï¿½145 ï¿½C
Indirect tubular or plate heating, scraped-surface for viscous and fouling products, direct steam injection when flavour retention is critical.

5. Holding and F0 control ï¿½ Holding tube 2ï¿½6 s ï¿½ F0 >= 3 in retort duty
Lethality is delivered in a holding section sized on measured flow and temperature; below set point, the flow-diversion valve recycles the product.

6. Cooling and aseptic buffering ï¿½ Flash vacuum or regenerative cooling ï¿½ sterile air
Product is cooled to filling temperature and buffered in an aseptic tank under sterile air, with steam-barrier valve clusters on every connection.

7. SIP, CIP and validation dossier ï¿½ SIP 130 ï¿½C ï¿½ recorded temperature curves
Sterilisation-in-place before every run, automatic CIP after it, and validation records handed over for HACCP, audits and financing files.

DIMENSIONS AND BUILDING ENVELOPE

Skid footprint	10 ï¿½ 4 m at 3,000 l/h, 16 ï¿½ 5 m at 15,000 l/h
Skid height	3.2ï¿½4.2 m for tubular coils; 6.5 m for steam infusion vessels

Clear height	7ï¿½8 m under beam over the steriliser and holding section
Service clearance	1.5 m around the tube bundle for extraction and inspection
Retort option	Horizontal retort 1.3 ï¿½ 6 m per basket, 2ï¿½6 vessels according to output

LAYOUT ï¿½ FUNCTIONAL ZONES IN FLOW ORDER

1 ï¿½ Feed & deaeration	Balance tank, feed pump and vacuum deaeration where required
2 ï¿½ Preheating	Regenerative preheating with condensate and product-to-product recovery
3 ï¿½ Sterilization	Tubular, scraped-surface or steam infusion at 121ï¿½142 ï¿½C
4 ï¿½ Holding	Hold cell sized >= 90 s for particulates, 4ï¿½6 s for UHT milk
5 ï¿½ Flash cooling	Vacuum flash cooling and aseptic cooling to filling temperature
6 ï¿½ Aseptic interface	Sterile barrier valves to the aseptic tank or filler with SIP recording

UTILITIES AND CONSUMPTION

Installed power	90ï¿½260 kW depending on flow and configuration
Steam	1.2ï¿½3.5 t/h at 10ï¿½12 bar, culinary steam for direct systems
Cooling water	40ï¿½140 mï¿½/h circulating plus chilled water for final cooling
Compressed air	100ï¿½220 Nmï¿½/h at 7 bar, sterile filtered on aseptic barriers
Performance	F0 / F-value recipes recorded per batch, SIP 30ï¿½45 min, 20 h aseptic run
Manning	1ï¿½2 operators with SCADA supervision

INSTALLATION, SITE CONDITIONS AND SCOPE BOUNDARIES

- Scope of supply: process equipment, automation, mechanical and electrical erection, commissioning, FAT/SAT, HACCP validation and operator training.
- Excluded from the ranges: land, civil works, building steelwork, external utility generation and import duties.
- Installation, commissioning and after-sales service are delivered worldwide by MCF crews, with remote diagnostics on the SCADA.

TECHNICAL FAQ

Pasteurisation or sterilisation ï¿½ where is the border?

Pasteurisation reduces vegetative flora and needs cold chain or low pH. Sterilisation targets spores of Clostridium botulinum in low-acid products (pH > 4.6) and gives ambient shelf life: 138ï¿½145 ï¿½C for seconds in UHT, or F0 >= 3 in a retort.

Tubular, plate or scraped-surface?

Plate for clean, low-viscosity liquids; tubular for pulps, fibres and particles up to about 10 mm; scraped-surface for high-viscosity or fouling products such as concentrated paste, cream cheese and fruit preparations.

Direct or indirect heating?

Direct steam injection heats in a fraction of a second and best preserves flavour, but requires culinary-grade steam and flash cooling. Indirect tubular heating is simpler to operate and recovers up to 90% of the heat.

How is F0 validated?

By calculating the lethality delivered along the holding section from measured temperature and flow, then confirming it with penetration tests or data loggers in retort duty. Curves and records are handed over as validation documentation.

What capacities does MCF supply?

Continuous sterilizers from 1 000 to 40 000 l/h and retort batteries sized on packs per hour and cycle time, both integrated with upstream mixing and downstream aseptic or post-process filling.

NEXT STEPS

- Full technical page: https://mcftechnology.group/en/industrial-sterilizer
- Configure the line and request the feasibility study: https://mcftechnology.group/en/configurator
- Run the ROI simulator: https://mcftechnology.group/en/roi-simulator
- Build the bankable financial plan (3ï¿½10 years): https://mcftechnology.group/en/financial-plan
- Request a quotation: https://mcftechnology.group/en/contact

DISCLAIMER

All figures in this datasheet are indicative engineering ranges used by MCF Technology for budget screening and layout discussion of the reference configuration. They are not a quotation, not a performance guarantee and not the audited result of a specific plant. Final specification, dimensions, utilities and CAPEX are fixed in the feasibility study on your product, packaging formats, utilities cost and site conditions.