

Industrial homogenizer $\frac{1}{2}$ high-pressure units for dairy, juice and sauces

Target application: industrial homogenizer

Reference configuration: Industrial homogenizer, 2,000 $\frac{1}{2}$ 20,000 l/h at 100 $\frac{1}{2}$ 250 bar

A homogenizer stabilises an emulsion by forcing product through a valve gap at high pressure: fat globules and particles are reduced to a fraction of a micron, so creaming, sedimentation and phase separation stop. MCF Technology sizes homogenizers together with the thermal treatment, because pressure, temperature and position in the line determine the result far more than the machine badge.

SCOPE OF SUPPLY

- High-pressure homogenizers from 500 to 40 000 l/h, up to 1 500 bar
- One- or two-stage homogenising valve with tungsten-carbide or ceramic seats
- Hygienic block with aseptic execution for UHT and aseptic lines
- Upstream / downstream positioning study against the pasteurizer or steriliser
- Optional in-line mixing, deaeration and de-agglomeration modules
- Pressure recording, spare kit and preventive maintenance schedule

TYPICAL OUTPUTS

Milk, cream and flavoured dairy drinks $\frac{1}{2}$ Plant-based drinks (soy, oat, almond, rice) $\frac{1}{2}$ Juices, nectars and purées $\frac{1}{2}$ Ketchup, sauces, mayonnaise and emulsions $\frac{1}{2}$ Ice-cream mixes and dairy desserts

PROCESS, STEP BY STEP

1. Product characterisation $\frac{1}{2}$ Fat %, viscosity, particle size distribution

The starting emulsion is measured: without a baseline particle-size distribution there is no way to prove the homogeniser delivered what was specified.

2. Feed conditioning $\frac{1}{2}$ Feed pressure 2 $\frac{1}{2}$ 4 bar $\frac{1}{2}$ 60 $\frac{1}{2}$ 75 $\frac{1}{2}$ C

The homogeniser is fed at controlled pressure and temperature: hotter product needs less pressure for the same droplet size, which cuts energy.

3. First-stage homogenisation $\frac{1}{2}$ 150 $\frac{1}{2}$ 400 bar $\frac{1}{2}$ carbide or ceramic seat

Product passes the valve gap at very high velocity: cavitation, shear and impact break fat globules and agglomerates below one micron.

4. Second-stage back pressure $\frac{1}{2}$ About 10% of total pressure (20 $\frac{1}{2}$ 50 bar)

The second stage breaks the clusters that re-form right after the first gap and stabilises the flow, preventing pulsation downstream.

5. Integration with thermal treatment $\frac{1}{2}$ Upstream 60 $\frac{1}{2}$ 70 $\frac{1}{2}$ C $\frac{1}{2}$ aseptic downstream option

In pasteurised dairy the unit sits between regeneration and final heating; in UHT lines an aseptic homogeniser can be placed after sterilisation.

6. Verification $\frac{1}{2}$ Particle size, creaming index, 7 $\frac{1}{2}$ 30 day shelf test

Results are checked on samples and on accelerated shelf tests, not only on the pressure gauge reading.

7. Maintenance and spares $\frac{1}{2}$ Wear parts on running hours $\frac{1}{2}$ recorded pressure

Valve seats, plungers, seals and oil follow a scheduled plan; the spare kit is delivered with the machine to avoid campaign stops.

DIMENSIONS AND BUILDING ENVELOPE

Machine footprint	2.6 $\frac{1}{2}$ 1.8 m at 5,000 l/h, 4.2 $\frac{1}{2}$ 2.4 m at 20,000 l/h
Machine height	1.8 $\frac{1}{2}$ 2.2 m; 3.5 m clear height for crankcase and valve maintenance

Service clearance	1.5 m on the drive side for oil service and plunger extraction
Foundation	Reinforced slab with anti-vibration mounts, 2.5ĩŁ½6 t machine weight
Skid option	Feed pump, buffer tank and homogenizer on a single 12ĩŁ½20 mĩŁ½ skid

LAYOUT ĩŁ½ FUNCTIONAL ZONES IN FLOW ORDER

1 ĩŁ½ Feed	Buffer tank and feed pump with minimum inlet pressure control
2 ĩŁ½ Compression	Three or five plunger block with ceramic pistons and pressure damper
3 ĩŁ½ Homogenizing valve	First stage 150ĩŁ½250 bar, second stage 30ĩŁ½50 bar for cluster breakup
4 ĩŁ½ Cooling & lubrication	Oil cooling circuit and plunger flushing with sterile condensate or water
5 ĩŁ½ Control	Pressure control loop, recipe management and vibration monitoring
6 ĩŁ½ Aseptic execution	Steam-barrier version for installation downstream of the steriliser

UTILITIES AND CONSUMPTION

Installed power	37ĩŁ½160 kW depending on flow and working pressure
Cooling water	1.5ĩŁ½5 mĩŁ½/h for oil cooling and plunger flushing
Steam	0.1ĩŁ½0.3 t/h for aseptic barriers on aseptic executions
Compressed air	20ĩŁ½60 NmĩŁ½/h at 7 bar for pressure control actuation
Performance	Fat globule < 1 ĩŁ½m on milk, particle reduction 80ĩŁ½95% on purĩŁ½es
Manning	Unattended running, inspection at each CIP cycle

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

Which pressure does my product need?

Drinking milk is normally homogenised at 150ĩŁ½200 bar, cream at 80ĩŁ½120 bar, plant-based drinks at 200ĩŁ½250 bar and fine emulsions or sauces at 250ĩŁ½400 bar. The exact figure is fixed on samples during trials.

Why a two-stage valve?

The first stage breaks the globules; the second, at about 10% of the total pressure, breaks up the clusters that re-form immediately afterwards. Two stages are standard on milk, cream and plant-based drinks.

Before or after heat treatment?

In pasteurised dairy the homogenizer usually sits between regeneration and final heating (upstream, 60ĩŁ½70 ĩŁ½C). In UHT lines aseptic downstream homogenisation is used when the emulsion must be stabilised after sterilisation.

How much power does it draw?

Roughly 0.5ĩŁ½0.9 kW per mĩŁ½/h per 100 bar, so pressure has a direct effect on running cost: over-specifying pressure is one of the most common and most expensive mistakes in a new line.

What maintenance does a homogenizer need?

Periodic inspection of valve seats, plungers, seals and oil, with wear parts changed on running hours. MCF supplies the spare kit and the maintenance plan with the machine.

NEXT STEPS

- Full technical page: <https://mcftechnology.group/en/industrial-homogenizer>
- 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 (3 to 10 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.