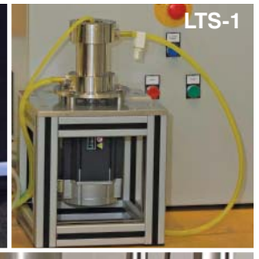
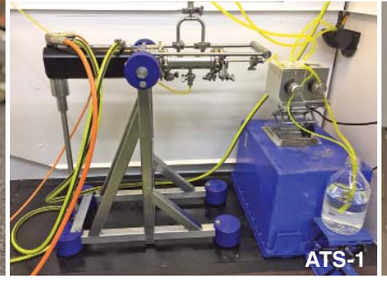
Micropore Membrane Emulsification Equipment

	LDC-1	AXF-1	LXF-1	LTS-1	ATS-1
Continuous operation	No	Yes	No	Yes	Yes
Capacity (Disperse phase Kg/hr)	20ml batch	15-20 kg/hr	3 kg/hr	5-10 kg/hr	5-10 kg/hr
Typical CV%	15-20%	10-15%	15-20%	6-10%	6-10%
Materials of construction	Glass / PEEK	S/S	S/S	S/S	S/S
Membrane	S/S	S/S	S/S	S/S	S/S
Moving parts	Vortex breaker	None	None	Oscillating membrane	Oscillating membrane
Can be customised?*	Yes - within limits	Yes - within limits	Yes - within limits	Yes	Yes
Can be GMP?	Yes	Yes	Yes	Yes	Yes
Capacity can be decreased?	No	Yes	Yes	Yes	Yes
Capacity can be increased?	No	Yes	Yes	Yes	Yes
Independence of flow rate from shear	Yes	No	No	Yes	Yes
Footprint	Lab bench	Lab bench/ pilot scale	Lab bench/ pilot scale	Lab bench/ pilot scale	Lab bench/ pilot scale
Packaging	Briefcase	Briefcase	Packing crate	Packing crate	Packing crate

* Customisation includes aspects such as full thermal control and holdup volume.





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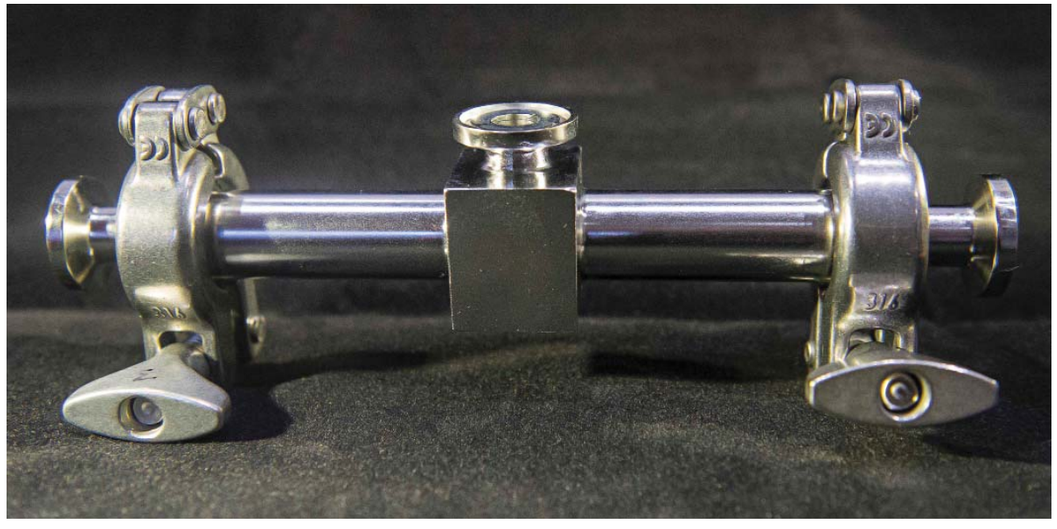
AXF Aseptic Crossflow

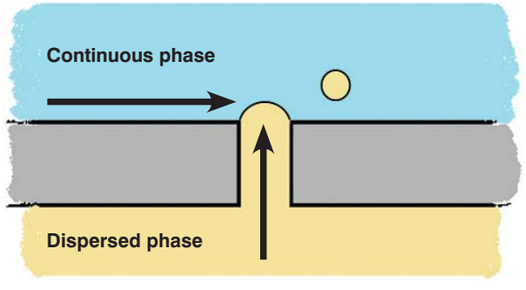
Micropore are pleased to announce the launch of our new Aseptic Crossflow Unit, the AXF.

Utilising Micropore's membrane emulsification technology, the AXF provides the ability to produce a high-quality emulsion, with a tightly controlled particle size distribution, at high throughput for a device of this size.

Specifically designed for applications where high levels of hygiene are important, such as cosmetics, food and pharmaceuticals, the simple but stylish design of the AXF allows it to be sterilised easily. Triclamp fittings avoid the need for push fit or screw fitting and the 316 stainless steel is electropolished to give a quality finish.

As it has no moving parts, it is a simple and robust way to continuously manufacture emulsion systems. The tubular membrane is precision engineered with laser drilled pores along its length, the size of the pores and the distance between them, is one of the primary methods of obtaining near mono-dispersed droplets.





The crossflow approach involves the dispersed phase to be injected into the middle port, where it is distributed along the length of the membrane and passes through the pores. Meanwhile the continuous phase is being pumped from left to right (in the image above), as the continuous phase, passes through the tubular membrane, it provides the shear force necessary to deform and detach the droplets as they form on the pores.

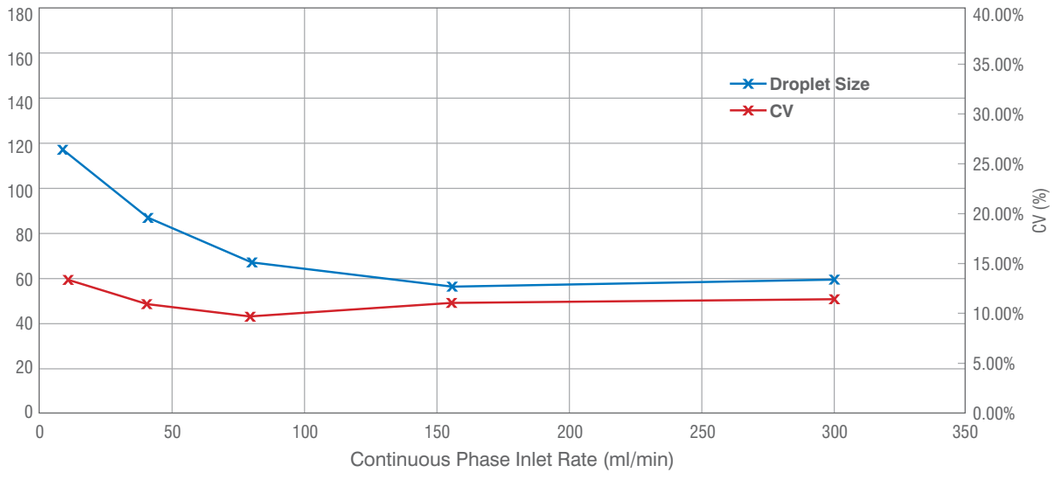
Easy to assemble, operate, dissemble and clean, this stand-alone membrane emulsification device can operate at high flow rates and still provide a small coefficient of variation (% CV, used as a measure of how well, or how poorly dispersed a system is).

Using a 15 micron pore size membrane, with a 200 micron pitch, it is possible, by changing the flow rates of each solution, to obtain a range of droplet sizes, represented by the D50 measurement and CV. Even at high flow rates (18L/hr of dispersed phase) the CV remains low.

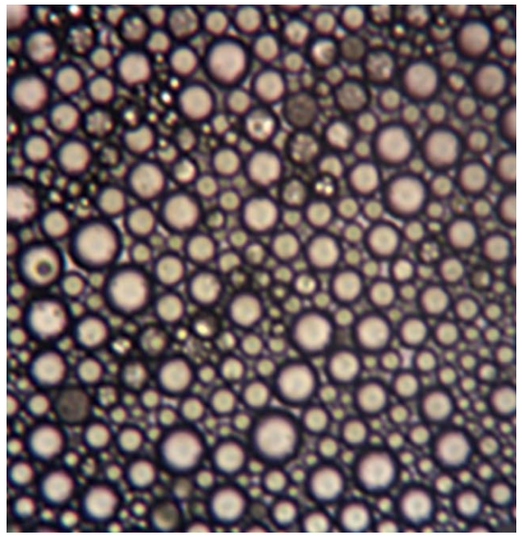
D50 and CV for various flowrates, maintaining 10%v/v. Sunflower Oil in 2% Tween 20

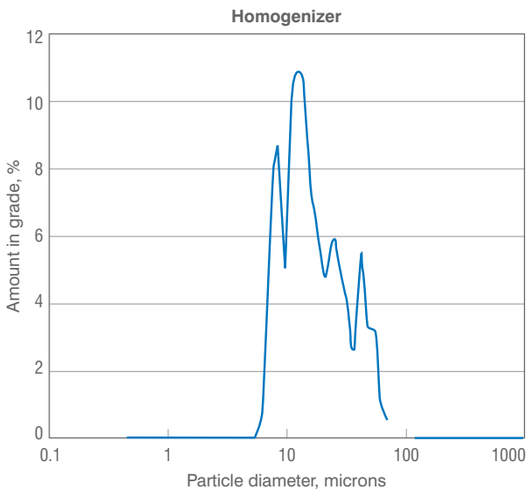
Dispersed Phase Injection Rate (ml/min)	Continuous Phase Injection Rate (ml/min)	D50 (μm)	CV (%)
20	180	114.8	13.0
40	360	88.6	11.2
80	720	66.7	9.5
160	1440	56.5	10.7
300	2700	60.4	11.0

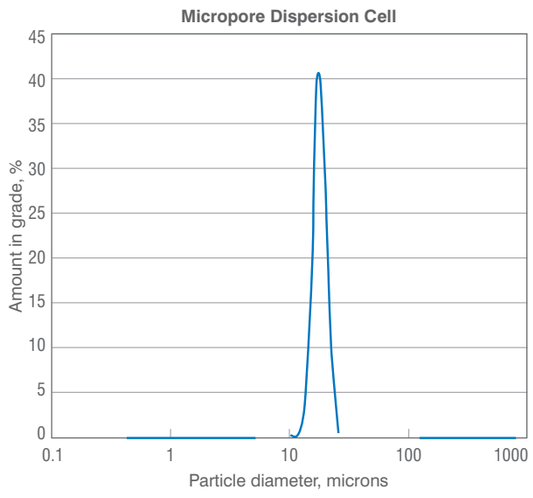
Figure 1 - D50 and CV versus Dispersed Phase Injection Rate. All data at 10%v/v. Sunflower Oil in 2% Tween 20



When compared with traditional emulsification methods, such as rotor/stator homogenisers, membrane emulsification offers clear benefits.







Membrane Emulsification Advantages

- Emulsions prepared via membrane emulsification are inherently more stable, as all of the droplets are close to the same size, they will have the same buoyancy, reducing creaming or sedimentation.
- The amount of emulsifier or surfactant can be reduced, providing a reduction in raw material costs.
- The membrane process uses much lower shear force and so it is more gentle, allowing processing of sensitive materials without damage.
- These emulsions can be post-processed and turned into microcapsules, delivery systems for a variety of actives. Each microcapsule will behave in exactly the same way, reducing variability upon rupture.