

# AXF-1



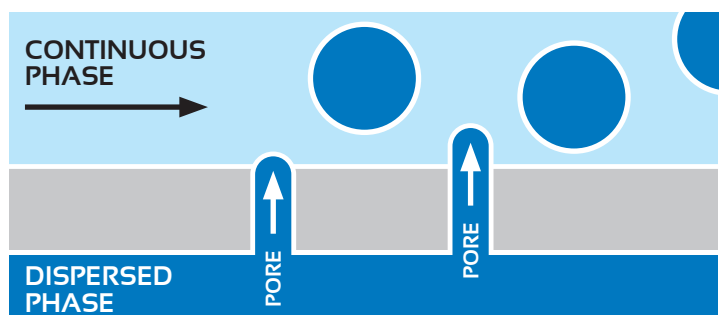
## Aseptic crossflow unit

The AXF-1 is a high throughput device scaling up Micropore's membrane emulsification technology, to enable the continuous manufacturing of high-quality emulsions in quantity, whilst retaining a tightly controlled particle size distribution.

- Specifically designed for applications where high levels of hygiene, including GMP, are important.
- 316 electropolished stainless steel body, with ergonomic triclamp (rather than pushfit or screwed) connections, allows for easy sterilisation.
- With no moving parts, it is an elegant, robust, ultra-low maintenance and easy to clean device for continuously manufacturing high quality emulsions.

- The internal tubular membrane is precision engineered with laser drilled pores along its length, and allows for the manufacture of near mono-dispersed droplets.
- Production volume in the range 1-1,000 kg.hr

The crossflow approach involves the dispersed phase being injected into the middle port, where it is distributed along the length of the membrane and through the pores. Meanwhile the continuous phase is pumped through the device, passing inside the tubular membrane, to provide the shear force necessary to deform and detach the droplets as they form through the pores.

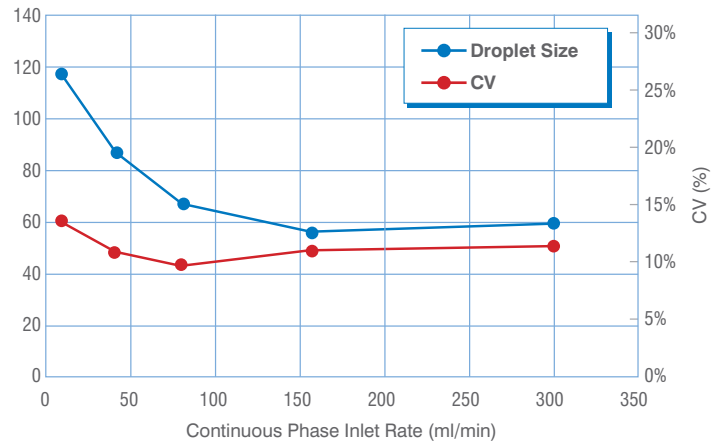


Using a 15 micron pore size membrane, with a 200 micron pitch, it is possible, by changing the flow rates of each solution, to obtain a range of droplet sizes, represented by the D50 measurement and coefficient of variation (CV). Even at high flow rates (18L/hr of dispersed phase) the CV remains low.

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

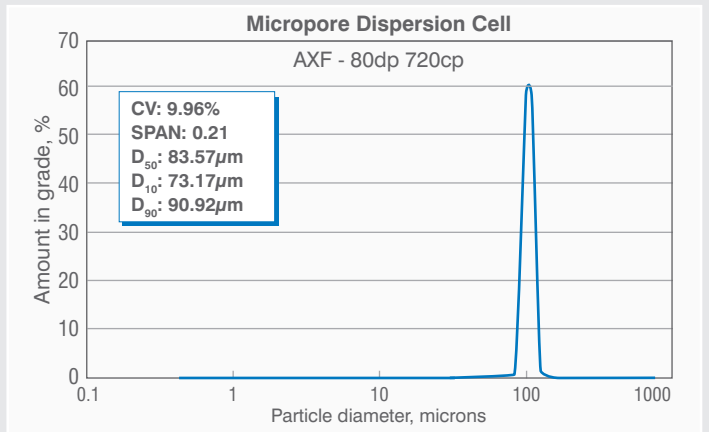
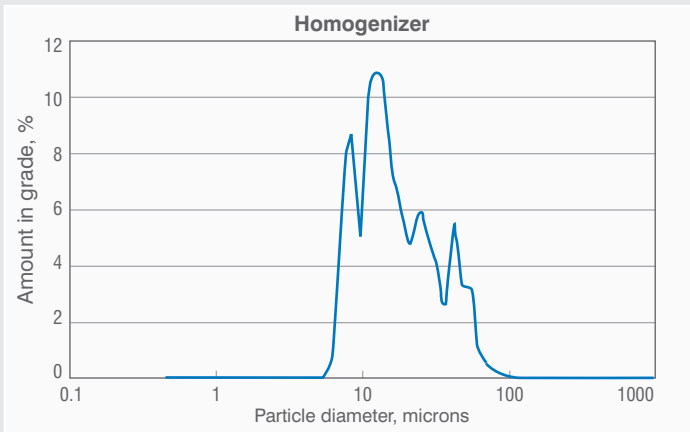
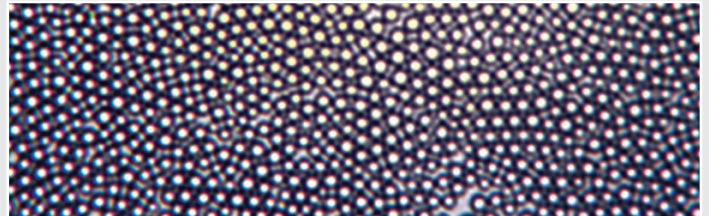
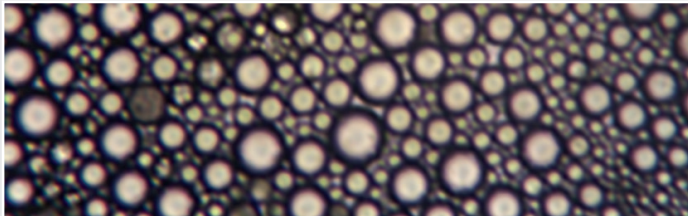
Dispersed Phase Injection Rate (ml/min)	Continuous Phase Injection Rate (ml/min)	D50 ( $\mu\text{m}$ )	CV (%)
20	180	114.8	13.0
40	360	88.6	11.2
80	720	66.7	9.5
160	1440	56.5	10.7
300	2700	60.4	11.0

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



## 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 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.
- The amount of emulsifier or surfactant can be reduced, providing a reduction in raw material costs.
- A comprehensive body of peer-reviewed literature, describing the benefits of membrane emulsification, is available.
- Because membrane emulsification is a very controlled and highly engineered process a major advantage, compared with traditional methods, is significant reduction in waste and an improvement in on-specification product yield.



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