

SCALE-UP OF NARROW DISPERSITY EMULSIONS FOR HIGH VOLUME MANUFACTURING AGAINST DEMANDING REQUIREMENTS

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Abstract Text

Homogenisation techniques have traditionally been used to generate emulsions but have drawbacks of high energy use and reduced stability through a lack of process control. Alternative methods to form superior emulsions have been investigated. Membrane emulsification has historically been limited to scale lab-scale operations, but recent developments have led to scalable systems specifically designed for aseptic applications, such as pharma, as well as more general industrial use.

One such membrane emulsification system is reported. The system contains no moving parts and generates uniform droplets using a continuous single pass, making the system suitable for highly sensitive and demanding processes in the pharmaceutical, cosmetic and food industries. The system is shown to be highly capable in large-scale production of emulsions, with a rate of production in the range 20 - 200L/Hr. Oil-in-water emulsions, across a range of droplet sizes with median diameters 20 - 100µm, were produced to demonstrate the equipment's flexibility. A model encapsulation system has been demonstrated to highlight the potential for continuous production of low-dispersity encapsulates. Samples produced have a droplet size coefficient of variation of below 15%. A high dispersed phase concentration of up to and beyond 40% has been achieved in a single pass, further demonstrating the potential for translation to highly efficient continuous manufacturing processes.

A narrow droplet size distribution results in a more stable emulsion. This emulsion, through different chemistries, has been converted into microcapsules and other forms of delivery systems with superior performance in mechanical stability, uniformity of dose and rate of diffusion.

This presentation will demonstrate the benefits of membrane emulsification to achieve size control and stability benefits. The associated cost savings of significant waste reduction and low energy usage will also demonstrate this technology can improve yields and enhance product performance through a low-cost sustainable process.