



QUADRO

Application Note



High Shear Mixing Technology for Mayonnaise Production



INTRODUCTION

Mayonnaise is an oil-in-water emulsion typically containing more than 74% vegetable oil (minimum 65%). Egg yolk is used as an emulsifier at a level commonly between 4% and 8%. Water makes up the continuous phase of the formula at 5-15% with various other additives for flavor such as salt, sugar, spices, and vinegar or an alternative edible acid (i.e. lemon or lime juice).

Commercial production of mayonnaise is often a two-step process. In the first step, oil is coarsely dispersed (i.e. 20-100 μm) in a pre-mix tank along with the other required ingredients. The resulting pre-mix is then transferred from the tank in a flowing stream through an emulsifying machine to finely sub-divide the oil into droplets averaging between 1-5 μm in size. The sub-division of oil into fine droplets forms a densely packed (i.e. space-filling) structure that creates a high viscosity oil-in-water emulsion. High viscosity is a desirable quality for mayonnaise because it improves the level of stability in the product.

The physical structure formed while processing mayonnaise is largely dependent on the product's oil volume fraction and droplet size distribution. The densely packed structure of oil droplets determines the consistency and rheological properties of a mayonnaise. The smaller the droplets are, the more densely packed the mayonnaise structure becomes, resulting in higher viscosities. So if a stiffer mayonnaise is desired, smaller oil droplets are necessary.



Material Processing Technologies

Fitzpatrick | Matcon | Microfluidics | Quadro | Steridose

The Quadro Approach

High Shear Mixing Technology

The Quadro Ytron® Jet Mixer configured with our bypass dispersion assembly is ideally suited to the first step of mayonnaise preparation with the ability to disperse powders or liquid ingredients sub-surface in the pre-mix. Sub-surface dispersion through the Jet Mixer head prevents powder lumps and agglomerates from forming, while also creating a uniform distribution of coarse oil droplets for the next step of processing. A uniform distribution in the pre-mix improves the reliability of droplet size reduction in the emulsifier while producing a more consistent stability in the mayonnaise.

For the second step of processing, the mayonnaise pre-mix can either be pumped through a Quadro Ytron® Z-Emulsifier or a Quadro® HV-Emulsifier. If a typical mayonnaise is desired with droplet sizes between 1-5 μ m, the Z Emulsifier is an ideal solution. The Z Emulsifier allows custom selection of up to three stages of rotor-stator tooling to meet the needs of processing mayonnaise at a higher capacity than a colloid mill, while maintaining a single-pass process. If a stiffer mayonnaise is desired our new HV-Emulsifier can be used to significantly reduce oil droplet size (i.e. below 1 μ m is possible), and more easily attain a densely packed structure, resulting in higher viscosity product.

