application data

PHA-HSM-01

ROSS HIGH SHEAR MIXER
FOR THE PRODUCTION OF MILK OF MAGNESIA FROM
SPI PHARMA BARCROFT™ RMP

Industry: Pharmaceuticals

End product: Milk of Magnesia Suspension

Machine: High Shear Mixer

Ross Laboratory High Shear Mixer Model HSM-100LC with Probe

BACKGROUND:

SPI Pharma's Barcroft™ Resuspendable Magnesium Hydroxide Powder (RMP) is a unique version of magnesium hydroxide powder. It is special in its ability to be resuspended, thereby forming a pharmaceutically elegant Milk of Magnesia suspension.

When processed correctly, suspensions made from Barcroft RMP allow users to reduce or eliminate the use of gum additives and suspending agents which are normally employed when attempting to suspend a fine powder.

PROBLEM:

Milk of Magnesia is typically prepared from a 7 to 10% RMP in water mixture. It is characteristic of an RMP suspension to gain viscosity as it is subjected to shear. But a maximum viscosity is reached beyond which additional mixing time will actually cause the material to thin out.

Many users have the notion that the longer the suspension is mixed, the better will be the product quality. An important parameter that can guide milk of magnesia manufacturers is particle size. At a mean particle size of 8 to 11 microns, the solution is expected to be at its thickest. This viscosity plateau will vary from one user to another but is supposed to be greater than 1,000 cps.

PROCEDURE:

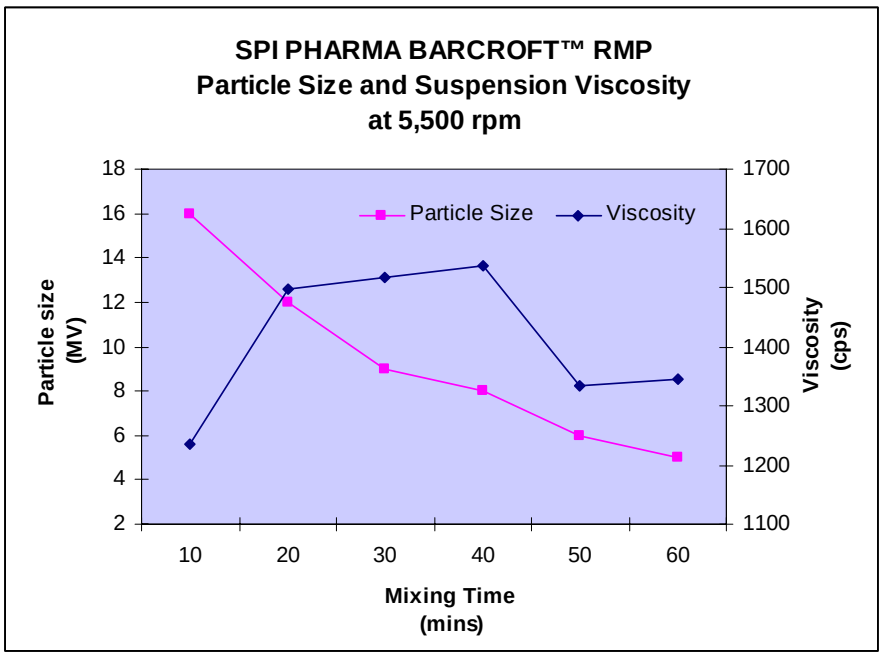
A series of laboratory tests at the SPI Pharma Research and Development Department done on a Ross Model HSM-100LC Laboratory High Shear Mixer revealed the following data:

MIXER SPEED (rpm)	VISCOSITY (cps) {TA Spindle}	VISCOSITY (cps) {#3 Spindle at 30 rpm)	PARTICLE SIZE (MV)
4500	700	1256	17.1
5000	800	1644	13.3
5500	**850**	**1696**	**10.8**
6000	825	1540	9.1
6500	550	864	5.7

(at constant mixing time = 20mins)

A Ross design Slotted Stator Head was utilized for the experiment. Batch size was 800g and solids (RMP) content was 7.7% by weight. Viscosity measurements were taken at 25°C using a Brookfield LVT viscometer.

Having identified 5,500 rpm as the optimum mixing speed, another experiment was performed to determine optimum mixing time. The results are summarized in the following graph.



Mixing for 40 minutes at 5,500 rpm resulted to the highest suspension viscosity. Additional mixing continued to reduce RMP particle size but the mixture started thinning out.

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The behavior of RMP solutions prepared on a plant scale is expected to parallel the laboratory results illustrated above. But because shear rate is more a consequence of tip speed (rather than rotor speed in rpm), optimum mixing speed in larger high shear mixer models may vary from the findings of the bench top experiments.

In consideration of the differences in formulation and other processing conditions, it is recommended for RMP users to plot their own viscosity and particle size profiles. Knowing these important data and using the proper high shear mixer will enable Milk of Magnesia manufacturers to benefit most from Barcroft RMP's unique properties, cut costs, and optimize processing time.

PRODUCTION MODELS

The Batch Model High Shear Rotor-Stator mixer design consists of a single stage rotor that turns at high speed within a stationary stator. As the rotating blades pass the stator, they mechanically shear the contents.

This batch mixer can be either permanently mounted to a vessel or suspended over a vessel on a portable lift. The mobile configuration offers the flexibility to use a single mixer in multiple vessels. It also allows the user to vary the position of the stator to accommodate different mixing capacities.

To aid circulation, the rotor-stator is generally positioned 2 - 3 head diameters off the bottom of the vessel, and slightly off center. In other applications, the rotor-stator generator may be positioned in the center of the vessel to ensure adequate suspension of heavier solids.

Inline models, consisting of a single, dual, or four-stage rotor/stator are a good choice for frequent product changeovers. A simple valve can divert product downstream or switch instantly from one vessel to another.

Tank-Mounted Model

Mobile Lift Model
(shown with Powder Induction System)

Inline Model

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