RECOMMENDED MIXING EQUIPMENT FOR

Carrageenan

APPLICATION SUMMARY:

Carrageenan is a natural hydrocolloid extracted from species of red algae. Available in powder form, it is used as a gelling and thickening additive in many dairy foods, processed meats, pharmaceuticals, cosmetics and other products.

The three main classes of carrageenan – kappa, iota, and lambda – differ in solubility and thickening mechanism. Depending on the specific formulation and its application, carrageenan dispersions can resemble a flowable liquid or a semi-solid gel especially when combined synergistically with other thickeners.

Mixer selection is based on a number of factors including viscosity profile, shear input and method of powder addition.

Ross High Shear Mixers with SLIM Technology

The Ross Solids/Liquid Injection Manifold (SLIM) Technology is well proven for fast and complete dispersion of carrageenan into water, glycerin or other liquid vehicle. The SLIM is a unique rotor/stator mixer designed to create a powerful vacuum that draws and injects powders directly into a high shear zone. It operates within a wide viscosity range: from water-like to up to 10,000 centipoise (cP) during powder injection. After all the solids are added, product viscosity may continue to climb.

Dispersing carrageenan gums using conventional propeller or turbine mixers present a number of processing difficulties. As with many powdered ingredients, dusting can create a health hazard for the machine operator as well as potentially pose an explosion risk. Adding carrageenan scoop-wise into an agitated vessel often proves inefficient when the powders have a tendency to float on the liquid surface and take a considerable amount of time to completely dissolve. During this prolonged powder addition, carrageenan added early on may begin to hydrate and form lumps making it much more difficult to add the remaining powders. In some cases, the carrageenan is first blended with other dry ingredients just to make it easier to disperse and dissolve.

The SLIM is ideal for wetting out carrageenan because it allows for rapid addition of powders without subsequent lumping. It does this by combining solids and liquids sub-surface at precisely the point where intense mixing takes place. Dispersion is virtually instantaneous and lumps or “fish eyes” are prevented from forming in the first place. A hose & wand attachment may be used to draw lightweight powders straight from the bag and prevent particles from becoming airborne.

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Ross Multi-Shaft Mixers and Planetary Mixers

High viscosity carrageenan solutions are batched in multi-agitator equipment and planetary-style mixers depending on their flow characteristics. For example, Ross Multi-Shaft Mixers equipped with two or more independently-driven agitators are suited for formulations up to several hundred thousand centipoise. A typical configuration consists of a low-speed anchor, a saw-tooth disperser blade and a rotor/stator assembly designed for sub-surface powder induction (SLIM Technology). The wings of the anchor agitator include adjustable scrapers for wiping the vessel bottom and sidewalls. This allows for tighter temperature control in addition to enhanced product turnover.

The Ross PowerMix Planetary Disperser and Ross Double Planetary Mixer, on the other hand, are extremely efficient for producing air-free carrageenan gels above 1 million cP. These machines consist of two blades which rotate on their respective axes as they revolve around the mix vessel. Unlike agitators that rotate from a fixed axis, the blades in a planetary mixer continually advance into the batch and contact fresh product all the time. This mixing mechanism is thus particularly suited for ensuring thermal and compositional uniformity virtually regardless of product rheology. Testing is normally recommended to confirm the best mixing strategy and equipment for a particular carrageenan formulation.