

Littleford Technifax

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COLOR CONCENTRATES

Uniform Color Through High Intensity Mixing

Color continues to be identified with plastics as consumers demand brighter, more vivid plastic products. Colorants are the dyes and pigments added to plastics to achieve the ultimate color effect.

Some physical means must be used to insure that the colorants are dispersed completely, that agglomerates are broken down to minimum particle size and that surface air is displaced producing a colorant to resin interface.

Recent technology and industry trends have contributed to an ever increasing use of concentrated colorant/resin systems as a means for coloring plastics. The reason for this high usage is the precision with which color levels can be controlled during manufacture to meet specifications.

In addition to precise color contact, color concentrates minimize the presence of colorant particle agglomerates that cause uneven coloring (streaks), and they blend more evenly in the processor resin than dry ingredients. They are less prone to contamination in storage and require a minimum of machine clean-up. They simplify inventory requirements since natural resins can be purchased in bulk quantities and colored with the color concentrates as needed. Their acceptance has also led to the incorporation of other additives in addition to colorants to simplify their addition to the resin system.

The amount of colorant used in color concentrates has been traditionally in the range of 20-30%, however, loadings of 50% and higher are being developed to provide products of greater cost performance and versatility while saving in inventory and shipping. These enriched colorant/polymer blends are melt mix extruded and chopped into pellets.

For less intense coloring applications, it is possible to actually impinge as much as 7-10% colorant onto the surface of the resin polymer.

Although this 7-10% loading is not as high as the normal melted concentrate's 50% level, this 7-10% product is clean (no rub-off) at the point of discharge from the Littleford high intensity mixer — without having to go through the melting, extrusion, and chopping processes.

To understand why Littleford mixers are being widely used in the color concentrate application, let's examine the design and function of the mixer.

Littleford's "W" Series high intensity mixers are vertical, cylindrical drums that have a single, bottom-

entering vertical drive shaft. Mounted on this shaft are specifically designed mixing elements, arranged in a cross pattern, that sweep the entire diameter of the mixing drum.

The mixers, with typical 1 to 2-minute cycles, provide a mix action that creates an intensive impingement of lubricant, pigment and additives upon the resin particles in combination with thorough blending and complete break up of agglomerates.

The mixing elements, or impellers, can consist of a horizontal plow (initiator) with an angular plow (accelerator) mounted above it.

These mixers convert horsepower into mechanical energy. They are designed with drive ratios of 1 horsepower for every 2 to 4 lb. of compound, depending upon bulk density. The mixing elements are driven at peripheral speeds of 5,000 to 8,000 ft./minute.

In order to achieve the intense, high-shear mixing, the designed-in mix action relies upon two separate principles . . . closely following Newton's first and third laws of motion in that there are both centrifugal (center-fleeing) and centripetal (center-seeking) forces acting concurrently within the mixer.

The impeller design and relatively high tip speeds create an intense vortex mix action that keeps the materials of mix in a rotating horizontal movement coupled with a cascading vertical movement.

With these concurrent actions and the intense, swirling vortex, the materials of mix are lifted up and along the periphery of the drum, then deflected down through the vortex and into the impeller system again.

There are two streams of product, one flowing up and one flowing down. At the interface between the upward and downward flows, particles are actually rubbing against one another. This action generates the heat required for deagglomeration, dispersion, and impingement of dry additives or absorption of liquid additives into the resin as well as for maximizing product density.

The mixer interior and all product contact surfaces are polished stainless steel; impellers are wear edged; and, the mixing vessel can be equipped with a water cooling jacket to prevent overheating the resin polymer during intense agitation.

Littleford "W" Series high intensity mixers are available in three production models, with total capacities of 6.5 cu. ft., 21.6 cu. ft. and 43.0 cu. ft.