

Dry And Wet Mixing Of Kevlar® Pulp

"Kevlar" aramid pulp is now being used as the reinforcing fiber in friction material, plastics, gasketing, rubber products and other industrial goods. Littleford has developed a totally new mixing process technology involving special mixing elements and procedural techniques for formulations which utilize "Kevlar" pulp.

Research and development work at Littleford, coupled with valuable input from the manufacturer of "Kevlar" fibers, has enabled Littleford to modify components of the basic FM/FKM Series horizontal batch mixer to effectively process this material with its unique characteristics.

The equipment and techniques developed by Littleford has made it possible to take full advantage of the reinforcing strength of the "Kevlar" pulp by achieving the maximum opening and separation of the individual fibers. It has been demonstrated that the "Kevlar" pulp could be opened (density decreased) to the highest degree known in the industry. This high degree of fiber opening makes the "Kevlar" more economical since the strength modulus in the finished product is directly proportional to the degree of fiber opening or separation.

The primary mix action of a Littleford FM/FKM Series mixer is developed by the rotation of plow-shaped mixing elements at a speed sufficient to place the materials of the mix into a "pulsating" mechanically fluidized bed. The basic mix action is supplemented by high speed, fiber opening and dispersing blades which are exclusive to the Littleford mixer. The combined action of the plows and the high speed fiber opening disperser blades act to fully open the fiber and uniformly mix and disperse all components of the mix.

A suggested procedure for mixing a typical dry mix using "Kevlar" aramid pulp is as follows:

- 1.) The Littleford FM/FKM Series mixer must be equipped with plow-shaped mixing elements

and a full complement of high-speed fiber opening disperser blades. The number of fiber opening blades is dependent on the size of the unit. All plow clearance (plow to drum wall) should be set at $\frac{1}{4}$ " - $\frac{3}{8}$ ". Fiber opening disperser blades must be the special multi-tier type. Mixing should be done with the main shaft and fiber opening blade operating at designated speeds.

- 2.) For batch sizing purposes, keep in mind that the final mixed fill volume must not exceed 80% of the mixers total capacity. Charge an appropriately sized batch of materials ("Kevlar" pulp, resins and minor additives) to the mixer. Mix with the plows and high-speed fiber dispersers for approximately 10 minutes or until the desired degree of homogeneity is achieved. The mixture should be highly fibrous with individual fibers well coated with the dry resins and minor additives.

A suggested procedure for mixing a wet mix using "Kevlar" aramid pulp is as follows:

- 1.) Equip the FM/FKM Series mixer in the same manner as for a dry mix.
- 2.) Charge an appropriately sized batch of "Kevlar" pulp and any dry resins, filler or additives to the mixer. Mix with the plows and high-speed fiber dispersers for approximately 2-4 minutes to "fluff" the fibers and mix all ingredients.
- 3.) Inject liquid resins or solvents and mix with the plows and fiber opening blades until the fibers are uniformly mixed and dispersed (wet out). Required time for mixing is normally 5-10 minutes, however, longer times may be necessary depending on the formulation. The mix should be free of dry, uncoated fibers. Yellow clumps or balls of fiber should not be noticeable.