How to reduce blending times

INTENSIFIED RIBBON BLENDING OF MELAMINE COMPOUNDS CUTS CYCLE TIMES 25 PERCENT FOR FURNITURE MOLDER

Ribbon blender blades produce counter-directional flow to blend materials having a variety of bulk densities and particle sizes in wide-ranging batch volumes.

A screw conveyor transports uniform blend of wood flour, melamine and pigments.

Charging tray is filled with blend prior to molding.

Melsur Corporation, the world's leading supplier of hard plastic melamine school furniture, molds components from a mixture of resin, wood flour and pigments. Each of the 32 color variations, 30 products and custom designs must be blended individually, a process that can take up to four hours, depending on product. Anything less than empirically defined cycle times alters the final color and produces blemishes in the finished product.

Melsur wanted to reduce blending times, but high mixing speed was not an option because it created friction and heat, causing the resin to degrade. The solution proved to be a Munson ribbon blender with an integral "intensifier bar" that cuts blending time by 25 percent, according to Brad Lockwood, Melsur Corporation's General Manager.

THE CRITICAL BLENDING PROCESS

Bulk bags of resin and wood flour are purchased in specified sizes to eliminate time-consuming weighing. The bags, which may contain up to 2,000 pounds (907 kg) of material, are carried to a mixing area by overhead crane or forklift and dumped into the 270 cubic-foot blender. Between 3,800 and 4,500 pounds of material are required for each batch, depending on the resin-wood flour ratio. The ingredients contain less than five percent moisture, and consist of particles up to 60 mesh (250 microns). Pigments are hand-weighed and added to the mix.

The U-shaped steel blender contains a horizontal shaft fitted with seals specially designed for Melsur to handle melamine and deliver exceptionally long life. The shaft supports inner and outer helical ribbon blades and as it rotates, the blades, which have reverse pitches, setup a counter-directional flow pattern within the batch. The flow pattern enables the blender to effectively handle materials of various batch volumes, densities and particles sizes, and to distribute minor ingredients uniformly. The 1/8-inch clearance between the ribbon blades and the drum trough eliminates dead spots and reduces the residual heel of material in the trough following discharge.

The intensifier bar is mounted at the mid point of the vessel and is located beneath and perpendicular to the blender shaft.

"The intensifier bar is a shaft fitted with a stainless steel fingers that intensively agitate material being propelled into the area by the ribbon elements," explains Lockwood. "This agitation cuts mixing times by as much as an hour."

The bar's unique action is especially valuable when mixing melamine, wood flour and pigments. Melamine and pigments tend to agglomerate, making them difficult to disperse through wood flour, and the flour, in turn, does not flow freely and has a fairly high angle of repose.

ADDED INSURANCE

Upon completion of the blending cycle, the operator draws a sample to check the blend against specifications and then enters a code on a touch screen to discharge the batch through a rotary valve into a Munson SK 24 MS attrition mill. The mill breaks down residual lumps and promotes uniform distribution of melamine and pigments both non-free-flowing and difficult to blend into the wood flour, minimum rejects and scrap. The mill plates have a ribbed pattern designed to work well with wood flour, and because they are nickel-hardened, the plates deliver outstanding wear life.

After milling, the mix is discharged into a small hopper with a screw conveyor that fills "charging trays" containing 1, 2 or 4 forms shaped like the part being molded. The number of forms depends on the number of cavities in the hydraulic press being used.

An operator places a tray on a load cell located beneath the conveyor's discharge spout and presses "start" to begin filling the tray. When the load cell senses the correct weight, it signals the PLC (programmable logic controller) to stop the conveyor. Once the rack is filled with charging trays, it is wheeled to the mold room and the charges are loaded into a hydraulic press where they are molded under high heat and pressure.

Operator loads charges into hydraulic press which molds furniture components (foreground).

From bulk bag, operator loads one of 12 ribbon blenders with wood flour or resin.

During the peak summer season, Melsur typically operates 24/7 to produce furniture for the upcoming school year, making high reliability and shortened cycle times important to meeting demanding production schedules. For maximum efficiency, Melsur has converted its 12 mixers to Munson SD 512 MS ribbon blenders with intensifier bars, working in concert with 12 Munson attrition mills.

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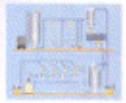

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