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## Diversified Chemical

Sanitary ribbon blender ups production of dental  
powders

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# Sanitary ribbon blender ups production of dental powders

Wilmington, DE — Dental laboratory needs are a specialty of Diversified Chemical Products, Inc. (DCP). Its business includes products for fabrication of dental prostheses, cleaning of dental instruments, and dissolving dental cement, in addition to other custom powders for dental laboratories, jewelry cleaning, and industrial applications. Since 1974 the company has worked closely with customers, developing products that meet a particular need, manufacturing those products on a private-label or contract basis, and packaging them in the form most convenient for the end user (Figure 1).

For one of its clients, DCP's development team helped extend the properties of an enzymatic cleaner for dental instruments to dissolve dental cement in addition to biological waste such as blood and mucous. "It was a unique mixture that fit a nice niche for one of our customers, and it grew into a rather large product for us," says Jim Longo, Jr., president. The innovation was so successful that orders quickly exceeded the capacity of the plant's two 35 gal (133 liter) planetary mixers, leading to an expansion.

## Complete system solution

The solution to higher production was an integrated system to load, mix, and convey the enzymatic cleaner (Figure 2). A Munson ribbon blender in FDA-mandated stainless steel with sanitary finish incorporates a bag dump station, a receiving hopper, and a pneumatic conveyor to transfer the materials to a surge hopper feeding the existing filling and packaging line. Munson engineers tested the powders and worked in tandem with the other vendors to assure satisfying all levels of requirements. DCP worked with Jerry Spross of EPI Technical Sales, who put the package together.

Since DCP often deals with powders in the form of low-micron dust particles, dust containment during the manual loading process was essential. The integral bag dump station is mounted atop the blender and includes a dust hood with two PTFE one-micron pleated cartridge filters for dust collection (Figure 3). The bags are laid on top of a grate and slit open, discharging the contents directly into the blender. A hinged, gasketed cover on one side opens to add minor ingredients, which are pre-weighed, or sometimes pre-mixed with small mixers, and added with buckets.

Blended powder discharges into a transfer hopper that feeds a pneumatic conveying system taking the product to a surge hopper and on to a semi-automatic auger filler. Less free-flowing material is loaded into drums and transferred via handheld pneumatic wand to a fully automatic vertical form-fill-and-seal bagging machine.



Figure 1. Dental laboratory powders... Diversified Chemical Products manufactures and packages custom powders for dental laboratories and other niche industrial applications.



Figure 2. Blending system... A system designed to increase mixing capacity centers around a Munson ribbon blender fed via a bag dump station with dust collection and exiting into a receiving hopper with pneumatic conveying.

## Why ribbon blending?

After testing, Munson custom designed the 52ft<sup>3</sup> (1.5m<sup>3</sup>) ribbon blender to meet exact process requirements. The ribbon was the most economical mixer able to meet the company's dual objectives of efficiently blending a variety of ingredients with dissimilar properties, including both low-micron-size ingredients and minor ingredients in small amounts, and also handling a range of batch sizes.

Ribbon blenders can efficiently mix components in batches smaller than rated capacity, although blending time increases with smaller batch size. The mixer was designed to fit DCP's most typical batch size of 2,000lb (907kg), but through continued use Longo has found adequate mixing in a range of 800-2,200lb (360-1,000kg) per batch.

The counter-flow agitation in the blender mixes materials rapidly and completely, and is particularly efficient at blending ingredients of widely varying quantities, densities, and particle sizes, a good fit for DCP's requirements. Most products require colors, dyes, or fragrances in very small amounts, as small as 1-2lb (0.45-0.9kg) in a 2,000lb (900kg) batch. The ribbon blender efficiently disperses these minor ingredients, according Longo, producing a homogeneous product in 5 to 15 minutes, depending on batch size.

Uniform blending is a consequence of the mixer's design and fabrication. The U-shaped vessel is constructed with large-radius fillet welds, ground smooth inside the body to eliminate rough spots that might trap material and prevent complete blending. An exceptionally small clearance between the agitator ribbons and the vessel further enhances complete mixing, with no dead spots, pockets, or corners.

The ribbon blade element consists of a central shaft that rotates two spiral or helical ribbons, inner and outer, with reversed pitches that force material in opposing directions (Figure 4). For optimum results, the blade's geometry is customized for specific feed properties, making testing critical to the engineering process. The agitator element is easy to remove, designed in an assembly that may be lifted out if necessary for cleaning or maintenance, although ribbon blenders are well known as tough designs that rarely need maintenance.

Since many of DCP's products involve addition of liquids, the blender is equipped with an internal spray line. Ribbon blenders are well suited to adding liquid ingredients to powders, and will not plug up with damp or pasty mixtures. A paddle type, lever-operated gate opens wide for complete discharge of blends, whether free flowing or damp, and leaves little or no residue to contaminate subsequent batches.

Since its installation, the blender's use has been extended beyond the enzymatic cleaner and now mixes ten different products. "The ribbon blender has worked out very well for us," concludes Longo. "It has enabled us to garner some larger business accounts that we weren't able to handle previously."



Figure 3. Bag dump station... The bag dump station includes pleated PTFE cartridge filters for dust collection and a gasketed cover for easy addition of ingredients.



Figure 4. Ribbon blade mixing element... Ribbon blenders use helical blades with opposing pitch to achieve batch uniformity, efficiently mixing ingredients of widely varying quantities, densities, and particle sizes.