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Rotary batch mixer facilitates proprietary nutraceutical processes

NRS (Nutraceutical Research Sciences, LLC) is a private-label manufacturer of nutraceuticals and novel ingredients. The company's products range from anti-aging supplements and sports nutrition to vitamins and meal replacements, and its proprietary manufacturing processes rely on a rotary batch mixer model 700-TS-50-SS from Munson Machinery.

Most batches include one or more liquid additions, which are introduced into the 1,416 L (50 cu ft) mixer through spray bars with exchangeable spray tips, enabling the addition of aqueous and oil-based liquids by the liter or milliliter and as a fine vapor. The spray bars operate in conjunction with subsystems for heating and cooling the liquids and dehumidifying and pressurizing the mixer vessel.

Mixer facilitates highly custom manufacturing techniques

Customization of the manufacturing process allows NRS to "micro-encapsulate or coat the ingredients, and then add other things, like flavors, on top of that to build a larger particle." The mixer's tumble-turn-cut-fold action ensures complete coverage by the liquid additions, according to NRS founder, the late John Anderson, a 42-year veteran of the dietary supplement industry involved in launching over 3,500 products.

A dehumidifier is connected to the mixer to remove moisture from the vessel, allowing the addition of one liquid after another. It's a process that a rotary mixer handles well, Anderson said. "It's much easier than with a V-blender because you have to exchange the air on the fly. The exhaust air will pick up a lot of material, and you'll a have a huge loss." The rotary blender, on the other hand, minimizes dusting by its gentle mixing action and by a single seal preventing dust leakage from the drum.

Non-stop rotation cuts cycle times, prevents segregation

The mixer's inlet and outlet remain stationary while the drum rotates, allowing hard piping to the discharge of an upstream screw conveyor or the cyclone separator of a pneumatic conveying system. Vessel rotation during loading and unloading reduces cycle times and prevents segregation upon discharge, maximizing yields. "I've used pretty much every kind of blender, including double-cone blenders and V-blenders, and neither can be loaded or discharged as quickly," Anderson said.

With its auxiliary systems, the mixer resembles an Apollo space module turned on its side. "It's housed in a dedicated suite we call 'Genesis 1' because of its novelty. It's one of a kind. No one has anything like it. We are growing fast due to these unique and novel custom ingredients we use to make life changing products," he said.

Novel processes scaled from R&D to high volume production

NRS' processes are developed in its R&D lab. "We built a miniature replica of our process so we can test products in very small batch form—one or two or five kilograms—to create the technique, the technology and the blending instructions," he said.

The pilot-scale work ensures that each process can run nonstop. "The name of the game is continuous processing. When you start the process, you continue through all the steps until it's completed, discharged, and out of the mixer," explained Anderson. "While every product requires an individual process, he estimated the company produces between four to eight batches per eight-hour shift. To keep up with demand "We're adding a Munson model 700-TS-90-SS with a capacity of 2549 L (90 cubic feet) that we'll call Genesis 2."

Particle size is a big consideration. "Matching and sizing particles is important in blending," Anderson continues. "You can't just blend 841 micron (20 mesh) and 149 micron (100 mesh) material in a standard way and then expect it to run through your other manufacturing equipment without separation," he said. "But with our pilot prove-outs, the Rotary Batch Mixer and our customization, I can take 841 micron (20 mesh) material, apply some humidity and then slowly apply 149 micron (100 mesh) material, then dry while mixing without separation. That is unique."

Minor additions, such as vitamin D_3, must be preblended with other materials. Indeed, even preblends sometimes need preblending. That was the case when Anderson needed to ensure that the same tiny amount of chromium picolinate went into each two-piece capsule. "The mixer's uniform blending enabled us to hold it to within just two micrograms either way of hitting 100 micrograms per capsule. You have to know what you're doing with raw material, and how to introduce it. It's a science." FP