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NutraCos

Pro-X Nutraceuticals, a Roex company, triples mixing capacity, reduces labor and waste

A former athlete and body builder named Rod Burreson searched for non-pharmaceutical supplements to enhance his physical condition, but none met his quality requirements, prompting him to develop and personally test his own formulations. Based on the health benefits he experienced, Burreson started a company in 1994 called Roex, Inc., that used contract manufacturers and packagers to commercialise his formulations. In 2004, he added a division called Pro-X Nutraceuticals and brought manufacturing and packaging in-house. Roex has since become a multi-million dollar manufacturer of vitamins, dietary supplements and herbals. The company is growing so rapidly that Production Manager Kory Seitz, realized that demand would soon exceed the capacity of the company's only mixer, a 0.85 m^3 ribbon blender located in the Irvine, CA, facility.

The mixer was a bottleneck to the operation due to its small size, requiring that each batch be split up, requiring extra labor for feeding, weighing, discharging and cleaning. "We were constantly splitting up batches, sometimes doing several batches to fill an order for a single product. We had to find a larger blender to keep pace with our process of making tablets, capsules and blends from dry powders," says Seitz.

In addition to increasing capacity, Pro-X wanted to comply with the U.S. Food & Drug Administration's Good Manufacturing Practices (GMP) by installing a stand-alone blender in a separate room that would include a load-bearing structure onto which bins of material would be forklifted and emptied into a hopper over the blender intake.

After considering V-blenders and rotary batch mixers, the company installed a 3.1 m^3 700 TS 110 Stainless Steel Rotary Batch Mixer from Munson Machinery, Utica, New York *. Whereas the original ribbon blender has a capacity of 650 kg, the rotary batch mixer handles up to 2,000 kg, allowing Pro-X to triple mixing capacity. The company also realised unexpected benefits in the form of reduced labor, shorter blending cycles, ease of cleaning and minimised waste.

ELIMINATING EXTRA STEPS AND ASSOCIATED LABOR, DOWNTIME

"Think of the productivity gains in being able to mix once versus three times," says Seitz. "Not only are we mixing fewer times, but labour for weighing, screening and staging prior to mixing has also been reduced."

When an order comes into the Pro-X facility, the appropriate raw material powders are selected and inspected for quality, screened, weighed and sent to an area where they are staged for blending. "Certain items need special treatment," explains Seitz. "Some herbal mixtures are too big and need to be ground, while other materials need to be oscillated to reduce clumps."

"When running several batches to fill a single order, we were performing these tasks several times," continues Seitz. "Those tasks are done only once now."

The preparation stage ensures that materials become free-flowing and ready to enter the blending and grinding area. Since each raw material – anywhere from 2 to 50 powders per blend – has a different bulk density and its own "specific quirks," operators adjust for the differences by feeding the materials at different times. "For instance, we add the excipients, materials, such as Magnesium Stearate, last to ensure that they are

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Figure 1 – Bags of raw material forklifted to mezzanine level are manually dumped through a screen (left of operator) into a rotary batch mixer located in the room below, in compliance with US FDA's Good Manufacturing Practices

blended throughout the entire batch without affecting their function. If you overblend excipients, they will not produce the desired effect of a good flow of material, solid compression or anti-sticking, which they are intended to accomplish," says Seitz. "For every product there is a specific order to add materials to the blend to assist in creating a problem free batch."

Once Pro-X formulators determine the sequence in which materials should be fed, each bin of material is forklifted to the top of the structure surrounding the blender where material is gravity discharged in the hopper and, in turn, into the blender which turns approximately two RPM during feeding (Figure 1). "The hopper allows us to pour raw material into the blender at a rate of 50 kg per minute," says Seitz.

"The ability to discharge material directly into the mixer via the hopper, cut labor by 75%," continues Seitz. "With the old blender, it took four to five hours to feed the powder by hand or using an auger conveyor.

ACHIEVING 100% UNIFORMITY

The mixer is capable of achieving 100% uniformity in less than three minutes (Figure 2), but Pro-X runs longer cycles for absolute insurance of uniform blends. Seitz says, "There are no moving parts inside the mixer, but the mixing flights attached to the interior of the rotating drum picks up the powder and moves it to the front of the blender and then back over itself." Continuous rotation assures all materials remain in motion, preventing segregation of materials of varying bulk densities.

When mixing is complete, the blend is discharged from a chute into plastic-lined drums (Figure 3), each of which carries between 90 kg and 120 kg of powder, which the blender discharges in less than 20 seconds. "With 2,000 kg of material, we need to fill about twenty of these barrels per batch," says Seitz. "The rapid discharge with minimal overflow has significantly increased our speed."

Filled barrels move down the line, where the product is again inspected, weighed and sent to the appropriate manufacturing areas for production of tablets, capsules or powders, which are then packed and shipped (Figure 4).

Figure 2 – Rotating drum with proprietary mixing flights achieves total batch uniformity in less than three minutes

Figure 3 – Internal mixing flights elevate the material which is discharged through a plug gate valve into plastic-lined drums

REDUCING RESIDUAL WASTE INCREASES YIELD, SPEEDS CLEANING

After discharging the mixer, usually less than 500 g of residue remain inside, according to Seitz. "Getting nearly 100% out of our blend increases revenue because we're dealing with expensive materials. With less waste remaining in the blender, we increase the yield of tablets, capsules and powders in the end."

Negligible amounts of material remaining inside the blender also simplify cleaning. "With the ribbon blender we had to open it, sweep the residual heel of material from the trough and remove and clean the seals and other moving parts. Since the rotary mixer has no internal moving parts, operators simply attach a hose inside, which sprays water while the mixer is running, removing any remaining powder. Next, operators spray a cleaning solution inside the blender, run it and wipe it down," says Seitz. "It's much faster and easier to clean than a ribbon blender."

While the ribbon blender is still used for batches under 500 kg, Pro-X relies mainly on the rotary batch mixer. "Not only are we mixing more efficiently," says Seitz, "but the ability to drop powder down the hopper and discharge the blender with minimal waste is also saving time and money."

Figure 4 – Pro-X Nutraceuticals manufactures and packages vitamins, dietary supplements and herbals from dry powders

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