# Powder and Bulk Engineering

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## BAGGING AND PACKAGING

## Case history

# Blender easily handles large metal powder batches

A toll processor installs a new horizontal rotary batch blender to increase the batch sizes of its custom metal powder blends.

Since 1997, Allegheny Blending Technology (ABT), Ridgeway, Pa., has been producing custom ferrous and nonferrous metal powder blends for local companies that make a range of finished metal products. When ABT first started operations, it used four double-cone blenders to make the various blends in 500-, 2,500-, 5,000-, and 10,000-pound batches. The company used a smaller 25-pound-capacity double-cone blender for testing and sampling purposes. In 1999, when customers began requesting truckload-size 45,000-pound batches, Paul Reed, ABT founder and president, decided to purchase a new large-capacity batch blender to meet customer demand.

### Purchasing a large-capacity blender

At the time when Reed decided to purchase a new blender, the metal powder industry standard for blending metal powders had been the double-cone blender. However, a new trend was emerging: Many companies in the metal powder industry were using horizontal rotary batch blenders for large batches.

According to Reed, a horizontal rotary batch blender has several advantages for blending large batches: "A double-cone blender that can handle a forty-five-thousand-pound batch requires a larger footprint and a lot more ceiling height than a rotary batch blender. Also, with a double-cone blender you can only produce a small batch down to maybe fifty percent of the blender's rated capacity. Whereas with a rotary batch blender, you can go down to at least ten percent of the rated capacity. Additionally, it's burdensome to work with such a large batch in a double-cone blender because loading it requires a lot more time and work than it does with a rotary batch blender. Overall, when comparing the two blenders, I found that a rotary batch blender has a smaller footprint and shorter blend times and is easier to load, discharge, and clean."

Prior to starting ABT, Reed worked at a company that purchased material from a toll processor that used a large-capacity horizontal rotary batch blender. Reed says, "Because the blender always produced quality metal powder blends for us, I didn't look at any other blender suppliers; I just called up Mun-

*The 250-cubic-foot-working-capacity horizontal rotary batch blender can completely blend a 45,000-pound batch of metal powders in about 15 minutes.*

son Machinery, the company that made that blender, told them what we wanted, and they designed a blender for us." Munson Machinery, Utica, N.Y., supplies dry-blending, size reduction, and metal-finishing equipment to the bulk solids and other industries.

## The horizontal rotary batch blender

The company purchased one model 700-THCX-250-MS extra-heavy-duty rotary batch blender, which is constructed of carbon steel and mounted on legs to increase the discharge height so the company can discharge material directly into gaylords. The 250-cubic-foot-working-capacity blender is approximately 21 feet long, 10 feet wide, and 13 feet tall, and its mixing drum can hold up to 50,000 pounds of metal powders. Because of the large batch size, the blender has two single-speed 50-horsepower gear-reduced motors that rotate the mixing drum at about 7.5 rpm. This helps spread the motor workload and extend their operating life. One motor is installed at the blender's inlet end, and the other is installed at its discharge end.

"The blender uses a simple on-off controller that starts and stops both motors at the same time," says Reed. "However, because of the weight in the mixing drum, the motors need to start slowly to avoid damage. To accomplish this, we put a soft-start component in the controller that slowly engages the motors when we start up the blender, preventing them from starting at full speed."

When making a 45,000-pound batch, the company adds the various materials to the blender in 5,000-pound increments. An operator starts making a typical blend by screening the iron powder and various minor ingredients to ensure a contaminant-free final blend. The operator then fills 5,000 pounds of iron powder into a portable hopper that's staged on a gain-in-weight floor scale. The operator uses a forklift to move the hopper and place it on top of a structural stand positioned next to the blender. Reed designed and installed the stand so that it would elevate and position the hopper's bottom discharge directly above the blender's inlet. The operator then starts the blender and manually opens the hopper's discharge gate, allowing the material to gravity-discharge into the rotating mixing drum.

"About thirty seconds later when the hopper is empty, the operator stops the blender and takes the hopper back to the floor scale to get another load of iron powder," says Reed. "The opera-

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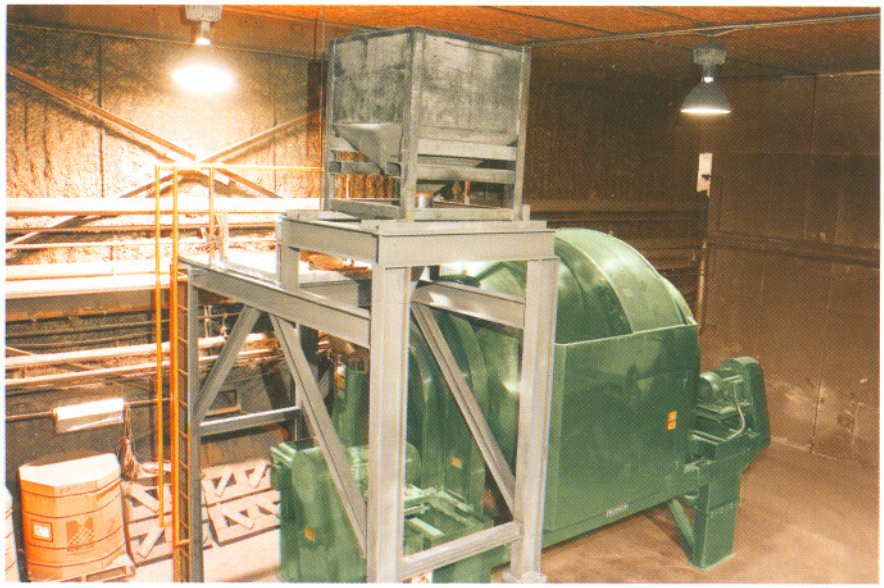
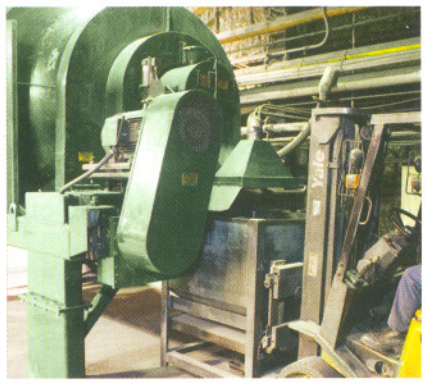


***A structural stand holds a portable hopper and allows the company to add 5,000 pounds of material at a time into the blender's inlet, which is located about 9 feet above the ground.***

tor repeats this process until the mixing drum is filled with more than forty thousand pounds of iron powder. Next, the operator weighs out the various minor ingredients, which typically total less than one thousand pounds, puts them into the hopper, and forklifts it onto the stand. The operator then starts the blender and discharges the minor ingredients into the mixing drum. After all of the minor ingredients are in the mixing drum, the blender runs continuously for about fifteen minutes to complete the blend."

During operation, the blender's self-adjusting inlet face seal ensures dust-free operation, and continuously welded lifters and baffles inside the mixing drum create a rapid but gentle mixing action that fluidizes the material. The supplier reinforced the internal baffles to prevent ABT's metal powders from bending and potentially breaking them. According to



*It takes just a short time for the homogeneously blended metal powders to fully discharge from the blender's mixing drum.*

Steve Knauth, general sales manager for Munson Machinery, the lifters and baffles gently lift, fold, and tumble the material onto itself while directing it to the mixing drum's discharge end. When the discharge gate is closed, the material is redirected back toward the mixing drum's center where the gentle blending action continues. This is how the blender can achieve a homogeneous blend in such a short time.

When the blending cycle is finished, the blender's discharge gate opens about 60 degrees and the material quickly and fully discharges from the mixing drum into a gaylord as a completely homogeneous blend. Whether a company is blending granular or very fine materials, all of the particles will be completely dispersed and blended, regardless of the number of different powders, their bulk densities and particle sizes, and the different percentages of each powder. Knauth says ABT can add less than one percent of a minor ingredient to a 45,000-pound batch and it will still be completely and homogeneously dispersed at the end of the mixing cycle.

According to Reed, the rotary batch blender's blend times are much shorter than those of a same-capacity double-cone blender. From start to finish, ABT can load, blend, and completely discharge a 45,000-pound batch in about 2.5 hours — that's with discharging the material from the blender 5,000 pounds at a time. "With a double-cone blender, we'd be looking at blend times of more than one hour," says Reed, "and that's not including

the loading or discharging time."

The blender is easy to clean, says Reed: "In the beginning when we were testing the blender, we'd crawl inside the mixing drum through the drum's access door to see how much material was left in the drum after discharge. Because the blender discharges nearly one hundred percent of the material, we only found a little dust remaining inside the drum, so we knew we didn't have to worry about cross-contamination or cleaning the drum between every run."

## Successfully blending the metal powders

Since installing the rotary batch blender, ABT's customers have been completely satisfied with the metal powder blends produced in the blender because the minor ingredients are always homogenously and uniformly dispersed throughout a batch. "We did a lot of tests during the initial stages of production where we would take a forty-five-thousand-pound batch and sample from the initial discharge all the way to the final discharge," says Reed. "The test results showed that the blender always produced a blend with consistent material properties all the way through."

The rotary batch blender's short blending times and gentle blending action produce top-quality blends, regardless of the batch size or percentage of minor ingredients. "With a double-cone blender, there's a lot more particle-on-particle contact inside the mixing vessel during operation because of its long blend times and mixing action," says Reed. "Too much or too harsh particle-on-particle contact can be detrimental to the overall finished blend because the oddly shaped metal powder particles can become more perfectly rounded and thus lose their ability to effectively mesh together after being put in a mold and pressed into what we call a green part before sintering. Through testing, we found that the rotary batch blender enhanced the green strength of a pressed part because the particles weren't being rounded, which allowed them to mesh together well when put under pressure."

"We've been using the rotary batch blender for more than eight years now and haven't had any problems with it," says Reed. "It's easy to load and discharges completely, and its operational efficiency allows us to produce more batches per day than we could with a double-cone blender. This has reduced overtime and provided us the potential to work with more customers each day." **PBE**

**Note:** To find other articles on this topic, look under "Mixing and blending" in *Powder and Bulk Engineering*'s Article Index at www.powderbulk.com or in the December 2007 issue.

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