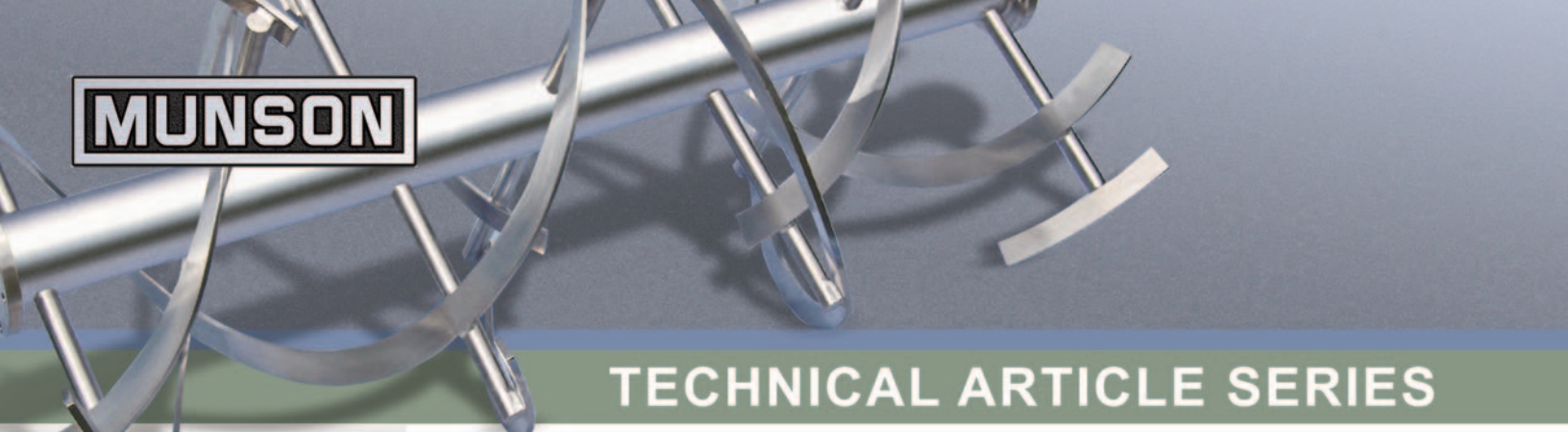


MUNSON

TECHNICAL ARTICLE SERIES

DRY BULK BLENDING EQUIPMENT

- Rotary Batch Mixers
- Ribbon/Paddle/ Plow Blenders
- Rotary Continuous Blenders
- Variable Intensity Continuous Blenders
- Vee-Cone Blenders
- Fluidized Bed Mixers

SIZE REDUCTION EQUIPMENT

- Shredders
- Lump Breakers
- Heavy Duty Cutters
- Knife Cutters
- Pin Mills
- Attrition Mills
- Hammer Mills
- Custom Machinery

CH-003

New rotary batch blender cleans up company's testing process

Akey Inc.

Munson Machinery Co., Inc.
PO Box 855
210 Seward Ave.
Utica, NY 13502 USA
Tel: 1-800-944-6644
(In NY: 1-315-797-0090)
Fax: 315-797-5582
info@munsonmachinery.com

New rotary batch blender cleans up company's testing process

A supplier of specialized animal feeds improves its research lab's quality control with a new easy-to-clean rotary batch blender.

"Our old lab blender just wasn't effective or efficient," says Frank Thompson. "The blender was too hard to clean out. We found that we were leaving three to four pounds of material in the mixing drum from the previous test batch. It was a small amount, but it was enough to skew the results of all following test batches."

Thompson is the quality assurance manager at Akey Inc., Lewisburg, Ohio, a producer of specialized animal feeds since 1976. The company's main products are medicated and nonmedicated feeds for cattle, chickens, turkeys, pigs, and other livestock.

Thompson's complaints were with the rotary batch blender used in the company's in-house research lab.

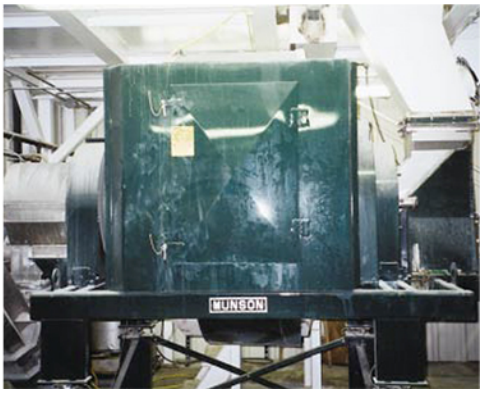
"We have our own research lab where we blend research diets for our customers, as well as finishing houses, pig nurseries, calf barns, and turkey barns here we do finished-product research," says Thompson.

Akey's lab researches new liquid and dry feed ingredients, creates and tests new product formulations, and perfects existing product formulations. The testing often involves adding liquid additives during blending. Akey sprays liquid fats, soy bean oils, and mineral oils onto various dry feeds to control dust and eliminate product segregation during the blending process.

The lab typically tests four different formulations per day, running one batch through the blender for each formulation. Between batches, an operator opens the blender's access door and cleans out the mixing drum by hand, removing as much of the remaining material as possible. Hot-water washouts can only be done at day's end so the drum has a chance to thoroughly dry out before the next day's work. If the drum isn't completely dry, dry material is likely to lump and ball.

The problem was that the old blender's mixing drum had only one access door and numerous mixing flights, so it was difficult to get into the drum and clean it out efficiently. "Overall, we were pleased with our old mixer's spray technology and its ability to process our product formulations," says Thompson. "But because of the difficulties we had in cleaning out the drum between batches, we weren't satisfied." When Akey decided to upgrade its research lab, a new rotary batch blender was on the list of equipment to be replaced.

Mounting the blender on load cells improves Akey's product formulation testing accuracy.



This profile view of the blender shows the discharge chute (left), one of two drum access doors (center), and inlet chute (right).

The two liquid additive spray lines (top line and middle coupling) and one wash line (bottom) enter the mixing drum near the blender's inlet chute.

Searching for a new blender

About this time, Charlie Divine, sales manager for Munson Machinery, Utica, N.Y., was at Akey's facility to check some Munson rotary batch blenders installed in the plant's production line. Thompson talked

briefly with Divine about the research lab's blender and how difficult and time-consuming it was to clean. Thompson said that he was looking for a new blender that would meet Akey's quality assurance demands and be easy to clean. The blender's spray system would have to uniformly coat dry materials for both small (400- through 1,000-pound) and large (1,000-through 2,000-pound) batches, and the drum's interior would have to be accessible for complete and efficient cleanouts between batch runs.
Within 2 weeks of their discussion, Divine had designed a customized blender that met all of Akey's demands. He contacted Thompson and had him send material samples to Munson's test facility in Utica, N.Y.

"We used pig feed in the tests," says Divine. "We used our 15-cubic-foot lab rotary blender equipped with a spray system and sprayed a non-nutritional liquid fat onto the pig feed during blending. Test results proportionally scale up to the 50-cubic-foot blender, which Akey required. Basically, Akey gave us its worst-case scenario and said that if we could design a blender that would work on this product, then it would surely do every other job they'd need it for."

Shortly after completing the tests, Munson's representatives traveled to Lewisburg and presented the test results and information concerning the blender's design and customized features. Akey held a roundtable discussion in which the decision was made to purchase Munson's model 700-TH-50-SS 50-cubic-foot rotary batch blender with a spray system.

New blender installed in research lab

Four months later, Akey received its new customized rotary batch blender with spray system.

The new blender has a 50-cubic foot (2,000-pound) maximum batch capacity. Its customized spray system is capable of accurately coating both small and large batches with liquid additives during blending. The blender's components are constructed from Type 304 stainless steel. A 7.5-horsepower electric motor, which can run off either a 230- or 460-volt power source, rotates the mixing drum at 8.5 to 9 rpm.

Dry material is gravity-fed into the blender through the inlet chute as the drum rotates. Material can either be directly metered into the blender from a conveying system, or it can be metered into a hopper first and then charged into the blender.

The blender's rotating drum has no internal moving parts. As the drum rotates, lifters and baffles (also called fins or mixing flights) tumble and fold the dry material in the mixing drum's bottom half (also called the blending zone), creating a natural fluidized material bed. The lifters are located at the blender's discharge end and direct the material to the discharge gate. The baffles, which are mounted at 45-degree angles on the drum wall, constantly move the dry material to the lifters.
The discharge gate rotates with the mixing drum. If the gate is closed, the material tumbles back down into the drum's blending zone and is blended further. When the discharge gate is open, it acts as a diverter

that diverts all of the dry material out the discharge gate, leaving only material dust on the drum's wall. Product segregation never occurs because during the charging, blending, and discharging cycles the material is in motion 100 percent of the time.

On a standard machine, each baffle is bolted to a bracket welded to the drum's side, and fine material can sometimes pass through the cracks where the baffles contact the drum. For Akey's application, Munson took the brackets out and continuously welded the baffles in place. All of the internal welds are radiused (that is, the weld surface is curved outward rather than trough-shaped) per USDA requirements to prevent crevices that could collect dry material. Munson also modified the baffle configuration in the mixing drum so small batches of dry material could be accurately sprayed with liquid additives during the blending cycle.

"The blender is designed for Akey's research lab and is capable of accurately blending both small and large batches," says Divine. "The critical aspect of this project was designing the blender's spray system. The problem we encountered is that a small batch's surface area in the drum's bottom is significantly less than a large batch's surface area."

For blending alone that's not a problem. But because a liquid additive has to be sprayed onto the material's surface area for Akey's application, the spray system has to be adjusted so it sprays directly onto the material and not the drum walls.

The spray system includes three spray lines that enter through the blender's inlet end, slightly offset from the inlet chute. Each line has a nozzle head. Two of the spray lines spray liquid additives onto the batches, and the third spray line (also called the wash line) sprays hot water during washouts. Inside the drum, the spray lines angle up and then level off so they're parallel to the drum's bottom. The spray lines are rigid pipes and don't need a support system.

"Typically, when you're spraying liquid additives in a blender you only want to spray the batch," says Divine. "The nozzle heads must be angled directly at the material in the drum, because if you spray the drum's sides the material will cling to it and form balls and lumps. We set up Akey's blender with three independent spray lines that are set at different heights the one for spraying small batches between 400 and 1,000 pounds is the low spray bar, the one for spraying large batches between 1,000 and 2,000 pounds is the high spray bar, and the third spray line is for washouts."

Because the blender rotates clockwise, the batch is positioned slightly off-center in the drum's bottom during blending. To compensate for this, the nozzle heads are positioned at 30-degree angles so they spray perpendicular to the batch's surface. If the rotating drum were a clock face, a small batch would blend between 6 and 9 and a large batch would blend between 5 and 10.

To resolve Akey's cleaning concern, Munson customized the mixing drum so an operator could have full access to the drum's interior. This was done by adding a second access door, positioned directly opposite

the drum's standard access door. Now after a batch is discharged and the blender's power shut off, an operator can open both access doors and completely clean out the drum.

"Between batch runs during the day we do what we call a regular cleanout. As the blender is discharging a batch, we vibrate the mixing drum by tapping the exterior sides with a rubber mallet to loosen any stuck material. By the time an operator opens both access doors, cleaning usually takes about five minutes. We use highly compressed air to blow the remaining fine material loose from the drum's sides, and then we use a vacuum to remove it from the drum," says Thompson.

For washouts, the discharge gate is left open after the last batch of the day is discharged so an operator can make sure that all of the loose material has exited. The operator then closes the discharge gate and activates the wash line, filling the rotating drum with about 500 pounds of hot water. The wash line's nozzle head spins around, completely spraying the drum's interior and knocking any stuck material loose.

"We let the drum rotate for a while, and the hot water cleans the lifters and baffles," says Thompson. "Then we open the discharge gate, and the water is discharged into a drain and carried to a water treatment facility. After the water is discharged the drum is still a little wet, so we leave the access doors open all night. When we come in the next morning it's air-dried and ready to go."

Research lab's new blending process

The new blender is mounted on four load cells so that Akey can weigh dry materials as they're added to the blender. Bulk ingredients, such as corn, are preweighed in a hopper and then added to the blender by hand. Microingredients, such as medications, antibiotics, vitamins, trace minerals, and flavors, are also added directly to the blender by hand. Mixing time is 5 minutes per batch after the last ingredients have been added.

"The load cells are very convenient and add to our processing accuracy," says Thompson. "Once the final batch is in the blender we can look at the load cells' weight readout and know exactly how much dry material we have in it."

The liquid additives are also pre-weighed before being sprayed onto a batch.

"We may have a batch that calls for 10 pounds of liquid and then we may have a batch that calls for 100 pounds of liquid, so the amount of liquid depends on the research we're doing," says Thompson. "The spray system's pressure, which can be adjusted up to 100 psi, is determined by the liquid additive we're using and the velocity needed to effectively spray it on."

When the batch is completed, it's discharged into a stainless steel drag conveyor that conveys the material to a portable hopper. The portable hopper is used either as a mash bin for pelletizing or a bagging bin for

bagging the test batch.

Blender meets quality assurance demands

"The new blender has met every one of our quality assurance demands," says Thompson. "In fact, once Munson's blender was installed in the research lab and started up, we had no problems with it."

The blender's spray system successfully coats both small and large batches of dry material. And cleaning times between batches have decreased. Complete cleanouts between batches are easily accomplished because of the drum's two access doors, which provide unimpeded access to the drum's interior. Because there are no hidden areas for material to build up, the blender discharges virtually 100 percent of the batch.

"This has improved the accuracy and precision of our overall product formulation testing process by eliminating the possibility of batch contamination. This is important to us because we use those test results to make large-scale production runs with our larger Munson blenders in the production facility."