Automated Powder-Unloading System Speeds Blending Process for Chocolate Maker

When Forbes Chocolate introduced an automated bulk-bag discharger at its Cleveland, OH-based plant, it was able to introduce into three ribbon blenders up to one-third more cocoa powder per shift than previous manual dumping of 50-lb. bags. The change, enabled by equipment purchased from Flexicon Corp., Bethlehem, PA, represents a 1,500-lb./hour increase with the same number of workers at the small, 100-year-old company that supplies chocolate powder to dairies and bakeries.

Health and safety is improved at the plant as well, because workers no longer need to cut open, lift and empty bags into a dump station. The work area is free of dust as the powder remains enclosed throughout the process. Likewise, the powder is protected from contamination.

The automated cocoa-powder unloading system consists of a bulk-bag discharge frame, a cantilevered I-beam support for a trolley and electric chain hoist for loading, 1-cu.-ft.-capacity high-flow hopper, which connects to a 5-ft. long flexible screw conveyor. This discharges to the auger conveyor through a transition adapter and 12-in.-long bellows.

The exact amount of powder flowing from the bulk bag is metered by loss-of-weight control. As the bag discharges, load cells under each leg of the unloader frame transmit weight-loss signals to a controller mounted on the side of the frame. The controller shuts off the flexible screw conveyor once the batch weight has been discharged. The conveyor runs at high speed, then at dribble speed before it stops when the target batch weight has been reached.

"Instead of manually weighing, say, 500 lbs. of main ingredient, we just push a button," says Keith Geringer, Forbes' vice president of manufacturing. "Unloading goes 50% faster."

The system had to fit into a tight space, for which Flexicon supplied a push-type flexible screw conveyor that locates the 5-hp drive at the intake rather than at the normal discharge end. The motor pushes rather than pulls the powder through. The low-situated drive helps the loss-of-weight control function more effectively by concentrating frame and conveyor weight directly on the load cells.

In operation, the hoist and trolley position the 87-in.-long bulk bag on the unloader frame. Pneumatically activated plates at the bottom of the bag promote flow of the non-free-flowing powders by massaging the lower side walls of the bag at pre-set intervals. As the bag empties, the stroke of the plates increases, raising the side walls in a 'V' shape, promoting complete product discharge.

Dust is suppressed by a 15-in.-diameter iris flow-control valve with a flexible, impermeable diaphragm that allows the operator to pull the tied bulk bag spout into the spout-access compartment and close the valve around the spout. The spout is then untied, the compartment's access door closed, and the notched valve released slowly, controlling the rate at which powder discharges into the hopper to prevent dust from escaping.

The cocoa powder is very fine (200 mesh) and dry (less than 5% moisture), which

tends to cause it to bridge. An agitator at the bottom and a pneumatic vibrator at the top of the hopper promote flow. The hopper is designed with a steep back wall, and sidewalls that are skewed outward at divergent angles. This orientation reduces the ability of the powder to bridge between sidewalls, and, instead, causing it to topple and flow toward and down the backwall.

The food-grade flexible-screw conveyor pushes the powder through a UHMW polythylene outer tube enclosing a rugged, flexible stainless steel screw. The only moving part contacting the material is the flexible screw. As it rotates in the tube, the screw self-centers to provide clearance between the screw and tube wall for gentle handling of the powder. Flexicon's Bevcon-style screw reduces compression of the material on all screw surfaces except the top surface, which propels material in the desired direction, promoting flow of the difficult-to-handle powder.

As the auger conveyor transports the cocoa powder to the blenders, minor ingredients such as salt, vanilla, carrageenan, are manually dumped from 50- to 80-lb bags through the original bag-dump station. "In the future, we might add another bulk-bag unloading system for one of the minor ingredients," says Geringer. Before selecting the Flexicon automated powder-unloading system, Geringer rejected an automatic bag opener and dumper, concerned about paper pieces and bag surface material contaminating the powder.

Geringer says Forbes Chocolate has grown considerably in the last 15 years, but with the same number of employees. The company has accommodated its rise in output, he says, with new packaging and filling equipment and automated systems such as this one for unloading its main ingredient.

Flexicon Corp., 2400 Emrick Blvd., Bethlehem, PA 18020; 888-353-9426.

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