

TECHNICAL ARTICLE SERIES

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Automated Cornmeal Unloading System Improves Product Quality, with Seven Month R.O.I.



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Berlin, PA — Snyder of Berlin improved yield by 4.5%, along with sanitation, safety, product quality, and accuracy in introducing cornmeal into the packaging line when it replaced manual dumping of 100-lb bags and conveying with two galvanized steel augers with an automated bulk bag unloader and three flexible screw conveyors from Flexicon Corporation.

The new system in producing Cheese Curls and Puff'n Corn snacks paid for itself in seven months from labor savings by freeing one operator per shift for more productive duties, plus buying cornmeal in 2000-lb bulk bags instead of 100-lb bags.

The improvements helped Snyder of Berlin become a low cost producer as it increases production to meet growing demand in western Pennsylvania and eastern Ohio.

The bulk bag discharger, under loss-of-weight control, introduces precise amounts of cornmeal into a 1000 lb capacity vertical blender via an 8 cu ft hopper and 5-ft long, 4-in diameter flexible screw conveyor. Moistened cornmeal exits the blender into a 5 cu ft Flexicon hopper and through two charging adapters to two 12-ft long flexible screw conveyors running at a 45 degree angle to two extruder surge hoppers.

Previously, two operators dumped 100-lb bags of cornmeal into the vertical blender. From the blender's discharge port, two enclosed galvanized steel inclined augers carried the moistened cornmeal to the two extruder receiver hoppers.

Benefits of Automated Unloading System

Yield (the ratio between cornmeal usage and amount of finished product) improved by 4.5% as the loss-of-weight control measures the precise weight of cornmeal discharging from the bulk bag. Knowing accurate weights, Snyder can determine exact cornmeal consumption and get a better handle on production. Previously, weights of 100-lb bags as received from the supplier could be off as much as 5-lb. Accurate weights also ensure consistent moisturizing in the vertical blender for a better-controlled, more consistent quality product.

Worker safety improved by relieving workers from manually cutting open, lifting and dumping 100-lb bags.

Sanitation improved as food grade flexible screw conveyors replaced the galvanized steel augers. The hoppers and charging and transition adapters, likewise, are of stainless steel. An American Institute of Baking inspector recommended that Snyder of Berlin replace the old augers with clean food grade flexible conveyors.

A flexible screw conveyor consists of an UHMW polyethylene outer tube enclosing a rugged, flexible stainless steel spiral driven by a 1-1/2 hp electric motor. Only the inner screw contacts the material. As the flexible screw rotates in the tube, it self-centers to provide clearance between the screw and tube wall. The screw's gentle rolling action prevents damaging the product.

In accordance with its Good Manufacturing Practices and quality assurance



Bulk bag unloader with 2000 lb bag of cornmeal discharges into hopper equipped with flexible screw conveyor which transports the material to a vertical blender where it is moisturized.



Bulk bag discharger with flexible screw conveyor is mounted on load cells that transmit loss-of-weight information to a controller which stops the conveyor once the target batch weight is discharged.

standards, Snyder of Berlin cleans out and washes down the flexible conveyors and hoppers at the end of each week. The operator cleans the flexible conveyor tubes by merely reversing the screw rotation and unscrewing the bottom clean-out cap to remove the remaining material.

Bulk Bag Unloader Operation

The 15 ft high bulk bag unloader frame includes receptacles for forklift loading of bags. To control the material flow while opening the bag, the operator pulls the tied bag spout through an iris flow control valve into the bag spout access compartment and cinches the valve around the spout. The spout is then untied, the access door closed, and the valve released slowly, preventing uncontrolled bursts of material into the hopper and dust into the plant atmosphere.

To promote flow and ensure complete bag discharge, top-mounted POP-TOP™ bag stretching devices gradually elongate the bag into a cone shape to promote complete discharge.

The cornmeal flowing from the bulk bag to vertical blender is measured using loss-of-weight control. As the bulk bag discharges, load cells placed under each leg of the unloader frame transmit weight-loss signals to the controller mounted on the side of the frame. The controller shuts off the flexible conveyor once the batch weight has been discharged.

The cornmeal unloading system operates intermittently but frequently at an average 635 lb/hr. The free flowing cornmeal is medium grind, #20-30 mesh size of 30 lb/cu ft bulk density.

The Packaging Line

The extruders squeeze out collettes, which are dried in a rotating infrared oven, then sprayed with cheese and peanut and soy oil in a slurry tumbler, to become Puff'n Corn and Cheese Puffs. They are conveyed to packaging machines for bagging in 5/8 oz., 1-3/4 oz., 8-oz and 12 oz sizes.

In recent inspections by the American Institute of Baking, Snyder moved up from an "excellent" to "superior" rating. A big factor in the upgrade was the automated unloading system and flexible screw conveyors that improved control, sanitation and safety in material handling.

As local appetites grow for its cornmeal-based snacks, Snyder of Berlin might add a second hopper and third flexible screw conveyor between the blender and extruders.



Moistened cornmeal discharged from vertical blender into floor hopper is transported by the Flexicon flexible screw conveyors that feed two extruder surge hoppers.



Bulk bag weigh batch discharger (right) feeds weighed batches of cornmeal into vertical blender. Moistened cornmeal flowing into floor hopper at left of blender is fed to two extruder surge hoppers by two Flexicon flexible screw conveyors.

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