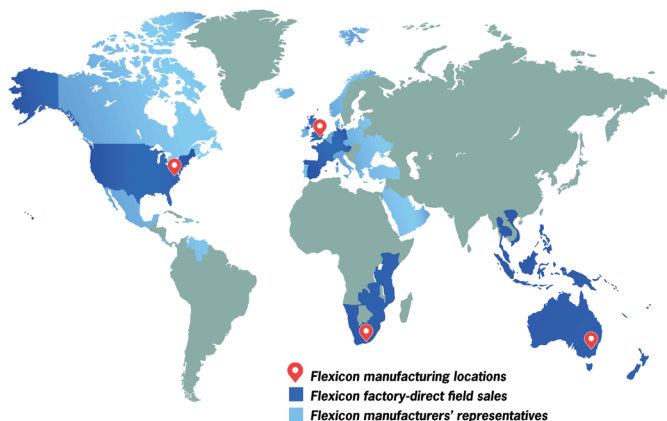




The Plastics Group installed its first bulk bag discharger and flexible screw conveyor to transport additives to a twin-screw extruder. The bag is positioned by a cantilevered I-beam and electrical hoist and trolley. FLOW-FLEXER® agitation plates raise and lower the bottom sides of the bag for full discharge.

Bulk Bag Discharger and Flexible Screw Conveyor Feed Twin-Screw Extruder in Restricted Space

X-0823



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Bulk Bag Discharger and Flexible Screw Conveyor Feed Twin-Screw Extruder in Restricted Space

WOONSOCKET, RI — The Plastics Group of America compounds thermoplastics in an old mill in Woonsocket, RI. When the company sought to increase capacity with twin-screw compounding lines instead of single-screw lines, the relatively low ceilings of the building affected equipment layout. But with careful planning and the use of bulk bag discharging and conveying equipment, the company was able to fit everything on one level of its 60,000 sq ft (5,574 sq m) building.

The story begins in 2001, with the decision to add its first 2.6 in. (68 mm) diameter twin-screw extruder for compounding. (Startup was in 2002.)

“We have limited headroom in the plant — 14 to 16 ft (4.2 to 4.8 m),” says Duane T. Delaney, Technical Manager of The Plastics Group. The extruder and auxiliary equipment had to fit in that space. Cutting through the ceiling was an option, but Delaney didn’t believe it would improve efficiency or, importantly, worker safety by adding platforms to access auxiliary equipment such as hoppers that feed the extruder. Instead, he designed a compounding line where all of the equipment fits on one floor.

Delaney doesn’t like the multilevel platforms of most twin-screw lines, which hold feeders and other auxiliary systems. “They rise 20 to 30 ft (6 to 9 m), make it difficult and dangerous to clean and maintain equipment, and add \$100,000 to \$200,000 to the cost of a compounding line for platforms, railings and steps,” he says.

“Our philosophy of production is to make it safe, easy and simple to do a job,” Delaney adds.

Protecting additive properties

The four resin hoppers on the twin-screw extruder are fed by pneumatic lines from silos. The additive-feeding system, though, was a challenge since it had to meet several needs apart from the height restriction. The Plastics Group uses many additives, fillers and reinforcements, from talc, mica, calcium carbonate and barium sulfate to glass fibers and beads. Transporting powdered additives and fillers to a feeder from a remote location by a pneumatic or mechanical system would mean a relatively high cost for the conveyor and installation, as well as the more intensive maintenance associated with the longer types of conveyor systems. Conveying glass fibers longer distances would also increase the possibility for damage to the material, which would affect compound properties.

Delaney decided that the solution was a bulk bag discharging system paired with a lower cost, lower maintenance flexible screw conveyor installed near the compounding line. The discharger would empty bulk bags into a hopper at its base, and the flexible screw conveyor would convey additives through an inclined tube to a feeder on the compounding line.



The first bulk bag discharger installed by The Plastics Group has a 6 in (150 mm) diameter flexible screw conveyor that transports material 17 ft (5.2 m) to a feeder hopper on a twin-screw extruder.



Flexibility of conveyor line routing allowed The Plastics Group to position two Flexicon bulk bag dischargers in restricted spaces, eliminating the need for a costly network of pneumatic lines.



The 4.5 in (115 mm) diameter flexible screw conveyor from the second bulk bag discharger passes through a wall to reach the additive hopper on the extruder, overcoming space limitations.

Because of the location of the twin-screw extruder, Delaney says, “the 15.5 ft (4.7 m) high discharger could only fit in one place and the twin-screw additive feeder could only be filled in one place. It became obvious that a flexible screw conveyor was a simple, direct system for our needs.”

This setup would also be more efficient — and safer — than having workers manually open and empty 50 lb (22.7 kg) bags of additives into the feeder hopper from a platform. This process could introduce bag scraps and other contaminants into the compounding operation, take up floor space for bag storage and create a costly waste-disposal problem with the empty bags.

Integrating the bulk bag discharger and flexible screw conveyor permitted fillers or reinforcements to be rapidly transported to the additive feeder. “The extruders each have five gravimetric feeding systems.” One is for additives and the others are for resins. “Material must be transported to the additive feeder fast enough to maintain accurate metering,” he says. A 100 lb (45.3 kg) additive load, for example, has to be conveyed to the feeder from the discharger hopper in 10 seconds. A loss-in-weight control system starts and stops the flexible screw conveyor as the feeder hopper reaches preset weight levels.

Linking the bulk bag discharger and flexible screw conveyor worked so well that when The Plastics Group specified a second twin-screw line, in 2007, a high-speed 2.75 in. (70 mm) diameter unit (startup was in 2008), it ordered another bulk bag discharger and flexible screw conveyor.

Discharger has multiple features

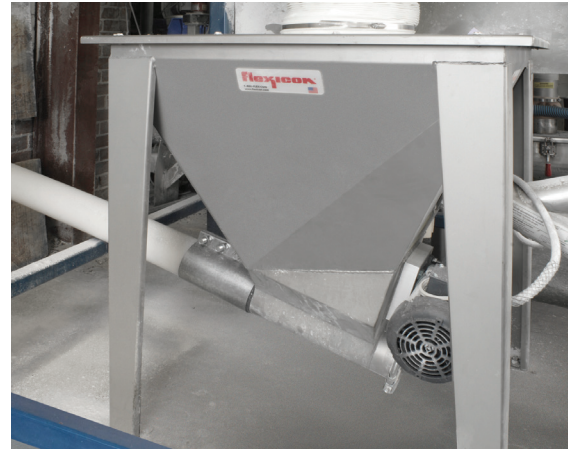
For both installations, the company specified Flexicon’s BFC Bulk Bag Discharger. Bags are attached to a four-cornered low-profile lifting cradle with Z-CLIP™ bag-strap holders and raised into position by an electric trolley hoist mounted on a cantilevered I-beam.

A pneumatic POWER-CINCHER® flow-control valve regulates flow through the bag spout. This is done by a series of curved, articulated stainless steel rods that cinch the spout concentrically on a horizontal axis for tie-off and vertically to prevent material leakage. The valve also permits the spout to be closed and retied if a bag is partially unloaded.

The BFC Discharger has a SPOUT-LOCK® clamp ring that attaches the bulk bag spout to a TELE-TUBE® telescoping tube. The tube maintains downward tension on the clamp ring, keeping the spout taut and preventing material from bulging out or falling in during discharge and creating flow restrictions.

Both dischargers have a pair of pneumatic FLOW-FLEXER® agitation plates that raise and lower the bottom of a bag to maintain positive flow and achieve full discharge.

The Plastics Group usually orders bags weighing 1,000 to 2,500 lb (453 to 1132 kg). Some additives it uses are shipped in 3,000 lb (1359 kg) bags, so the BFC Bulk Bag Discharger frames are rated for 4,000 lb (1812 kg) loads.



Each bulk bag discharger empties additive into a hopper, which uses a pneumatic turbine vibrator and mechanical agitator to promote material flow into the flexible screw conveyor intake.



Many of the additives handled are powders that would be difficult and costly to convey long distances through the plant.

The original flexible screw conveyor is 6 in. (150 mm) diameter, installed at a 35-degree angle and transports material 17 ft (5.2 m) to the feeder hopper. Delaney says that as the flexible screw turns, it self-centers within the polymer outer tube, providing efficient delivery of material to the feeders without damage to the glass fibers and other reinforcements.

The second flexible screw conveyor is 4.5 in. (115 mm) diameter, and runs for 27.5 ft (8.4 m) at a shallow angle to empty material into the twin-screw extruder's additive feeder.

Delaney says that the flexible screw conveyors, both from Flexicon, each handle 50 to 2,000 lb (22.7 to 907 kg) per hour of additives depending on the material being compounded. The company changes material one or two times a day on average. A typical run lasts 18 hours.

Feeding system proves reliable

The BFC Dischargers and flexible screw conveyors have worked almost flawlessly. "We've only had to do normal maintenance," Delaney says.

Reliability is essential to operations. "If either of these systems goes down, there's no backup." And with each line capable of compounding 70,000 lb (31,710 kg) per hour, a less reliable discharger and flexible screw conveyor system could create major production problems.

The Plastics Group doesn't release revenue figures, but Delaney says business is broad enough in end-markets that sales have held steady even in the recession. The company supplies filled and reinforced polypropylene, along with recycled-content polyolefins, high-impact polystyrene and ABS, for automotive, recreation, packaging, construction, appliances, toys, household durables and other applications.



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