

Bulk solids handling system boosts calendering operation

By installing a **Flexicon** bulk-bag unloading system with pneumatic and flexible screw conveying, a major plastics processor has streamlined materials handling, improved process quality and created a safer work environment

Oplox, a plastics processing company, calenders polyvinyl chloride (PVC) sheet for applications such as advertising banners, automotive seat covers and door-panel liners, and truck canopies. It produces sheet on two calendering lines that receive PVC compounds from a central batch-mixing system.

Previously, workers had manually loaded 25kg paper sacks of PVC resin and calcium carbonate (CaCO_3), the solids components of the formulations, into a mixer and used a conveyor system of the company's own design for adding liquid components such as plasticisers, stabilisers and lubricants.

During the process, manual loading created problems, notably in quality control. Oplex was mixing six batches per hour (144 per day). With one batch mixed and discharged every 10 minutes, workers were rushed, which led to mistakes. It was not unusual for them to forget how much product had been added to a batch and, as bags were opened with knives, particles of paper sometimes fell into the mix. The work was repetitious, which created the potential for injuries from carrying bags to the mixing station.

Bulk bag unloading system

Oplex decided to automate the mixing of PVC resin with a bulk bag unloading system, reasoning that this would improve batch quality and enable the company to use several dozen 700kg or 1000kg bulk bags in place of hundreds of 25kg sacks. An automated system would also create a safer work environment by reducing the amount of manual labour required in batch loading and mixing.

The company developed a specification for a PVC materials handling system that demanded equipment compatibility with a PLC and in-house software. CaCO_3 would still be loaded by hand from 50kg sacks because it is not packaged in bulk bags. Oplex, nevertheless, intended to install a more efficient hopper and additive mixing station for CaCO_3 .

The first part of the system is a BFC series bulk bag unloader from Flexicon.

The unloader features an electric trolley hoist on a cantilevered beam that lifts bags weighing up to 1450kg into place above a carbon steel frame.

PVC resin flows from the bag through a Tele-Tube telescoping tube that attaches manually to the bag spout with a Spout-Lock clamp ring, which creates a dust-tight connection. The tube pneumatically raises and lowers, applying continuous downward tension to elongate the bag and keep the spout taut, which prevents the spout from bulging outward or falling inward, for complete evacuation. A bin vent dust collector mounted on the discharger frame keeps dust from escaping into the plant. This helps to safeguard worker health by reducing airborne particles and also improves plant cleanliness and reduces the risk of product cross-contamination.

The Oplex operational facility is in a building with little horizontal space, so operations are spread over several floors. Flexicon's vacuum pneumatic system conveys PVC resin from bulk bags to a filter receiver on the third floor. A hopper integral to the bulk bag discharger directs PVC resin to a drop-through rotary valve, which meters the material into one of two pneumatic conveying lines transporting it 60m to the filter-receiver above the mixer. The bulk bag discharger is equipped with load cells to allow the PLC to receive loss in weight data as material is conveyed from the discharger. This enables the PLC to control the feed of the pneumatic conveyor so that the required weight of PVC resin is delivered to the filter receiver, then dropped through a chute to the mixer.

On the second floor, Flexicon installed a bag dump station with dust collector for loading CaCO_3 . Material from the dump station is transported to a small weigh hopper on the third floor by Flexicon's Bev-Con flexible screw conveyor. A flexible stainless steel screw, designed to move difficult-to-handle materials, rotates in a 9m-long plastic tube set at a 45° incline. The conveyor is powered by a motor at the discharge end where the CaCO_3 enters the weigh hopper through a transition

Below the hopper on the bulk bag discharger frame, a drop-through rotary valve meters PVC resin into two pneumatic conveying lines

PVC from the bulk bag unloader is pneumatically transported to a filter-receiver and hopper on the third floor of the Oplex plant. The flexible-screw conveyor empties calcium carbonate into the smaller weigh hopper. Both ingredients are gravity fed to the mixer on the floor below

Oplex installed a BFC series bulk bag unloader from Flexicon to improve the quality and productivity of its PVC compounding operation. Features include a cantilevered I-beam and hoist, Bag-Vac dust collector, Flow-Flexer bag activators beneath the bag for positive material flow, Tele-Tube telescoping tube and Spout-Lock clamp ring at the bag spout interface, hopper, and PLC-controlled rotary valve

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adapter. Load cells under the weigh hopper permit precise weights of CaCO_3 to be measured. From the hopper, the weighed batch passes through a slide gate valve to the mixer.

The accuracy of the automated system's loading, weighing and mixing operations has improved overall product quality and repeatability. Moreover, by permitting the use of bulk bags in place of 25kg sacks of PVC, the automated materials handling system has reduced the amount of valuable floor space needed for materials storage.