The Art of Diverting

www.dmnwestinghouse.co.uk
Dust contained

Flexicon's dump bag conveying system contains dust and boosts productivity in PVC blending operation

Flexicon bag dump stations have become a 'must-have' at Ameron International's manufacturing plant which produces protective PVC lining products for large concrete sewer pipes. The bag dump stations with their high velocity fans and two-stage filtration system have dramatically improved the working environment, drawing airborne dust away from the operator whilst also reducing build-up on machine surfaces. In addition, the performance of a Flexicon screw conveyor for handling a difficult paste-like material has improved transfer rates six-fold.

Production of the PVC linings require precise quantities of titanium dioxide (TiO₂) to be weighed and blended with a PVC resin prior to extrusion of the compound, to impart UV resistance and a translucent white colour. With the company's previous mixing process it was difficult to contain dust. Plant personnel cut open bags of titanium dioxide (TiO₂) and shoveled the powder into a bucket on a scale. When the net weight of TiO₂ reached 2.7kg it was dumped into a blender containing 137kg of PVC - a 2% concentration.

Handling the powder in an open environment produced dust. "If you open a bag of titanium dioxide and dump it, the powder can become airborne," explains James Gross, a product engineer at the Ameron plant. TiO₂ powder is difficult to handle since it is cohesive and compressible, tending to pack, cake, bridge and otherwise resist flow. "It's a powder that acts almost like a paste, so it's problematic to move," Gross says.

To improve both productivity and the working environment Gross researched enclosed systems that would be able to handle this 'paste-like' powder. He decided on a two-part system from Flexicon which consists of a bag dump station with an integral flexible screw conveyor.

Pallets of 11kg bags of titanium dioxide are stacked next to the bag dump station on an elevated dock (see picture left). The station is equipped with a waist-high bag tray support that provides a work surface for operators to stage, clean and open bags prior to dumping.

The bag dump station's dust collection unit is mounted directly on the 150 litre floor hopper. The operator opens the hopper lid, activating a high-velocity vacuum fan, and dumps TiO₂ through a screen that keeps foreign objects out of the system. The fan drives airborne dust onto filter cartridge rated at 99.99% collection efficiency for materials with a particle size of 1 micron or greater. At the same time, an automatic reverse-pulse filter-cleaning system employs time-activated solenoid valves to direct short blasts of compressed plant air at the cartridge filters, causing dust buildup on the outer filter surfaces to fall into the hopper.

Measuring 760 mm square x 985 mm high, the hopper is a "high-flow" configuration that causes titanium dioxide to tumble and flow toward and down the unit's steep back wall, preventing the powder from bridging between the unit's side walls. A pneumatic vibrator and agitator have been incorporated in the system by Flexicon to promote flow of this "paste-like" material to the conveyor inlet, for free-flowing materials the ancillary equipment is not required.

Flexible screw conveyor moves difficult material

The hopper directs powder into the intake adapter of a 7.8m long x 67mm diameter flexible screw conveyor inclined at 45 degrees. The conveyor employs a flexible, stainless steel screw with a specialized geometry that has been engineered by Flexicon to handle materials with difficult properties such as TiO₂.

A 1.5kW electric motor at the discharge end of the conveyor rotates the screw, propelling titanium dioxide through the plastic tube to the discharge spout which is connected to a 1.2m long x 152mm diameter wire-reinforced PVC downspout. The powder falls into a bucket enclosed in a dust-containment box, which sits on an electronic scale above the blender.

When the blender calls for titanium dioxide, an operator activates the conveyor, as well as the vibrator and agitator in the hopper. The controller automatically stops the conveyor when the weight of the material in the bucket reaches 2.5kg, at this point the remaining powder in the down spout trickles into the bucket bringing the 'final weight close to the required 2.7kg. "We're achieving batch weight accuracy of approximately ±0.01kg, which is many times more accurate than the old system," Gross reports.

Gross's initial estimates allowed up to three minutes for depositing the required 2.7kg given the variable flow characteristics of titanium dioxide, the task is now accomplished in 30 to 45 seconds since the installation of the Flexicon bulk handling system.

With the Flexicon system an operator can empty the filled bucket into the blender without removing it from the dust-containment box, titanium dioxide is thus contained throughout the system.

For more information contact Flexicon (Europal on tel: 01227 374710 or visit: www.flexicon.co.uk