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Bulk bag discharge for elastomer producer

Kirkhill TA, a US elastomer manufacturer, reduced its inventories of carbon black and improved plant cleanliness by replacing a large silo storage system with a Flexicon bulk bag discharge system.

According to Flexicon, its system enabled Kirkhill to cut inventory by 90%, while preventing carbon black dust from contaminating the plant environment. Cost savings and improvements in efficiency and competitiveness accrued as side benefits, Flexicon said.

The bulk handling system is the latest upgrade for Kirkhill. The company began making gaskets, seals and other elastomeric products in 1919, and gradually shifted production from general industrial products to highly engineered silicone parts for commercial and military aircraft, missiles and aerospace applications.

Carbon black is one of Kirkhill's main processing materials. Adding carbon black to an elastomer reduces its rate of thermal expansion, thereby enabling it to maintain an air-tight seal in high temperature applications. It can also modify elongation, rigidity and other physical properties, and impart conductivity to prevent static discharge.

As Kirkhill moved from mass production of industrial parts to lower-volume production of aerospace parts, it became unnecessary and costly to maintain carbon black inventories in silos.

Larry Pierce, vice president of technology at Esterline, Kirkhill's parent company, said: "With railcars, we had to bring in 136,563 kg of carbon black pellets at a time. We only received shipments a few times per year, and were tying up close to $210,000 in inventory with each shipment."

In addition, the city of Brea, where Kirkhill is located, decided to tear up the railroad tracks that supplied the plant to expand its park space.

"We were the only industrial facility left in the city, and agreed to it. In return, the city gave us a loan to buy the new bulk offloading system."

Kirkhill had several priorities for its new materials handling system. It had to improve inventory efficiency and keep costs in line.

It needed to use as much of the existing infrastructure as possible. Finally, it had to prevent carbon black dust, caused by the friable pellets rubbing against one another, from escaping into the plant or processing equipment.

Carbon black is produced by burning heavy oil or tar to form soot-like particles. When airborne, they can penetrate operating equipment.

"Carbon black tends to soak up lube oil," Pierce said. "If it gets into the bearings and rollers, they will wear out prematurely." It can also cause short circuits.

Because carbon black is a petroleum product, California classifies it as a hazardous material. While carbon black is shipped in 1-5mm diameter pellets to reduce the likelihood of airborne release, manufacturers must remain vigilant to prevent spills and the cleanup that would follow.

Railcar system handled bulk deliveries

Kirkhill had a significant infrastructure to handle carbon black, with a rail offloading station, including screw conveyors and bucket conveyors, and two storage silos.

Carbon black pellets flowed from the silos to the company's Banbury mixers two ways: by pneumatic conveyor, and when weight in the silo fell below 22,675 kg, by large steel toes that hold approximately 909 kg of carbon black.

They are like bulk bags made of steel. We move them by forklift and gravity feed the carbon black into a weighing container with an integrated weigh scale, which sits on a mezzanine above the mixers.

"When the container and pellets reach the weight required for the recipe, the container's chute opens, discharging the material
into the mixer for compounding with elastomers prior to moulding into finished seals,” Pierce explained.

The pneumatic conveyors are no longer utilised, but the steel totes and weighing system remain as part of the new bulk handling installation.

**Bulk bags simplifying handling**

According to Kirkhill, bulk bags were a clear choice for receiving carbon black. They are available in 455kg and 910kg sizes, large enough to receive bulk discounts. While vendors charge less for bulk railcar shipments, the savings are largely offset by higher rail transportation costs.

By switching, Kirkhill said it would pay only a fraction of a cent per pound more for bulk bag deliveries. Add in the savings from minimising inventories and eliminating silo maintenance and the bulk bag system pays for itself, the company explained.

The bulk bag discharger also improves site cleanliness, Kirkhill claims. It moves bulk material handling operations inside the facility, so any accidental leaks are contained within the plant. The discharger also uses dust-tight connections to fully contain carbon black until final addition to the mixer.

Trucks deliver 10 to 12 palletised bulk bags at a time. A forklift raises each bag by its straps and delivers it to a storage site on the mezzanine. When carbon black is needed, the forklift operator attaches the bag straps to a detachable bag lifting frame, and then lifts the frame into the cradle on the bulk bag discharger.

The discharger unloads carbon black pellets from the bulk bag into a purpose-built hopper, from which a 4.5m long, 11.4cm
outer-diameter flexible screw conveyor transfers the material to a steel tote.

At this point, the operation proceeds as it did originally using the steel totes. A forklift transports the tote along the mezzanine to the container above one of the mixers, where it releases its load.

**Air-tight system yields cleaner plant**

The bulk bag discharger is engineered to fully contain the material being unloaded, preventing contamination of the product and plant environment. The bag spout is attached to a Spout-Lock clamp ring, which forms a sealed connection between the clean side of the bag spout and clean side of Flexicon's Tele Tube telescoping tube (through which the material is discharged).

The tube pneumatically raises the clamp ring, allowing the operator to make a dust-tight connection with the bag spout. The tube then lowers, elongating the bag to fully discharge the pellets. Also promoting full discharge, Flow-Flexer bag activators, two plates located under the bag, raise and lower opposite bottom edges into a V shape, directing material toward the bag spout.

Above the clamp ring, a Power-Gincer flow-control valve encircles the upper portion of the bag spout to allow retying of partially empty bags. When the bag is empty, the operator actuates the BagVac dust collector, which generates vacuum within the sealed system, collapsing the empty bag dust-free for retying and removal.

The conveyor encloses a flexible stainless steel screw with a specialised geometry to minimise compression of materials like carbon black that tend to compress in conventional conveyors.

As the screw rotates, it self-centres within the plastic tube, providing clearance between the screw and tube wall, allowing sufficient space for pellets to flow without damage.

The intake end of the conveyor attaches to the outlet of the hopper. At the discharge end, a 4kW motor drives the screw as the material passes from the conveyor outlet, through a 15.2cm diameter flexible downsputs into the steel tote. Being fully enclosed, the conveyor further assures plant cleanliness.

A batch timing control activates the conveyor for a repeatable time interval to fill the tote.

"We reduced inventories of carbon black from 227,000-154,000kg to 22,700-45,400kg." Pierce said. "The bulk off-loading system improves efficiency and competitiveness and brings our costs in line."

**Contact:** www.flexicon.com.au

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**NEW PRODUCT**

**Hydraulic hoses for high pressure applications**

Gates Australia has released the MegaSys range of hydraulic hoses and accessories, which it says meets the demands of modern hydraulic systems.

**MegaSys** hydraulic hoses and accessories have been tested at 1,000,000 impulse cycles and at pressures above maximum working levels, Gates says.

Advanced hydraulic systems are incorporated into increasingly high-powered, high-pressure equipment. This makes durable and reliable hose assemblies more critical than ever, according to Gates.

Gates says MegaSys hoses can be bent up to one-third SAE specifications and guarantee leak-free performance up to a maximum working pressure of 8,000psi.

MegaSys hoses come in coloured laylines and constant pressure ratings through all sizes of its hoses, making identification and selection more efficient.

**Contact:** www.gateaustralia.com.au/megasys