

Pneumatically conveying of wet, abrasive mica

Flexicon has supplied a custom-designed pneumatic conveying system to a LKAB Minerals in Derby, UK, for the transfer of hot, wet and abrasive mica to a drying system on the floor above. Samantha Bucknall, UK Group Performance Manager for LKAB highlights the systems advantages.

LKAB Minerals has been processing mica, also known as muscovite, at its Derby facility since the 1950s, for use as a mineral filler for a wide range of applications in the agricultural, building, construction, polymers and paint and coat-

ings industries. One of the mica processing applications involves moving large volumes of wet, abrasive mica powder from a wet process to a drying system on the floor above.

To improve worker safety in the vicinity of the heated material and overcome abrasive

wear, the company has replaced mechanical conveyors with a pneumatic conveying system from Flexicon.

Wet mica processing

Mica, received at the Derby Works as a fine powder in bulk bags, undergoes one of six size reduction processes, depending on its end use. One of these is a wet process, in which water is added to create a hot, sand-like material with high moisture content ideal for use in paints and coatings.

The material was originally transported to a drying system on the floor above using a forklift and bucket elevator, and subsequently by a mechanical conveyor and bucket elevator so as to distance workers from the material. However, components of both systems suffered from abrasive wear.

Most of the alternative equipment options evaluated could not be routed as needed to move the moist material efficiently and/or resist abrasive wear. "We looked at a number of conveying systems, but most suppliers considered the material and the restricted routing as too much of a challenge. Ultimately, only Flexicon was willing to take on the project and offer a viable solution," says Samantha Bucknall, UK Group Performance Manager at LKAB.

"It was a new material for them," continues Bucknall. "We supplied a batch to Flexicon's test lab and worked with them to find the best solution."

The resulting automated system comprises a 560ℓ capacity floor hopper, which receives the mica from the wet process via a mechanical conveyor. Pneumatic rather than mechanical conveying permitted the most direct material transfer path. A 30 m, a 75 mm diameter PNEUMATI-CON® vacuum line from Flexicon propels the muscovite vertically 11 m to the floor above and around two 90° bends to a 1 220 mm diameter filter receiver. The filter receiver separates the muscovite from the conveying air and is sized to hold 800 l of material.

The dilute phase vacuum system is powered by a 15 kW positive displacement vacuum pump delivering a pressure differential of 500 mbar. The filter receiver is sized to hold an entire wet mill batch, and includes



A 30 m conveying line transfers wet, abrasive mica powder from the wet process on the floor below into the filter receiver, which separates the material from the conveying air.



Left: LKAB's MicaFort product is used as a mineral filler for paint and coatings and other applications. Right: Final milled muscovite material has gone through size reduction, pneumatic conveying, drying and sieving steps.



a level sensor to signal to the PLC when a full batch has accumulated so the next batch can be fed to the mill.

The filter receiver includes an automatic reverse-pulse jet cleaning system, which dislodges material accumulated on the filter elements to maintain optimal conveying performance. This material is returned to the batch to eliminate waste. Bag filters were selected over cartridge filters for more effective release of the sticky material.

Material is then transferred from the filter receiver to a drying system, then to any of three sieving stations to separate the product into two particle sizes. Due to greater customer demand for finer mica, two of the three sieving stations produce a 90 µm particle size, while the third produces a coarser 125 µm

(120 mesh) particle size. LKAB supplies Mica under the trade name MicaFort in 25 kg bags, 1.0 t bulk bags, or in bulk tankers.

Overcoming challenges

"Installation of the new pneumatic system was difficult as it is located in a very tight space," continues Bucknall. "We experienced a number of challenges during early operations, but Flexicon stayed with us to find solutions as these arose."

One challenge stemmed from mica's abrasiveness, which ate through one of the elbows within six weeks of operation. "Flexicon suggested we replace the worn bend with a SMART ELBOW® deflection elbow from HammerTek Corporation. This gave us 12 months of operation, almost nine times longer, which we are very pleased with," says Bucknall. The deflection

elbows are designed to minimise wear of the elbow wall. Unlike conventional elbows, which rely on material impact to change direction of material flow, the deflection elbow features a spherical chamber that protrudes just beyond the pathway of the material.

A ball of suspended material rotates in the chamber, gently deflecting incoming material around the bend and preventing it from impacting the elbow wall.

Overall the project represented a "leap of faith for us as we had not used a pneumatic conveyor before and we were not sure how it would handle the wet mica," concludes Bucknall. "We overcame all the obstacles and now have a system that performs well, and are more than happy with the service provided."

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Flexicon's PNEUMATI-CON® Pharmaceutical Grade Filter Receiver for medium- to high-throughput vacuum and positive-pressure conveying of extra-fine, difficult-to-handle and/or contamination-sensitive bulk solid materials, features designs to readily change/inspect filter cartridges and sanitise the interior.

A gas-spring-operated lid provides access to a removable filter plate, allowing cartridge filters to be removed and inspected or cleaned from the top, eliminating product hold up points and cleaning difficulty associated with side access doors and bolted-in filter plates. In addition, tri-clamp fittings allow rapid disconnection and cleaning of all accessory parts and lines.

Constructed of 316ℓ stainless steel to pharmaceutical standards, the receiver housing is free of interior ledges, cavities or recesses that could harbour contamination, and features three tapered filter cartridges

that separate conveyed material from the air stream. Automatic reverse pulse-jet cleaning of the pleated filter media maintains separation efficiency, while the tapered filter design improves material release.

Available in 450 and 610 mm diameters, the design can accommodate level sensors, pressure monitors and other accessories.

Typical applications include separation of bulk pharmaceuticals, nutraceuticals, foods and other contamination-sensitive materials being conveyed to tableting machines, packaging lines and other downstream processes.

Flexicon is a manufacturer of complete pneumatic conveying systems, flexible screw conveyors, tubular cable conveyors, bulk bag dischargers, bulk bag conditioners, bulk bag fillers, bag dump stations, drum/box/container tippers, weigh batching/blending stations and plant-wide bulk handling systems.

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