Case history

Easily controlled air classifier consistently sizes limestone dust

When vibratory screens failed to efficiently handle a mineral company's limestone dust, switching to a centrifugal classifier provided consistent dust sizing.

Colorado Lien produces crushed limestone, gypsum, calcium feed supplements, and silica sand. The company's Fort Collins, Colo., plant mines limestone from a quarry and crushes the limestone to –2 inches using a 25-by-40-inch jaw crusher and a 45-inch cone crusher. Trucks haul the crushed limestone to the company's plant.

Front-end loaders then move the limestone to feed hoppers, and a vibrating feeder moves the limestone to a conveyor that leads to a rotary dryer. The dryer reduces the limestone's moisture content from between 3 and 5 percent to between 0.0 and 0.05 percent. A hammermill breaks the limestone to –¼ inch, and a four-roll cage mill reduces it to –10 mesh.

Next, a bucket elevator moves the limestone to an air classifier, and another bucket elevator moves the classified limestone to screens of various sizes, which further classify the limestone. A cleated belt conveyor moves the resulting limestone dust for classification to –325 mesh, and a pneumatic conveyor blows the classified dust to storage silos. The limestone dust is eventually used in cattle feed. A force-flow packer packs the plant's finished limestone products into 50-pound bags for palletization and shipment.

Vibratory screener for limestone dust proves hard to control, inconsistent

In the past, the Fort Collins plant used 60-inch-diameter, high-frequency vibrating screeners to classify limestone dust. The screeners used ball trays to prevent screen blinding. However, the screens, ball trays, and motors required frequent maintenance or replacement. The screeners required 1 to 4 hours of daily maintenance, which cost at least $30,000 yearly. In addition, the plant occasionally required the screeners to run at low throughputs, but they blinded at feedrates less than 1½ t/h. Each screener's

The limestone facility's centrifugal air classifier sizes limestone dust to –325 mesh.

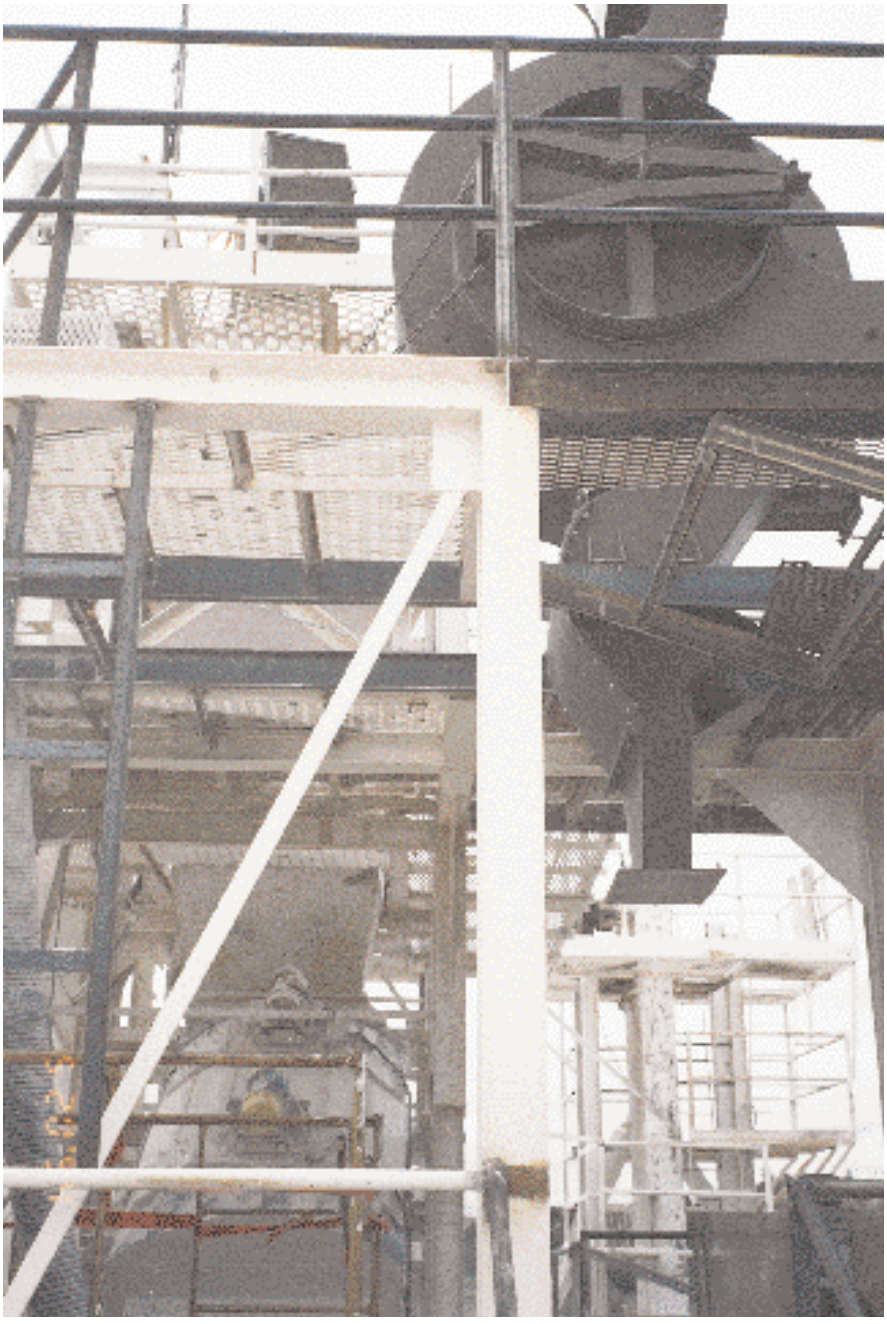
fixed-speed rotary airlock feeder made controlling the screener difficult. The screeners also produced inconsistent classification results.

Plant considers several centrifugal air classifiers

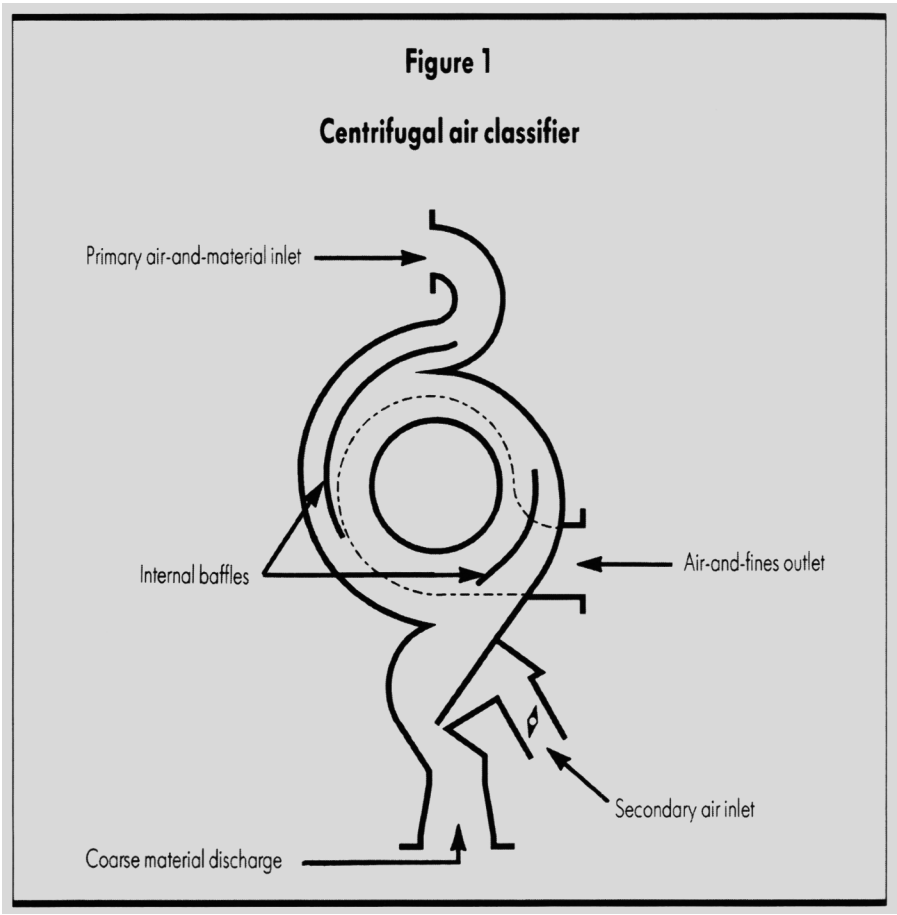
To eliminate the screeners and associated problems, the Fort Collins plant decided to replace them with a centrifugal air classifier. The plant considered three manufacturers' classifiers.

One manufacturer has an air classifier that feeds materials to a rotating disc, which imparts centrifugal force to disperse the particles, throwing them onto another disc. A primary fan's air currents sweep light particles upward while grav-

High-speed vibrating screeners for limestone dust were hard to control and produced inconsistent output. A centrifugal air classifier is easy to control and consistently sizes the dust.



The centrifugal air classifier mounts on a metal walkway that provides access.



ity pulls heavier particles downward. A system of blades further separates the lifted particles for final classification before discharge.

Another manufacturer's air classifier passes material through a rotor with tapered blades that send material down to a coarse-product hopper or out the side to a collector cyclone. The cyclone further separates the material, discharges it through a rotary airlock valve, and releases separation air through a return duct.

The mineral company also considered a centrifugal air classifier with no moving parts in the classification chamber. In the final analysis, plant manager Rob Kisner decided the unit without moving parts would require less maintenance. He said, "All the classifiers could do the job very nicely. But only one had no moving parts."

Centrifugal air classifier uses airflow and stationary internal baffles for particle separation

The selected model C54-27 centrifugal air classifier has a primary air-and-material inlet, stationary internal baffles, two air-and-fines outlets, a secondary air inlet, and a coarse material discharge. In operation, air and feed material enter the classifier through the primary air-and-material inlet. The internal baffles apply drag forces to the coarse particles while allowing 8,000 cfm of air to pass through the material for fines separation.

The heaviest particles drop to the classifier's bottom and exit through the coarse material discharge. Fine-tuning the airflow into the secondary air inlet gives a specified classification cut point. The primary and secondary airstreams conveying in-spec material follow a spiral path and exit the air-and-fines outlets on each side of the classifier. These two airstreams join and carry the fines away for final recovery in a cyclone.

The unit has a rated capacity of 20 t/h and handles an air-volume-to-feed ratio of between 300 and 500 cfm/t/h of classified feed for most materials. The classifier's pressure requirements fall in the 4- to 12-inch wet gauge range for most applications. The unit separates particles at cut points between 15 and 100 microns (1,000 and 150 mesh).

A mineral company's vibrating screeners required frequent maintenance. A centrifugal air classifier has no moving parts and has required no maintenance.

Classifier reliably and consistently sizes limestone dust

Colorado Lien mounted the centrifugal air classifier on a metal walkway to provide access to the unit. The classifier has consistently classified limestone dust at the Fort Collins plant since June 1994. The classifier is easy to control by fine-tuning airflow for a specified cut point, and the unit operates reliably. "The idea of no moving parts in the material stream is good," Kisner said. "We have done zero maintenance on this unit. That's nice. The air classifier makes a more consistent product than our old way of screening, and it just keeps working." **PBE**

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