A large industrial minerals company with a lime processing plant in the mid-Atlantic region of the US handles chemicals — beginning with loaded haulage from inside a mine all the way through to the final processing of the material, which is then sized, screened, and put into trucks.

“We produce chemical-grade lime for multiple industrial processes, and we’re a hybrid mining and chemical company,” says Jonathan Proudley, maintenance manager. “Some of our products are fairly large lumps and don’t act like a powder, but some portions are absolutely powder.”

The plant has 29 dust collectors with a capacity of 20,000 cfm or less for nuisance dust collection. The plant also has six larger production baghouse collectors with capacities between 120,000 and 150,000 cfm connected to kilns.

**Wasted maintenance hours**

With so many dust collectors to monitor throughout the plant, the company was required to regularly send workers to inspect the equipment for damage to the bag filters. Furthermore, the company has a Title V permit, which requires that strict air emission standards be met.

“Bag damage and emissions are always the thing we’re trying to prevent,” Proudley says. “But it’s also important to efficiently use labor hours with maintenance staff because we were doing preventive maintenance work that wasn’t identifying the source of problems.”

In addition to maintenance hours, there’s also a safety issue since the material has a pH of 12, which means it’s basic and poses a potential risk to employees. This makes it important to limit how often people need to get inside these collectors for inspection and maintenance.

“The less I have to send people inside of the collector looking at bags, trying to dye-check bags, and see if we can find a leak, the better,” Proudley says. “If I can instead use a particulate monitor connected with a differential pressure meter to maintain good operating parameters, it’s less wasted time that we can direct to other places in the facility.”

To find a long-term solution to monitoring the dust collectors, the company turned to Donaldson, a filtration and dust collection equipment manufacturer and supplier based in Minneapolis, MN. The
mineral company wanted to reduce the amount of preventive maintenance and unnecessary trips to free up labor hours for other necessary repairs at the plant, which was initially built in the 1940s.

Normal preventive maintenance on dust collectors typically is conducted on a time-based schedule that requires technicians to go to each collector on a quarterly basis. They inspect the filters with black light to look for holes, check solenoids for proper operation, and check the collector’s differential pressure.

“A time-based maintenance schedule can have variable results,” Proudley says. “The chances are you aren’t going to be there when the dust collector goes into upset condition, and you have a chance of having an excess emission due to bag damage because you’ve plugged the hopper, or you start to just see damage due to pulse cycles and damage to the bag media.”

Fixing bag fill issues
To get away from time-based maintenance processes, the supplier recommended using the iCue connected filtration service to digitally monitor the plant’s dust collectors and provide real-time information. Better monitoring allows the company to switch to condition-based maintenance, allowing maintenance personnel to set parameters to trigger preventive and corrective maintenance.

The digital monitoring system provides continuous remote monitoring of dust collectors using sensors in the collector to gather operating data. The system uses a wireless internet gateway to send information to a secure cloud, where analytics turn the collected sensor data into actionable information that is then forwarded directly to the user’s computer or mobile device, prompting timely maintenance actions.

To begin with, the company put the system on one of its more temperamental dust collectors that’s used for very fine, hydrophilic lime material. This collector’s hopper had a tendency to plug and have high dust emissions because when material would build up in the hopper, the bags were pushed out of their seat.

“Running a less than ¼-inch material generates quite a bit of dust from approximately 100 tons of material per hour through these transfer points,” Proudley says. “Then everything shuts down, which means you have a hard time unloading the dust from the collector. We try to recycle the material back into the stream since it’s still usable material. So, we’re trying to collect dust that’s being generated at each transfer point.”

Installed in early 2020, the digital monitoring system allows operators to see when the differential pressure across the filter tube starts to change. Operators can also change the fan operation to create an off-time pulse cycle, which helps remove any material from the bags. “The differential pressure is now essentially straight-lined,” Proudley says. “We’re keeping differential pressure between 3.5 and 6 inches water gauge on this
consistently. When we first started recording data, we were seeing differential pressure as high as 12 or 13 inches water gauge, which can damage the filter media."

The digital monitoring system also has a particulate monitor that detects changes in the proportion of undesirable particulates in the air after filtration through the collector. The company can receive alerts on the particulate percentage as well as on any changes to the differential pressure. Users can set up alarms that trigger once preset parameters are exceeded.

“As soon as I see what the data looks like from the particulate monitor once we do the bag change, if the system does what it’s supposed to, we’ll be expanding into the other collectors throughout the plant,” Proudley says. “We’ll be buying one iCue installation every month or two, depending on how much labor we have to put into putting the device in and expanding out the solution.”

Multiple sensors can be monitored on one computer, so all of the company’s dust collectors can be observed from one station. The company plans on getting sensors installed on all of the smaller collectors and the six larger dust collectors attached to kilns. The larger dust collectors have multiple modules that each need to be monitored separately for particulate and differential pressure.

“By making one central package, it became very cost-efficient because you don’t have to worry about the communication from section to section of the automation,” Proudley says. “It was a very nice compact solution.”

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For further reading
Find more information on this topic in articles listed under “Dust collection and dust control” in Powder and Bulk Engineering’s comprehensive article index in the December 2019 issue or the article archive on PBE’s website, www.powderbulk.com.