Case history

Compact dust collector delivers full-size results

A rock and sand company installs two compact high-performance dust collectors in its screening operation to ensure compliance with state dust emission standards.

Holliday Rock, Upland, Calif., operates 14 facilities that produce concrete, asphalt, and aggregate for use in construction projects throughout San Bernardino, Riverside, Los Angeles, Kern, and Orange counties. The company's Palmdale facility near Littlerock, Calif., produces ready-mix concrete, hot-mix asphalt, and aggregate. The facility excavates rock and sand from a surface pit and then crushes, screens, and classifies the material into sizes ranging from rock dust up to ¾-inch aggregate for use in making the various products. In summer 2008, the facility decided to replace its screening operation's two old baghouse dust collectors to ensure compliance with California Environmental Protection Agency (Cal/EPA) and Air Quality Management District (AQMD) dust emission standards.

Processing the rock and sand

The Palmdale facility operates 5 days week, 8 hours a day, processing more than 5,000 tons of rock and sand each day. Excavated material is sent through a crusher to produce 5-inch-minus material, which is conveyed out of the pit to a surge pile. The material funnels down through the surge pile onto a series of belt conveyors that transfers it to a two-deck vibrating scalping screen with 1-inch-mesh

The high-performance dust collector (blue) collects nearly 100 percent of the dust produced by the 1-inch-minus material discharging from the scalping screen onto the belt conveyor.

top screen. Material that passes through the top screen is conveyed to a two-deck vibrating wet screen with spray bars that wash the sand and clay from the material as the screen separates it into three sizes.

The oversize material that doesn't pass through the scalping screen's top deck discharges to a belt conveyor that transfers it to a cone crusher for reduction. The crushed material discharges to a series of belt conveyors that transfers it to a three-deck vibrating dry screen. The dry screen separates the material into ¾-, ½-, and ⅜-inch crushed rock and rock dust. The material that doesn't pass through this screen's top deck is recirculated back to the cone crusher for further size reduction and dry screening.

Collecting fugitive dust becomes a problem

In the past, the facility used several spray suppression systems and two baghouse dust collectors to control the dust generated during the screening process and prevent fugitive dust emissions. One baghouse serviced the scalping screen and collected the dust produced at the material transfer point where the 1-inch-minus material discharged from the screen onto the belt conveyor. The other baghouse serviced the dry screen and collected the dust created at the point where the ⅜-inch crushed rock and rock dust discharged from the screen onto the belt conveyor.

According to Gerald Fair, Holliday Rock area superintendent, the Palmdale facility's baghouses weren't always able to effectively control the dust because of their low filtration efficiencies. "The baghouses were also difficult and costly to maintain," he says. "It wasn't easy accessing and replacing the baghouse bag filters. It was a pain trying to slide out the bag-covered cages, which were about two inches wide, four feet long, and two feet tall. Half the time, a cage would get bent in the process and we'd have to try to fix it or hunt down a new one, which added time to the process. In addition, replacing the bag filters interfered with production because we had to shut down the screening operation for about half a day."

To compensate for the baghouse inefficiency, the facility had to continuously run the spray suppression systems when operating the screens to minimize dust emissions and maintain compliance with Cal/EPA and AQMD standards. "However, since the spray suppression systems use water to suppress the dust, the dust

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When the dry screen's dust collector pulse-cleans the filter packs, the rock dust blown off the filter media falls onto the belt conveyor and is carried off with the usable material, ensuring maximum production efficiency.

would turn to mud and cause screen plugging and cross-contamination issues when it reached the screens," says Fair. "The mud would also stick to the belt and eventually fall off onto the ground after the belt went around the head pulley, creating a mess and material waste. To recover as much material as possible, we had an operator shovel up the spillage from underneath the belts, which added to the facility's housekeeping and labor costs."

At the beginning of 2008, Cal/EPA issued new, more stringent dust emission standards affecting facilities engaged in mining, quarrying, crushing, and pulverizing nonmetallic minerals. After reviewing the standards, Fair and other Holliday Rock management decided to replace the Palmdale facility's two underperforming baghouses with more efficient dust collectors to maintain compliance. Fair also saw an opportunity to reduce the facility's maintenance and labor costs by installing dust collectors that were easier to maintain and less costly to operate.

Engineering firm provides dust collector recommendation

Fair contacted Butler-Justice Inc., Anaheim, Calif., an engineering firm that has worked with the company many times over the years, providing its facilities with various industrial equipment, parts, and technical and consulting services. Based on their extensive experience representing suppliers that manufacture equipment for use in the aggregates industry, reps Mike Butler and Dave Justice recommended that Holliday Rock purchase two high-performance dust collectors manufactured by Donaldson Co. Inc. to replace the Palmdale facility's existing baghouses. Donaldson, Minneapolis, supplies dust collection and filtration equipment and systems, replacement filters and parts, filter media, and related products.

"We could have gone with a less-expensive dust collector," says Fair, "but since we process a high volume of material and are under pressure from Cal/EPA to stay below dust emission limits, we weren't going to try to save a penny to spend a dollar. We wanted to fix it right the first time and not have to worry about it again later on."

In June 2008, Todd Fields and Adam Sebastyn, Butler-Justice technicians, installed two of the supplier's dust collectors in the facility's screening operation — one at the scalping screen's 1-inch-minus material transfer point and the other at the dry screen's rock dust transfer point. "The dust collectors arrived at the facility preassembled, including the filter packs, making installation fast and easy," says Fair. "To maximize dust collection, we designed each dust collector support stand to create a seal with the screen discharge and belt conveyor. This allows the dust collector to pull air and dust through the entire screen system and further prevents unwanted dust emissions."

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The dust collector

The model CPV-12 Torit PowerCore dust collector with 12 PowerCore filter packs efficiently filters such challenging particulates as cement, gypsum, rock dust, grain dust, wood dust, and others in high-airflow, high-grain-loading applications with tight floor space or headroom limitations. The space-saving unit is 64.2 inches wide, 83.6 inches long, and 46.1 inches tall, and weighs just 1,130 pounds. The unit can operate at 4,200 to 8,200 cfm in temperatures up to 180°F and requires 60 to 90 psig of clean, dry compressed air for effective pulse-cleaning. (The Palmdale units operate at 4,800 cfm and use 60 psig compressed air.) The dust collector's 12 filter packs use the supplier's Ultra-Web nanofiber filter media and provide a total of 804 square feet of filtering surface area. The supplier's tests show that compared to a standard 16-ounce polyester bag filter, this filter media releases 78 percent fewer emissions.

The compact dust collector's 12 filter packs provide 804 square feet of filtering surface area, which is equivalent to the surface area of 72 8-foot-long traditional baghouse bag filters.

Weighing only 5 pounds, each 22-inch-long, 8-inch-wide, 7-inch-deep filter pack contains as much filtering area as six 8-foot-long traditional baghouse bag filters. A filter pack consists of rigid, corrugated media, which is tightly layered, allowing the effective use of more media in less space. The media's corrugations (or *flutes*) are alternately sealed so that the air entering the open flutes on the pack's dirty-air side is forced to exit the adjacent flutes on the pack's clean-air side. Because the air flows in through the filter pack's bottom, dust can't accumulate between filter packs, which prevents bridging and minimizes maintenance.

In operation, dust-laden air is continually pulled in through the dust collector's bottom inlet and up to the filter packs. As the air is pulled through the filter packs, dust particles are stopped on the filter media's surface. The clean air is pulled from the filter pack's clean-air side and through the dust collector's fan, discharging to atmosphere.

The dust collector uses the supplier's patented Compact Oblique Pulse Cleaning System to pulse-clean the filter packs. A pulse valve installed above each filter pack in the dust col-

lector's clean-air side is connected to the compressed-air source. The system's programmable timer board activates the pulse valves in a preset sequence to ensure that the filter packs are pulse-cleaned at regular intervals during operation. When activated, a pulse valve generates a 10-millisecond high-pressure air pulse that effectively covers an entire filter pack, knocking the dust off the filter media and forcing it out of the flutes.

"Gravity is one of two mechanisms that help move the large dust particles back down onto the belt conveyor," says Kristine Graham, Donaldson's PowerCore product line manager. "The other is the momentum that the pulse pressure imparts on the particles. When the unit pulses, the particles are shocked off the filter media's surface and basically shot downward toward the belt conveyor to be carried off with the other material."

Minimizing operation costs and dust emissions

Since installing the dust collectors, the Palmdale facility only needs to operate the spray suppression systems intermittently to help keep dust down. "The dust collectors easily capture most of the dust on their own, so we don't have to use the spray suppression systems as much as we used to," says Fair. "This has reduced our maintenance costs and minimized material waste since the material doesn't stick to the belt anymore. We've also reduced housekeeping and labor costs because an operator no longer needs to shovel up spillage from under the belt."

The dust collectors' improved filtration efficiency has greatly reduced the facility's dust emissions.

The dust collectors' improved filtration efficiency has greatly reduced the facility's dust emissions. "The dust collectors went above and beyond what Cal/EPA required for dust emission limits," says Fair. "And that was key to us because we wanted to be ahead in the game so we won't have to play catch-up later on. If Cal/EPA upgrades their standards in the future, we won't have to do anything because we're already exceeding them by so much."

According to Fair, the dust collectors are operator-friendly and easy to use; basically, an operator just has to hit a start/stop button to activate them. Each dust collector has a Magnehelic gauge that allows an operator to monitor the pressure drop across the system, which helps the facility keep accurate records for Cal/EPA. "The gauges also tell us when the filter packs need to be replaced, which now only requires one operator and less than thirty minutes," says Fair.

"To change out the filter packs, an operator opens the unit's top access door from the clean-air side and removes a filter pack's retainer. Using a filter pack's handle, the operator pulls out the dirty filter pack and inserts a new one. Since changeout is so fast and easy now, we have less downtime, which has improved the facility's production and lowered maintenance and labor costs." **PBE**

Note: 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 2008 issue and at *PBE*'s Web site, www.powderbulk.com, and in books available through the Web site in the *PBE* Bookstore. You can also purchase copies of past *PBE* articles at www.powderbulk.com.

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