Case history

Dust collection system captures fugitive dust, ensures OSHA compliance

A custom cosmetics producer installs a baghouse dust collection system in its plant to eliminate fugitive dust.

West Coast Cosmetics, Chatsworth, Calif., a contract filler and private label house, manufactures and packages custom cosmetic products such as eye shadow, blush, mascara, lipstick, foundation, and others. In spring 2003, OSHA inspected the company's plant and told the company it needed to install a dust collection system to remove fugitive dust from the plant's compounding and filling rooms. To comply with OSHA's requirements, the company worked with a local manufacturers' rep to design and install a new dust collection system.

Experiencing problems with fugitive dust

When making a custom cosmetic product, the company first blends the various required powder ingredients in a small mixer in the compounding room. The finished blend is moved to the filling room where it's packaged in small containers that are put into large boxes and shipped to the customer.

In the past, operators in these rooms wore masks and other protective clothing to guard against the fugitive dust generated during the mixing and filling processes. A small quantity of dust would settle onto the equipment, tabletops, and floors, accumulating overnight. In the morning, the operators would sweep it up before starting their shift. Then, a little more than 4 years ago, OSHA inspected the plant and found these dust-protection and -removal methods insufficient. To remedy the problem, OSHA told the company to install a dust collection system to remove the fugitive dust from the rooms as it was generated.

"OSHA told us that we needed to provide a completely dust-free working environment for the workers in the compounding and filling rooms," says Keith Anderson, West Coast Cosmetics plant manager. "So we began looking for an efficient dust collection system that would suck up the fugitive dust and take it out of the rooms, allowing us to meet the state's air-quality and worker-safety standards."

The baghouse dust collector, which uses 40 fluorocarbon-treated oleophobic bag filters for a total of 378 square feet of filter media, operates with an air-to-cloth ratio of 9.8-to-1.

Searching for a dust collector

Anderson contacted several dust collection equipment suppliers and manufacturers' reps to learn more about their equipment and capabilities for meeting the plant's requirements. He says, "It took about four months to get all the data that we needed to make our final decision. And in the end, we chose Air Cleaning Solutions, a manufacturers' rep that focuses on air filtration products, because they had the best bid and provided the best equipment and options for what we needed to do in our plant."

In November 2003, the company purchased a complete dust collection system from the Huntington Beach, Calif., manufacturers' rep. The system features a baghouse dust collector manufactured by Scientific Dust Collectors (SDC), Alsip, Ill., a supplier of dust collection, indoor air quality, and ventilation equipment.

The dust collection system

In January 2004, the baghouse and dust collection system components were delivered to the company's plant, and engineers from the manufacturers' rep supervised the equipment installation. The baghouse dust collector is installed outside of the plant, and multiple duct runs connect the baghouse to dust collection hoods inside the compounding and filling rooms. Three stationary dust collection hoods installed inside the filling room — one at each filling station — remove the fugitive dust created when filling the containers. The compounding room has been fitted with two dust collection hoods, each of which is attached to an extendable, movable duct. An operator can easily move them to any of the four mixers to collect the fugitive dust generated when accessing a mixer.

"We don't need a stationary dust collection hood at each mixer because their lids are sealed tight during operation," says Anderson. "We only need to collect dust when we fill or empty a mixer or open a mixer's lid during operation to check the product inside. And since we only access one mixer at a time, the extendable ducts allow us to move a dust collection hood to the mixer we're working with — or anywhere else in the room — to suck up any fugitive dust."

The baghouse dust collector

When operating, the baghouse dust collector generates 3,700 cfm at 10

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The compounding room's easy-to-use extendable ducts allow an operator to collect fugitive dust when filling or emptying a mixer or opening a mixer's lid during operation.

inches of static pressure and continuously pulls air through all five dust collection hoods. The baghouse contains 40 bag filters, each of which is 4.5 inches in diameter and 8 feet long, for a total of 378 square feet of filter media. Because some of the cosmetic dusts have hygroscopic characteristics, the supplier specified fluorocarbon-treated oleophobic bags that have moisture-resistant properties. With standard polyester singed bags, the company's dust would cake and form a crust on the bags' outer surface, preventing the dust from properly releasing during reverse pulsing. The oleophobic bags' fluorocarbon treatment makes the bag fibers moisture-resistant and prevents crusting so the dust releases as it should.

A nozzle-based reverse-pulse-jet cleaning system with five valves continuously cleans the bags when the baghouse operates. The cleaning system pulses a short burst of compressed air every 30 seconds and cleans 20 percent of the bags with each pulse, ensuring that all of the bags are cleaned every 2½ minutes. The cleaning system requires 7 cfm of compressed air and operates at a noise level of less than 75 decibels.

During reverse pulsing, the dust falls to the baghouse's conical bottom hopper and into a 55-gallon drum directly below it. The drum's airtight lid prevents the baghouse from pulling in air through the hopper discharge, maintaining the system's seal. To change out the drum, an operator engages a manual slide gate located between the hopper's discharge outlet and the drum to maintain the system's seal when the lid is disconnected. The operator then places an empty drum below the hopper, reconnects the lid, and disengages the slide gate. The company changes out the drum about every 3 to 4 months, and a disposal company picks up the full drum and takes it to a landfill.

Anderson says one reason the company chose the dust collection system was because of the baghouse's design and operating features, which can more than double the typical operating life of standard bag filters. SDC's baghouse differs from most other baghouse designs in that the dusty air is pulled in through a baffled inlet located in the baghouse's upper top side rather than up through an inlet in the hopper's bottom. The airflow is directed downward through a drop-out section that discharges the air under the bags. The air downflow slows the dust's velocity from 4,000 fpm to less than 3,000 fpm, allowing most of the large dust particles to fall out of the airstream into the hopper and the small particles to move upward to the bags to form an efficient and tight dust cake.

"These design features minimize the amount of dust particles that get pulled up to the bags and allow us to operate the baghouse successfully with fewer bags than other baghouses that bring the air in through an inlet in the hopper," says Mike Gerardi, SDC general manager. "And because we use fewer bags, we can space them three inches apart rather than one to two inches apart like you'll find in most other baghouses.

"One benefit of spacing the bags so far apart is that during reverse pulsing when the dust falls off the bags it doesn't become re-entrained on the adjacent bags and instead falls to the hopper bottom. This provides a longer bag operating life because the bags don't have to work as hard filtering the same dust particles over and over."

Since installing the dust collection system, the plant has maintained compliance with OSHA's air-quality standards.

In the powder and bulk solids industry, most baghouses operate with air-to-cloth ratios in the range of 4-to-1 to 6-to-1, meaning 4 to 6 cfm of air passes through every 1 square foot of filter media. In contrast, the supplier's baghouse operates with an air-to-cloth ratio of 9.8-to-1, meaning 9.8 cfm of air passes through every 1 square foot of filter media.

A stationary dust collection hood at a fill station in the filling room pulls in fugitive dust created during the container-filling process.

"Most engineers are under the impression that it's all about maximizing the filter media's square footage inside the baghouse, but it's not," says Gerardi. "It's really about how much cleanable and reusable media there is, so we do a few things that are different to achieve that: We bring the air in through a top side inlet rather than through a bottom inlet; we use a drop-out section to slow the airflow's velocity so most of the dust drops out of the airflow into the hopper; and we space the bags three inches apart to ensure efficient and maximum pulse-cleaning with minimal dust re-entrainment. We also use a unique pulse-cleaning nozzle that induces much more cleaning air than other baghouse cleaning systems. In most generic baghouses, the bag filters typically only last about one year for powder applications. In our baghouse, the bag filters typically function more than two years — and that's with any standard bag filter from any manufacturer."

Maintaining compliance and improving production

Since installing the dust collection system, the plant has maintained compliance with OSHA's air-quality standards. "We operate five days a week, eight hours a day, and when we operate, the dust collection system is always on," says Anderson. "One benefit we've seen is that the compounding and filling rooms are always clean at the end of the day, so the

operators don't have to spend time sweeping up dust in the morning and can start working right away when they get here. This has reduced housekeeping costs and helped make us more productive. Another benefit we've experienced is low operating and maintenance costs because the bag filters last so long."

Additionally, Anderson is happy with how well the extendable ducts function in the compounding room. "The extendable ducts are easy to use and do a great job removing the fugitive dust at the mixers," he says. "It was one of the equipment options that Air Cleaning Solutions offered us that the other suppliers and manufacturers' reps didn't. The others wanted to install stationary dust collection hoods in the compounding room at each mixer, and if we'd done that, the project would've cost more." **PBE**

Note: To find other articles on this topic, look under "Dust collection and dust control" in *Powder and Bulk Engineering*'s Article Index at www.powderbulk.com or in the December 2006 issue.

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