Six cost-saving considerations for your dust collection system

Finding ways to reduce plant operating costs is a goal for many dry bulk processing facilities. This column discusses ways to cut costs related to your dust collection system. There are a number of actions you can take to reduce the cost of operating a dust collection system for your dust-generating processes. Typical operating costs include dust collector filter replacement, filter-cleaning compressed air usage, and energy consumption. Carefully considering and managing these operations can go a long way toward cutting costs.

1. Consider filter cleaning.
Continuous cleaning of your filter media (every couple of minutes) uses a lot of compressed air and may not be necessary. Cleaning too often may even shorten the filter media’s useful life. Continuous compressed air pulsing will over-clean the filters and possibly allow some fine dust to penetrate through the filters. An on-demand filter cleaning timer can be used, which will effectively clean the filter media when the pressure drop across the media reaches a predetermined high point. Setting the timer’s low point at about 2 to 3 inches water gauge and its high point at 4 to 5 inches water gauge can work well in many cases. The filters will be properly cleaned and last longer; the pressure drop across the media will remain fairly steady, and you’ll conserve compressed air. Check with your dust collector representative on what options may be available to you.

2. Consider expectations.
Specify in your dust collector purchase order that the dust collector filters shall perform efficiently and effectively for a specific period of time without the need for replacement. Typically, you should expect that the dust collector can continuously operate for 12 months without the filters failing (plugging or permitting dust to pass through). An undersized (fewer filters) dust collector will require more frequent filter replacements than an oversized (more filters) dust collector. An oversized dust collector will cost more, but it very well could be worth it. The cost of replacement filters for an 8,000-cfm cartridge filter dust collector is about $3,500. Then there is the labor cost to replace the filters and the production downtime cost to do so. The total cost, not including production downtime, would be at least $5,000. This adds up dramatically if the filters need to be replaced every couple of months. You have the responsibility to make sure your dust collector supplier is fully aware of what type and quantity of particulates will be captured in the exhaust system going to the dust collector so that the proper filter type and size will be selected. If your process operates at elevated temperatures and produces moisture or other vapors, the dust collector supplier must be made aware of this.

3. Consider airflow.
Reducing the airflow through the system will give you much control over costs. You’ll cut the annual fan operating cost as well as the operating cost for the make-up air system if you don’t or can’t return the cleaned air from the dust collector back to the plant. The best time to minimize the airflow through the system is during the engineering and design stage. Some dust control exhaust systems were never designed with dust capture hoods. These systems have open-ended flexible ducts with end funnels serving as dust capture devices. You can increase the dust capture effectiveness of these open-ended ducts by up to 50 percent by installing properly designed fixed dust capture hoods at the dust sources. If you have an existing system with open-ended ducts and you are getting good dust control before you add the fixed hoods, you can get the same good dust control using less exhaust air using the fixed hoods. You then may be able to reduce the fan speed to exhaust less air. Make sure you maintain minimum dust transport velocities within the ductwork to prevent dust settling within the ductwork.

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**4. Consider ducts and leakage.**
A new duct system, even with continuously welded seams, can leak up to 20 percent of a system’s total airflow. Ducts with continuously welded seams are no guarantee of a leak-free system. Spiral duct can leak, as well, if not properly fabricated. Open seams won’t be visible. The best step to take to avoid leaks is to have the installing contractor leak test and seal each duct section before it’s installed. Then, if there are still leaks, they’ll most likely be at the duct connection points. Bolted flanged duct and clamp-together duct connections can leak if they aren’t properly sealed or installed truly inline so that the mating sections are flush with each other. These duct connections still need to be checked after installation. If you’re getting good dust control even with duct leakage, you can slow the fan and reduce exhaust air by the amount of the duct leakage after you seal the leaks. Again, be sure to maintain minimum dust transport velocities within the ductwork.

**5. Consider fan operation.**
Install and operate exhaust fans efficiently:
- a) If the fan load changes regularly, use variable-speed drives.
- b) Replace restricting ductwork at the fan inlet and outlet. Restricting ductwork requires additional energy (static pressure) to deliver the design airflow.
- c) Even with the fan on the clean-air side of scrubbers and dust collectors, you need to inspect and clean the fan blades periodically.

**6. Consider dust sources.**
Then eliminate them. Take another look at your process. Can you eliminate or reduce sources of dust by making material handling or process changes or by repairing leaking process equipment? Eliminating or reducing dust sources can minimize the need for dust capture hoods and let you reduce total exhaust-air requirements, which will help you reduce costs.

Note that some of the suggestions listed here to reduce exhaust air and save energy with existing dust collection systems may require replacing existing ductwork with smaller-diameter ductwork to maintain minimum dust-transport velocities within the ductwork. The cost to replace the ductwork needs to be compared to the dollar value of the energy saved with the contemplated changes. You should also check with the fan manufacturer to see if slowing the fan for reduced airflow will still allow the fan to operate in the stable area of the fan curve.  

**For further reading**
Find more information on this topic in articles listed under “Dust collection and dust control” in *Powder and Bulk Engineering’s* article index in the December 2018 issue or the Article Archive at *PBE*’s website, www.powderbulk.com. (All articles listed in the archive are available for free download to registered users.)

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