Donaldson Torit®

Cost-Effective Dust Collector Placement Strategies

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When it comes to the placement of dust collectors for material handling applications in process industries, there are several strategies to choose from. The wrong choice may increase your operating expense. Choosing the right option is based on the application and the needs of the facility.

CENTRALIZED DUST COLLECTION STRATEGY

One strategy for dust collector placement is to install a single collector outside the building and to run ductwork to the various areas of the process that are generating dust. This is known as a **central dust collection system**.

There are several benefits to this choice. The first one is the relatively little space that is taken up at the location of the dust source. In a powder and bulk processing facility, there are a multitude of junctures and processes that generate dust, including conveyor transfer points, bin vents, mixing, bag dumping, and bag filling locations. Many of these applications generate dust in locations with limited space. With a centralized dust collector placement strategy, a dust control hood can be inserted at the location of dust generation and the dust then gets ducted to the collector. Hoods take up relatively little space compared to a full collector, which helps to overcome restrictive space issues.

Another benefit of central dust collection placement is that multiple dust sources can handled by a single collector. This means fewer collectors to monitor and maintain.

While these benefits sound good, there are some drawbacks to be considered with this approach. First, a centralized placement approach requires ducts, and sometimes many of them. In addition to the expense of purchasing the ducts, there is also the cost required to maintain the ducts especially if the dust is abrasive or the ducts will be exposed to the environment.

Another drawback to the centralized dust collection approach is that different dusts from different processes are being mixed in a single collector. If the collected dusts are incompatible, you may create a risk of fires, explosions, or corrosion. Even if the various dusts are compatible, the combined mixture might not be suitable for reclamation. This can mean that the mixture might need to be trucked to a landfill; the transportation and landfill costs can add up quickly.

Increased energy expense is another potential drawback to central dust collection placement. With a centralized placement approach, the system pulls air from all the hoods connected to the collector even if just one dust producing piece of equipment is operating. Energy is wasted by moving air from hoods where no dust is being produced.

Last, but by no means least, if dust generation from several processes are connected to one dust collector, a large portion of the operation may need to be shut down when it comes time to service the dust collector. This could push a facility to only service the collector over weekends or holidays, which results in higher labor costs.

DEDICATED DUST COLLECTOR PLACEMENT STRATEGY

A second strategy includes dedicating a dust collector to each specific dust-generating application or to each area generating the same dusts. A potential benefit of this approach over centralized placement is that one collector on the same type of dust allows the collected dust to potentially be reclaimed rather than taken to a landfill.

Another benefit is smaller collectors at specific points allows collectors to be maintained one at a time without shutting down the entire operation. This approach also allows tailored energy consumption that matches changes in production since collectors operate only when the specific work area generating dust is in operation.

Dust collector with fluted filter packs as compared to a standard baghouse with tubular filters. The smaller collector can do the work of the larger one but is up to 70% smaller.

One perceived downside of a dedicated placement strategy for collectors is the increased number of collectors and fans required. At first glance, this may seem true. However, in most cases, the dedicated dust collector strategy will cost less than the centralized strategy when you consider the cost savings from the:

- use of smaller duct sizes,
- reduced length of duct runs,
- reduced installation time, and
- reduced overall horsepower requirements.

Although the Centralized and Dedicated Placement Strategies seem to have major drawbacks, they are still good for applications where the dust being collected is considered part of a waste stream. A prime example would be dust coming off cleaning operations such as those in the grain industry.

INTEGRATED DUST COLLECTOR STRATEGY

The third—and most innovative—placement strategy is the integrated (or source) dust collector. This strategy involves the attachment of a dust collector directly to the process so collected dust is returned directly back into the product stream. Previously, this strategy could only be used in applications where large amounts of space were available for a collector on the process. Recent new technologies in dust collection now allow dust collectors to be much smaller so they fit into very tight spaces. Baghouses with envelope-shaped bags and cartridge collectors shrank in size relative to baghouses with tubular-shaped bags, but now collectors with fluted filter packs are dramatically shrinking the size of dust collectors further. Because these filters offer more filtration media packed into a smaller space, collectors can be up to 70% smaller than traditional baghouse collectors.

Dust collectors with fluted filter packs are much smaller than conventional dust collectors, which allows the collector to be integrated into a truck load-out hood.

The **Integrated Dust Collector** strategy has many benefits. First, since the collector is actually placed right where the dust is generated, ducts are not

needed in the installation. This reduces the cost of the ducts, the labor to install the ducts, and eliminates duct maintenance costs—especially when dealing with abrasive dust.

Energy savings is another benefit to this approach. When using the centralized or dedicated placement approaches discussed earlier, a fan draws the dusty air from the hoods at the dust generation points, through the ducts and finally into the dust collector. Depending on the size of the system, the ducts can result in a much larger fan consuming large amounts of electricity to transport air and dust to the collector. In contrast, an integrated placement approach uses no ducts or hoods because the collector serves as the hood. In most situations, a small fan may still be needed to keep the process under sufficient negative air pressure to draw the dust to the collector, but the size of the fan motor required will be considerably smaller and the consumed power will be less since it does not need to carry dust through ducts all the way back to a remote collector. Depending on the application, the annual energy savings can be substantial.

Integrated placement also results in the collected dust being returned directly back into the process stream. This saves money in several areas. With a central or dedicated solution, one must get rid of the collected dust. If there is value in the collected dust, it must somehow be transported to return it to the process. This means conveying it back (added equipment cost) or manually transporting it back in batches to the process stream (labor cost). If there is no value to the dust, it still has to be transported to a landfill or disposal site, which results in transport and landfill costs.

The integrated approach, much like the dedicated placement approach, may require multiple collectors, rather than a single large collector. This may mean more collectors to maintain, but this approach can be helpful because it is possible to service any one collector without disruption to the entire operation. This allows maintenance to be done during regular business hours so weekend or holiday labor rates will not be required. It also means the entire operation, or a large portion of it, is not dependent on one collector.

Finally, since the integrated solution uses smaller collectors (e.g. compact design, no hopper, no leg structure), freight and installation costs are greatly reduced. And considering that there are no ducts to purchase or install with this approach, additional installation savings result.

To get a better understanding of the benefits of the integrated approach, let's look at some real-world examples.

TRUCK DUMP IN CENTRAL U.S.

A grain truck unloading station in the central U.S. was originally designed without dust collection. After the facility started operation, it quickly realized dust collectors were needed. A Donaldson Torit dealer installed four Torit® PowerCore® CPV-6 collectors (dust collectors with fluted filter packs) in each of the truck dump bays. Because there was not sufficient room for fans to be installed directly on each of the collectors, ducts connected the collectors to the fans outside the bays. Even though this site does not enjoy all the energy savings that typically comes with using the integrated strategy, the site manager is pleased he doesn't have abrasive dust traveling through ducts. This represents a significant savings in duct maintenance. He also likes that there are fewer filters to replace because each filter pack takes the place of six, eight-foot tall bags that the site would have used if it had installed a baghouse outside the building. The easy access to the filters is a bonus.

Four Donaldson Torit CPV-6 collectors at grain truck dump pit.

Had the site been able to use five HP fans installed on each of the collectors instead of having them ducted to a 25 HP central fan outside of the building, each truck unloading bay could have saved $2,391 annually

Donaldson Torit Dalamatic Insertable as integrated solution at Southern Cement.

in electrical costs (assuming 4,000 hours of operation and a cost of 15 cents per kilowatt hour). Since there are actually four bays here, the total savings in this example could have been $9,564 annually.

SOUTHERN CEMENT

Another example of the benefits of an integrated approach for dust collection is the Southern Cement transfer station in Mobile, AL. Southern Cement unloads cement and pneumatically conveys it to three separate storage houses until it is transferred for loading into trucks or railcars. When the cement is conveyed to the storage houses, dust collectors control the dust and keep it in each storage house.

The original design intent included three central dust collectors (one collector located outside each of the storage compartments). However a Donaldson Torit dealer proposed a more effective solution. The dealer suggested it would be better to use an integrated solution installing five Donaldson Torit Dalamatic Insertable collectors on the roof of each storage compartment. The fans attached to each Insertable now draw dusty air through the filters. Although both solutions required a displacement of 20,000 cubic feet per minute of air per storage compartment, less static pressure is required with the integrated Dalamatic Insertable solution because all duct losses were eliminated. This resulted in an electrical savings of over $18,000 per year. The customer also enjoys the following benefits:

- No need for rotary valves or screw conveyors to transport collected cement dust since the cement dust is pulsed from the collector directly back into the storage houses.
- If collectors need to be serviced, it can be done one at a time without needing to shut the entire operation down.

Donaldson Torit Dalamatic Insertables used as an integrated solution at Southern Cement.

There are multiple dust collector placement strategies that can be employed in a powder and bulk processing facility. The use of the integrated solution, when possible, will result in many forms of costs savings.

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