TABLETS & CAPSULES
Solid Dose Digest
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Ask an Expert

Dust collection for continuous solid dose manufacturing

Q: What features should we consider when purchasing dust collection equipment for continuous solid dose manufacturing?

A: David Steil, Camfil Air Pollution Control, says:

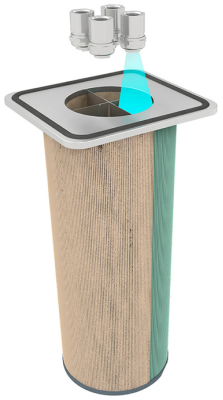
A continuous solid dose manufacturing system simultaneously charges ingredients into the system while discharging finished product out of the system. Its key benefits compared to batch manufacturing are the use of smaller processing equipment and facilities, simplified processes, and superior quality control. However, you can achieve these benefits only if your auxiliary equipment is able to keep up.

Uninterrupted dust collection is critical in continuous manufacturing because the system may need to run 24 hours per day, 7 days per week. To ensure that your dust collection system can meet the challenge, look for the following attributes: online filter cleaning, energy efficiency, compact design, safety features, and reliability.

Online filter cleaning

Dust collectors can run continuously when they remove dust properly from their filters during operation using reverse pulse cleaning (Figure 1). During operation, dust accumulation on the filter media restricts airflow through the filters and raises the dust collector's differential pressure (dP). Reverse pulse cleaning uses nozzles that direct pulses of compressed air as needed into the filter cartridges' interior to dislodge dust from the media's outer surface. The dislodged dust then collects at the bottom of the dust-collection vessel.

Figure 1



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The most efficient reverse pulse cleaning systems use on-demand cleaning. A controller reads the dP across the filters and initiates a cleaning cycle automatically when the dP reaches a targeted value, to return the dP to a stable level. A suitable receptacle stores the collected dust and allows emptying of the container when necessary without having to shut down the dust collector.

However, the pulse cleaning process can cause pressure disturbances in dirty-air ducting and in the process machine to which it's connected. Dust collection system suppliers can design a system to prevent such disturbances by using proactive strategies such as:

- Reducing the compressed air pressure
- Using segmented filters
- Setting up offline cleaning regimes

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- Using automatic dampers

Energy efficiency
In continuous manufacturing, energy efficiency is a primary consideration in the design of all ancillary equipment, including dust collectors. Dust collectors consume energy in two main areas: the fan and the filter cleaning system.

Fan. The fan produces negative pressure that effectively draws in the dust and air from the process equipment and removes the generated dust. Well-designed dust collection systems have well-balanced and -designed ducting to minimize the fan's power consumption. Using variable-frequency drives and high-efficiency motors can also reduce energy consumption significantly.

Filter cleaning system. Compressed air is expensive to generate. A more efficient filter cleaning process will have a lower average dP and will consume less compressed air. Consider the following factors when selecting an energy-efficient dust collector for your application:

- The filter media should effectively release accumulated dust during filter cleaning. Each type of filter media has unique characteristics that you need consider for each application.
- The filter cartridge design should encourage dust release during cleaning and maximize the amount of usable filter media.
- The pulse cleaning mechanism should be designed to minimize compressed-air usage while still effectively cleaning the filters.

Compact design
Small process machines and reduced floor space require small ancillary equipment. This includes dust collectors and the cartridge-style filters that dry dust applications typically use (Figure 2). Cartridge-style filters have a greater surface area and smaller footprint than bag filters.

Figure 2

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In addition, dust collectors typically need to incorporate a HEPA filter and a fan, which can take up valuable space in a production floor or suite. Using a fully integrated, compact dust collection system is a space-saving strategy that is sometimes a necessity. A more compact unit can also have much lower installation costs.

Safety features
You must evaluate a continuous manufacturing process before implementation to determine its potential health and safety risks. With dust collection, the main risks involve the potential exposure of workers to harmful dusts, cross-contamination of other products, and fires or explosions from combustible dust. A well-designed and well-maintained dust collection system can remove airborne dust from the workspace.

Dust exposure. Removing collected dust during filter changes and performing maintenance work on the system can expose workers to harmful dusts. Dust-collection equipment suppliers offer containment systems that limit risks during these procedures, such as bag-in/bag-out containment systems and continuous-liner technology (Figure 3). Dust collector containment systems vary in design, so choose a system that an independent organization has surrogate-tested and validated. Also, select a safe-change system that is ergonomically designed and easy to use so that maintenance teams don't have any difficulties following the procedures.

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Fire and explosion risks. To manage fire and explosion risks

Figure 4

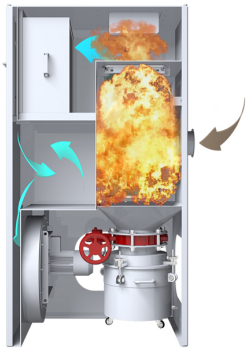

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Figure 3

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effectively, your facility personnel must fully understand the hazards of the manufacturing process and the dust explosion properties of the materials being processed. Current National Fire Protection Association (NFPA) standards require that you determine the dust explosion properties for all materials you handle, including proprietary products. products. Dust collection equipment suppliers can use this information to design their systems properly. When this information isn't available, you can contract a specialist lab to conduct explosion tests with your material to determine such values as the rate of explosion (Kst), maximum explosion pressure (Pmax), and minimum ignition energy (MIE).

For processes with small air volumes, you can sometimes avoid specifying expensive, ancillary, explosion protection equipment by selecting an advanced dust collection system that has documented, performance-based testing showing that it can safely contain dust explosions. The cost savings can be significant with compact dust collectors, particularly with respect to installation and ongoing maintenance costs.

Reliability

Dependability is a critical requirement when selecting machinery for continuous pharmaceutical applications. Dust collection suppliers should destructively test dust collectors to generate real-world performance data that can be used to determine the equipment-design and explosion-protection requirements.

Dust collector maintenance must be as quick and simple as possible to avoid unnecessary production delays. In addition, look for a dust collection equipment supplier that provides dedicated sales and after-sales support to ensure the availability of spare parts and minimize downtime. A well-established supplier with a customer-focused approach can not only provide reliable equipment but can also be a reliable partner.

David Steil is pharmaceutical market manager, North American and Canadian sales and marketing, at Camfil Air Pollution Control, Jonesboro, AR. The company manufactures dust, fume, and mist collection equipment for challenging industrial applications. For information call 800 479 6801 or email the company.

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