

What major factors should you consider when selecting a drying method?

You need to consider several factors to select the optimal drying method for your application. These include the feed consistency; the desired powder form or appearance; whether you're drying water or a solvent from the feed; whether the powder is heat-sensitive, flammable, or explosive; whether the powder can be exposed safely to the combustible products of the fuel being used; whether low-cost steam is available; and whether you have a secondary use for the dryer's exhaust heat.

If you want to produce a free-flowing powder with spherical particles, a spray dryer is probably the best approach. This requires the feed to be a free-flowing fluid. Many different spray-drying configurations are available, and each offers different capabilities and degrees of flexibility.

If your feed is a viscous fluid and a flaked product is acceptable, consider using a film drum dryer. These dryers are limited in capacity due to their drum sizes. They can use low-pressure steam, though they achieve higher capacities using higher-pressure steam.

If your product can be a fine powder with less flowability, consider a spin-flash or flash dryer. For these dryers, the feed can have a higher solids content and must have the consistency of a wet cake or a damp crumbly powder or granule. Spin-flash dryers can accept a cohesive paste or cake feed, but a flash dryer may require dried powder to be externally back-mixed to convert the feed to a friable non-sticky consistency.

If your feed is a damp powder, a fluid-bed dryer is a good choice. These dryers can use low-pressure steam heating, since the heat can be transferred to the material by heat transfer tubes or plates within the fluidized powder bed. This reduces the amount of air required for fluidization. The dryer bed can be up to several feet deep, which can result in lower costs.

If your end product will be very coarse, you can use a conveyor band dryer. This dryer spreads or extrudes wet feed onto a perforated conveyor, which transports the material slowly through multiple zones that heat and recirculate the air blowing through the material bed. The end product is a dried pellet with the same general shape and size it started with.

If your end product is heat-sensitive or if very low residual moisture is required, you can use a vacuum dryer. These dryers, including rotating double cone or agitated cylinder or pan models, heat the material by conduction from the shell and the agitator.

If your feed is wet with a solvent, it should be dried under an inert atmosphere, typically nitrogen. The dryer configuration must be fully sealed with the nitrogen recirculated between the drying zone and a condensing system to recover the solvent and return the dry nitrogen to the heater.

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Although the prospect of selecting a drying method may seem daunting, choosing the right dryer for a particular application can be dwindled down by prioritizing and answering a few basic questions:

Drying Application:

- Is the drying process batch or continuous?
- Is the material heat-sensitive?
- Are there material handling problems to consider, such as a sticky phase or fouling issues?
- Is product attrition or dust a concern?
- Are the exhaust vapors hazardous or odorous and need to be contained or treated?
- What kind of permitting is required?
- Are there other safety issues that need to

be addressed? For example, is there an area classification that needs to be met?

- How do you control the drying process?

Drying Economics:

- How much space does the drying system take?
- How efficient is the dryer? How much power does it consume to evaporate one pound of water?
- What are the construction materials?
- What are the system's capital costs?
- What are the yearly maintenance costs?

Dryer Operation:

- How easy is it to operate the dryer, and how many operators are required?

Selecting the right drying method for your application is based on various factors, such as your material's moisture content, consistency, particle size variation, and heat sensitivity. Pay great attention to the energy efficiency of the method selected. Drying is an energy-intensive process — take care to select a method that allows the use of waste heat and minimizes energy loss. Another important consideration is the method's flexibility during operation. Evaluate the ease and precision of temperature control and moisture removal to ensure that the drying method can accommodate variations in process conditions and material quality.

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Equipment suppliers are a valuable source of information about equipment and processes. In light of this, each month we ask suppliers a question of concern to our readers. Answers reflect the suppliers' general expertise and don't promote the suppliers' equipment. If you have a question you'd like suppliers to answer, send it to Alicia Tyznik, Associate Editor, Powder and Bulk Engineering, 1155 Northland Drive, St. Paul, MN 55120; fax 651-287-5650 (atyznik@cscpub.com).

- What auxiliary systems are provided with the dryer? For example, how is the dryer fed, the product removed, and the off-gas treated? Are heating equipment, pollution control, and a complete control scheme provided?
- How easy is it to maintain the system?
- What kinds of spare parts are required?
- How long does it take to start and stop the system?

An experienced drying manufacturer should be able to provide answers and solutions to your application, even if it means referring you to another vendor.

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