SUPPLIERS' TIPS

How can I improve my drying process's energy efficiency?

There are several methods you can try to improve your drying process's energy efficiency. If your dryer's outlet temperature is high enough and the exhaust airstream is particulate-free, try installing an air-to-air heat exchanger to extract energy from the exhaust stream. This can potentially yield an energy savings of 20 to 25 percent. Also, make sure you insulate as much of your equipment as possible and check your old insulation for damage. Try operating your dryer at a lower outlet temperature if your final product can tolerate slightly higher final moisture content. You can also optimize your feedstock to maximize solids concentration and investigate new nozzle technologies to help process higher solids.

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Equipment suppliers can be a valuable source of information about equipment and processes. In light of this, we occasionally 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 Heaton, Assistant Editor, Powder and Bulk Engineering, *1155 Northland Drive, St. Paul, MN 55120; fax 651-287-5650, aheaton@cscpub.com.*

Improving a drying process's energy efficiency is an issue that has continually plagued vibratory fluid-bed dryer operators, because the vertical air velocity that's required for adequate fluid-bed dryer fluidization determines the amount of air that will be passed through the bed. The inlet air temperature is determined by the material's drying characteristics and the fluid-bed area is determined by how quickly the product dries.

If you have a conventional, rectangular, vibratory fluid-bed dryer, try tweaking your air distribution, material movement rate, and bed depth to increase efficiency. Also, there are new multi-deck dryers on the market that could increase your energy efficiency. In a multi-deck system, the drying air contacts the material at each deck level, thereby achieving a dramatic improvement in thermal efficiency. The multi-deck approach generally uses the same inlet air temperature, a lower discharge air temperature, and dramatically less air than a traditional dryer.

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There are several ways to improve your drying process's energy efficiency. First, try reducing your required drying amount by keeping the dryer feed moisture as low as possible. You can do this by using centrifuges, presses, static drainage, or other components. If you keep the amount of water to be evaporated to a minimium, your energy use will stay low.

Try reducing your energy use by increasing the inlet hot-gas temperature for convection drying or increasing the surface temperature for conduction drying. Insulating a dryer will reduce radiant heat losses. Recovering heat from exhaust gases may reduce your energy use, but keep in mind that it could result in major capital expenditures for very little savings. Another way to improve efficiency is to increase the intimate contact between the heat source and the wet material. Better mixing and reduced surface area fouling will assist conduction heat transfer. And maximizing contact time between the hot drying gases and the product being dried assists fluid-bed and rotary convection dryers.

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A good way to improve your dryer's energy efficiency is to raise the temperature, since most dryers don't run at the maximum possible capacity for all materials being run through them. To prevent overdrying, the operating temperature is usually turned down well below the maximum value allowable for acceptable product quality. Also, reduce your exhaust to raise the humidity to a level that slows down the drying rate enough to produce your product's desired final moisture. This new operating condition will likely use less energy than before because the reduction in exhaust flow more than offsets your increased temperature. Your actual savings depends on your dryer type and your application but, in general, this method works best for lower-temperature drying with exhaust temperatures below 212°F. Keep in mind that, in addition to product quality, there are other concerns, such as controlling pressure inside the housing or condensation in the ductwork, that limit how much the exhaust rate can be reduced.

Another method to increase dryer efficiency is to add more drying area instead of using an add-on heat-recovery system, which can compromise dryer flexibility and be difficult to clean and maintain. Many dryer designs are modular, which makes adding area to an existing machine relatively easy. Once you have more than the minimum drying area re-

quired to do the job, you can try reducing the amount of exhaust per pound of water evaporated and run your process in a more energy-efficient way. Again, your dryer type and application will determine the optimum area-increase amount.

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Many factors can affect a dryer process's energy efficiency. Here are two suggestions that often provide the greatest impact in reducing energy use in a convection conveyor dryer:

• Check the incoming dryer load. Many people don't realize that a small increase in the material's incoming moisture content can significantly affect the dryer's energy requirements. Check the incoming moisture content and the upstream equipment to ensure that the material is entering the dryer close to the initial operating setup.

• Check the airflow entering and exiting the dryer. A convection dryer requires make-up air to be added to the airstream, which then picks up moisture to be exhausted from the system. If your dryer pulls too much exhaust, then an equal mass of make-up air is required to replace the exhausted quantity. The added make-up air has to be heated, so overall energy use must be increased to accommodate this larger air volume. Adjust your dryer's exhaust fans to remove the optimal quantity of process air from your system.

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