

Optimal drying of bulk solids despite variable inputs

Drying of bulk solids is often required for preservation of the product and as a final step before storage. It also serves as a feed stock preparation step for adjusting the moisture content of the incoming material to the desired level for downstream processing. For storage purposes insufficient solids drying can lead to caking and deterioration of the product, while over drying can lead to the production of undesirable levels of fines and dust.

THE CHALLENGE WHEN DRYING BULK SOLIDS

The moisture content of bulk solids varies significantly depending on a range of factors from ambient conditions to product texture. The amount of solids drying required varies accordingly.

The challenge for any bulk solids drying technology is to provide precise outcomes despite these variable inputs. For successful handling, storage and processing of bulk solids, it is crucial that the dryer employed in a facility delivers product at both the specified discharge temperature and the specified moisture content. The failure to meet either of these requirements can result in operational issues, reduced product quality and even reduced yield.

Controllability of the bulk solids drying process is essential to product quality. While the product going into the dryer can vary greatly in moisture content, the product coming out of the dryer must achieve both a precise moisture content and meet the specified discharge temperature required for the downstream process.

CONVENTIONAL DRYING OF BULK SOLIDS

Conventional bulk solids drying technology involves blowing large volumes of hot air over the product. Ambient air is taken in and heated. As the hot air comes in contact with the product and picks up moisture, the temperature of the air drops quickly, causing the air to become saturated and rendering it unable to extract additional moisture from the bulk solids material. At this point, the saturated air must be discharged. As a result, the process requires the intake, heating and discharge of large quantities of air. The humidity of the ambient air is an important variable that impacts the process. Air that is more humid may require conditioning before it can be used or, being already somewhat saturated, it will be unable to carry away as much moisture.

Use of the single medium of hot air to both heat and dry the bulk solids creates controllability issues on several fronts. Air distribution generally varies, resulting in non-uniform heating.

As well as controllability issues, the use of hot air as both the heating medium and the moisture removal agent sees much of the energy input going up the stack. Given the large volumes of air required, emissions are high. Thermal efficiencies are often as low as 30 percent.

SOLEX BULK SOLIDS DRYING TECHNOLOGY

Instead of using hot air to heat the product, Solex bulk solids drying technology uses an indirect heat exchange design in which the product flows between plates heated by hot water or steam. The bulk solids dryer combines thermal modeling with the science of mass flow of bulk solids to deliver uniform heat transfer and uniform drying. The product is heated by conduction while a small amount of cross-flow air is used to remove moisture. The indirect heating of the product helps maintain the temperature of the cross-flow air, preventing it from becoming saturated as quickly, and enabling it to extract increased amounts of moisture. In contrast with conventional bulk solids drying technologies, only a very small amount of cross-flow air is required to remove moisture from the product.

The combination of the two media of indirect heat and cross-flow air facilitates precise control over the desired outcomes. The indirect heat of the plates controls product temperature while the cross-flow air controls product moisture content. Together, the two media provide the flexibility to achieve specified outcomes.

In addition, Solex bulk solids drying technology has the environmentally-friendly advantage of lower emissions and thermal efficiencies as high as 90 percent. If waste heat is available it can be captured, further adding to the energy efficiency.

THE IDEAL SOLUTION FOR DRYING BULK SOLIDS

Using only the single medium of hot air, conventional bulk solids dryers have a difficult time controlling the two key outcomes of final product temperature and moisture content. By using indirect heating to control product temperature and small amounts of cross-flow air to control moisture content, the Solex bulk solids dryer is able to provide the exact outcomes required for downstream processing.

Solex bulk solids drying technology enables facilities to achieve optimal drying given the variable inputs of product moisture content and humidity in the ambient air. In contrast with conventional technology, Solex offers better responsiveness to changing inputs and precise controllability over product outcomes.