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Gentle In-line Drying of Bulk Material

In-barrel drying of bulk material will invariably leave behind some moisture – a prejudice still prevalent today despite the fact that it was proved wrong more than 20 years ago. Here is an example from the electronics industry to demonstrate our point.

Weidmüller Interface is a globally operating supplier of connectivity solutions and other electronics equipment. At the turn of the millennium, Weidmüller reorganized the process in their in-house plating shop. Post-plating centrifugal drying had impaired the quality of their highly sensitive electronics items. Centrifugation had also entailed process interruption and manual handling, which was considered unsatisfactory. Weidmüller found an alternative solution provided by drying system manufacturer Harter.

The previous process was as follows. Having undergone surface finishing the sensitive electronics items were manually transferred into baskets and then subjected to centrifugal drying. In this process, the items were unnecessarily heated by a hot air blower, some of them distorted by centrifugal forces and their surfaces deteriorated. And, on top of it all, the items were left incompletely dry.

Dry within 12 minutes

Harter had built their first static bulk material dryer in 1996. In this application, drying took place inside the centrifuge but without any movement involved. The next dryers were barrel types where the bulk material was actually dried in-line inside the barrel until fully dry. Harter has successfully realized several hundred barrel dryers to date.

Initially, two barrel dryers (1,350 mm long / 2,630 mm wide / 1,350 mm high) were designed for Weidmüller's double barrels. The dryers are connected to the so-called Airgenex dehumidification module which provides the necessary process air thus ensuring highly efficient drying.

The items are completely and uniformly dried at 60 °C within the specified cycle time of 12 minutes. In this process, the sensitive items are not subjected to any stress because the barrels are moved only minimally, very slowly and at intervals specific for each article to be dried. The project was also attractive under energy aspects – the connected load of the entire system is 34.8 kW in production operation.

Heat pump based condensation drying

What are the critical factors that enable in-line drying? Drying of bulk material in its container constituted a milestone in Harter's business history because is posed a major engineering challenge. The heat pump based condensation system developed by Harter first dehumidifies the process air in the Airgenex dehumidification module. The unsaturated air is then passed to the items to be dried, in this case over and through these items. In this process, the air very quickly absorbs any humidity present by physical action.

The bulk material is dried in the barrel at a temperature of 60 °C.

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The small parts are gently and uniformly dried in three drying stations.

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The dehumidification modules provide the dry process air required by the dryers.

Ancillary Information

Harter's dryers are highly energy efficient and carbon saving owing to their inbuilt heat pump technology, which makes them eligible for government subsidy. The drying systems feature a completely closed air circuit so that no humidity may escape into the ambient workshop air.

Once returned to the dehumidification module the air is cooled and the moisture condenses. The process air is reheated and passed to the dryer again. The closed circuit makes the difference. It is the closed air circuit in conjunction with the integrated heat pump technology that makes drying energy efficient and carbon saving.

A special air routing provision inside the barrel dryer ensures that the dry process air passes through the barrel and out again. The air stream is uniformly distributed throughout the barrel such that each and every item is dehumidified. The barrels are cautiously rotated at certain intervals to support dehumidification.

Weidmüller has grown much bigger over the years employing a global workforce of some 4,900 today. They also invested in their original site at Detmold. Their in-house plating facility was brought up to date and expanded to nine processing lines, four of which are barrel types. From the very first project, Weidmüller has always relied on Harter's gentle and efficient drying. Meanwhile, a total of 13 barrel drying systems of various sizes are in operation at the Detmold site. This includes two basket dryers for drying items after cleaning processes.

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