

Brilliant Drying Results for Bulk Material

Drying is often a bottleneck in cleaning processes, and standard hot air fans frequently do not produce the desired quality. A globally operating group obtained quality and process improvements through optimized drying.

The company operates a multitude of facilities to clean high quality bulk material after grinding. Following cleaning, the material is subjected to drying. This had been done using hot air fans at temperatures as high as 85 °C. The drying method had conflicted with the operator's high quality standards. Through the trade

press, they learnt of the drying system manufacturer HARTER and their alternative low temperature drying systems. HARTER was all too willing to explain the operation and applications of Airgenex heat pump based condensation drying. HARTER's system seemed to basically fulfil the operator's requirements. The

normal procedure would now have been to run drying tests in HARTER's pilot plant station which was, however, precluded by the high monetary value of the bulk material. Instead, the relevant parameters – temperature, time, humidity, air speed and airflow rate – were determined by field tests run at the company's premises using a specially designed experimental dryer over a period of twelve weeks. In view of the positive outcome of these tests the company decided to invest in a condensation dryer.

Air Blowing and Drying

The drying system was installed as part of a facility including a new continuous cleaning line. The sequence of operations is as follows. The rectangular baskets holding the sensitive bulk material are inserted in various cleaning tanks in a row. Immediately afterwards, they run through a drying tunnel including seven stations which the baskets pass at 15 seconds cycle time each. The total door-to-door time is thus 315 seconds.

At the first station, the items have water blown off by a special non-compressed air nozzle. An air recirculation fan extracts 90 percent of the water present in this process. The drying proper takes place in the remaining six stations,



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The sensitive bulk material is dried completely and may be subjected to immediate further processing



This is how the energy-efficient drying system works



Baskets of bulk material pass seven combined air blowing/air recirculation drying stations inside the drying tunnel

each having also a special air recirculation system.

Combined air blowing and recirculation drying suggested itself as a result of the test series conducted. And this approach was also adopted as a result of experience gathered in watch and clock industry applications. This drying process ensures that sensitive bulk material is dried completely, quickly and free from staining which makes it possible to submit the items to straightforward and immediate further processing. The blowing-off nozzle may be moved vertically. Blowing angle and speed may be varied using the programmable logic controller integrated in the system. This is important because the size of the items in the bulk material load differs. The load may be any number of items placed randomly to a certain height and density or larger separate items.

Dehumidification and Air Routeing

For this alternative drying approach, extremely dry and thus unsaturated air is passed over the items to be dried absorbing, by physical action, humidity very quickly in this process. The air is then cooled, water condenses, and the

condensate leaves the system. The cooled air is now reheated and returned to the drying chamber. The circuit is thus closed. The air is conditioned in the so-called Airgenex module which is attached to and controls the environment in the tunnel. Good dehumidification alone, however, does not suffice to ensure good drying results. The dry air must be routed to pass directly over or through the items to be dried – in this case through the baskets and the bulk material and out again. The perfect combination of air conditioning and customised air routeing forms the basis for fast, reliable and gentle drying. Heat pump based condensation drying is method capable of drying, with little energy input, any solid matter irrespective of the process used to manufacture or finish the products. Drying temperatures vary between 20 °C and 75 °C as appropriate to the individual application. The drying temperature in this application is about 45 °C.

Well Thought-out Energy Design

Changing to the hitherto unknown drying technology made it possible for the bulk material manufacturer to cut the drying time in half and to optimise drying qua-

lity, which ensures immediate further processing. And their employees are no longer exposed to the intense heat of 85 °C.

The drying system was designed to enable doubling of the load, i.e. having stacks of two baskets processed at a time, for increased throughput. Another bonus is the low connected load of the drying system which amounts to only 16.7 kW. Plus, the dehumidification module produces, in certain phases, excess heat which when run through a plate heat exchanger may be used to heat the fresh water for the cleaning systems.

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