Fast and Reliable Drying

Uniform Drying of Bulk Material from Manufacturing Processes

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Fig. 1 – Complete, gentle and energy-saving drying of bulk material in a barrel dryer with minimal intermittent movement at a temperature of 70 °C

In many industrial manufacturing processes bulk material is placed in centrifuges for drying. Centrifugal drying exposes parts to high thermal and mechanical strain with resulting potential deterioration, and it may leave the parts ultimately wettish at that. In an attempt to drying, bulk material is sometimes also subjected to inadequate techniques using air blowers or to intense heat.

All such drying methods are no longer state-of-the-art. An alternative technology can be employed to easily dry small parts in barrels, baskets or on trays both in batch or continuous operation in a gentle and reliable way. Drying system manufacturer Harter launched a highly efficient process on the market more than 25 years ago. It uses extremely dry air forced to follow a specific path to render products completely dry at low temperatures and within very short time. Harter has since vigorously advanced the development of the process such that appropriate solutions to the most challenging bulk material drying issues should be available today. As early as in 1996 there was a pioneering project in Switzerland. Ever since this time, hundredth of bulk material dryers have been implemented throughout industry.

Fig. 2 – The plastic parts dried here have deep bottom holes and recesses

Bulk Material in Barrels

A renowned surface finishing processor specified drying requirements clearly focused on time and quality. Quantitative bottlenecks were to be eliminated. So, efficient dryers were to be integrated in the process chain to enable direct in-barrel drying. The specific application includes two in-barrel dryers for one double barrel system each. Leaving the rinsing station, the barrels are moved into the dryer where the parts are dried within 10 minutes in a complete, reliable and gentle way. The drying temperature is 70 °C.

The barrels are subjected to minimal movement during drying. As a standard, each dryer includes an automatic lid system to retain the precious heat inside the system. Four 1.6 kW connected load recirculation fans are integrated in each dryer.

Two so-called Airgenex® modules are attached to the dryers to condition the required process air. Each dryer has a connected load of 14.45 kW. The two heat pump based condensation type dryers have demonstrated to consume 60 percent less power than comparable exhaust air dryers (ref. fig. 1).

Continuous Drying in Baskets

A ski binding manufacturer needed a system to dry their injection moulded parts. Following application of a special solution, the parts were to be gently dried for subsequent powder coating. Bulk material of various sizes and geometries are placed in metal baskets holding a maximum of 25 kg. All these parts have recesses and bottom holes as much as several centimetres deep, which is a special challenge to the drying process.

The baskets containing the bulk material are loaded in two parallel drying chambers including a turnable basket support. First,

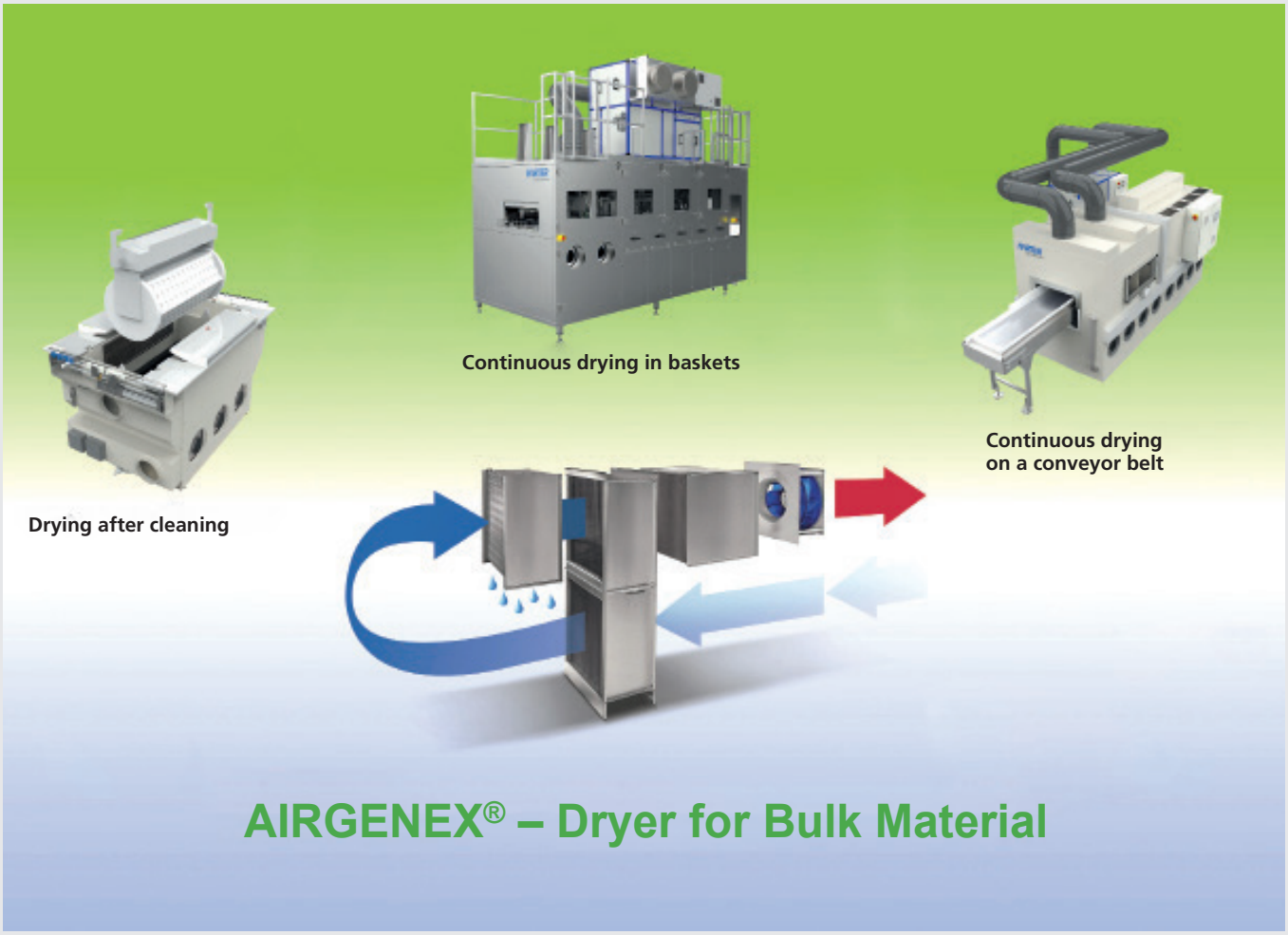

Fig. 4 – Process schematic with application examples

Principle of Heat Pump Based Condensation Drying in a Closed System

Successful drying is governed by two factors which Harter combines. These are efficient air conditioning and appropriate air routeing. Harter uses an alternative physical approach for drying. The process air is stripped from any moisture and, at the same time, heated in the Airgenex® dehumidification module. This unsaturated air is then passed into the dryer and over or through the products to be dried quickly absorbing humidity in this process.

Subsequently, the saturated air is returned to the dehumidification module where it is cooled. Water condenses from the air and the condensate is drained off the system. In a closed circuit, the air is reheated to become available for drying again. The use of dry air enables drying at low temperatures.

Drying temperatures vary between 40 °C and 90 °C as required by the specific application or desired by the customer. Standard drying temperatures range from 45 °C to 75 °C.

Now, this is where the second factor comes in. Without precise air routeing is would be impossible to dry items, particularly bulk material, in a fast and complete way. The air route is designed for each specific project such that the dry process air takes a precise path to flow through the bulk material and to leave it again. The Airgenex® dehumidification module is either included in a compact dryer or placed separately, even on a different floor if required for space restrictions, and connected to the dryer through plastic tubing.

the baskets are slowly and gently rotated by 180 degrees. This is to largely drain the bottom holes so that a certain amount of water is removed from the parts and the baskets by gravity. Then, the drying process proper starts as described.

Upon completion of drying, the metal baskets exit the drying chamber automatically and run on a roller track to a station where they are removed manually. The drying time varies for each product but does not exceed four minutes. The drying temperature is 60 °C. The drying system including four special recirculation fans has a connected load of 15.9 kW (ref. fig. 2).

Combined Drying-Cooling System

Another company's portfolio includes the manufacture of parts from steel blanks to be dried in a continuous process following vibratory finishing. This requirement was reflected by designing and installing a continuous dryer. A maximum of 800 kg of vibratory finished parts are dumped on the dryer conveyor belt after cleaning. The drying zone inside the tunnel is two metres long. This is where the parts are uniformly and completely dried at 70 °C.

Subsequently, the parts are cooled to about 30 °C on the next two metres. The customer's existing ventilation system is used for cooling. Inlet and outlet ducts are positioned such that 24 °C ambient air temperature is ensured. Fans installed in the dryer take in ambient air, pass it over the parts to be cooled to finally release it through an outlet duct to the production area.

Fig. 3 – Combined drying-cooling continuous dryer

The belt speed is 0.58 m/min. Thus, the parts leave the continuous dryer – dried and cooled – after seven minutes. The dryer is made of polypropylene, the belt of stainless steel. Harter dryers are very economical owing to their operating principle which is based on the use of a heat pump. The connected load of the Airgenex dehumidification module is 6 kW. The drying tunnel has eight special recirculation fans installed for drying plus four for cooling. All fans are frequency controlled and have a rated power of 1.5 kW each. The system has also an inbuilt auxiliary electrical heater for a short-time initial boost of the dryer's temperature to faster obtain the desired operating temperature. The rated power of the overall system in production operation is about 25 kW (ref. fig. 3).

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The company was established under the name of HARTER Oberflächen- und Umwelttechnik GmbH. Their services encompass the design of new dryers as well as the refurbishment and the performance improvement of existing drying systems. Harter GmbH also has an in-house pilot plant station to conduct drying tests in order to determine and record the parameters required for successful drying. Such testing may also be done in larger test beds or using Harter GmbH rental systems at the customer's premises.