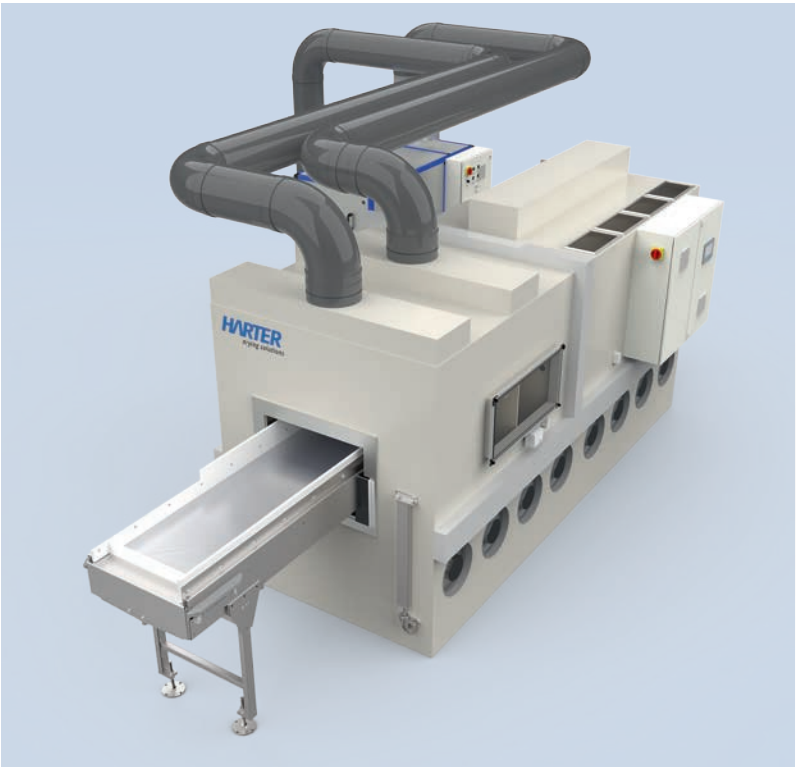
Drying and Cooling after Vibratory Finishing

Heat pump based condensation drying is capable of complete and energy saving drying at temperatures much lower than conventional hot air systems. When combined with a cooling system the temperatures may be further reduced.

Following vibratory finishing, Stiwa dried their blanks at temperatures above 100 °C. Owing to their high temperature the blanks could not be subjected to immediate further processing. The company wanted to expand their production area and find an alternative drying solution for their new vibratory finishing facility. Drying system manufacturer Harter was awarded the order to implement this solution.

Combined Drying-Cooling System

When a new project is launched Harter almost always conducts tests in their in-house pilot plant station. Initially, the tests are run to ascertain that the customer requirements - for quality, time etc. – can be met. If so, which is the regular outcome, further tests are made to determine the parameters to ensure successful drying, namely temperature, humidity, airflow rate, air speed and air routeing. These parameters form the basis for later design.



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Uniform and complete drying of blanks at 70 °C and subsequent cooling to about 30 °C in the continuous dryer.

The extensive tests conducted for Stiwa soon demonstrated that condensation drying at 70 °C was capable of drying their blanks fast, well and completely. Yet, the Austrian company found this temperature still too high for immediate subsequent packaging of their parts. As a remedy to this situation, Harter employed a solution used now and then in other industrial applications – combined drying and cooling.

Combined drying and cooling is achieved by minor modification to the condensation drying system to switch from drying to cooling once drying is completed. As Stiwa had a ventilation system in place, the latter was to be used for cooling of the parts. This solution does not only ensure proper drying but also immediate downstream processing.

Dry and Cool Parts in a Matter of Seven Minutes

Stiwa produces in continuous operation so that the dryer also had to be a continuous type. A maximum of 800 kg of punched out and 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

Heat Pump Based Condensation Drying

Extremely dry and, thus, unsaturated air is passed exactly over or through the parts to be dried taking up humidity in this process. The humidity laden air is subsequently stripped of the humidity it contains by a dehumidification module (Airgenex). The humidity condenses, and the condensate is drained off the system. Then, the cooled air is reheated using the energy recuperated and returned to the drying zone. The circuit is closed. Drying is effected at temperatures which may be varied between 40 °C and 90 °C, as required for the specific application. The drying method may be used for batch or continuous operation.

are cooled to about 30 °C on the next two metres. The ventilation system is used for cooling, as already mentioned.

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. 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. The conveyor frame includes rollers for ease of removal of the conveyor system for cleaning and maintenance purposes. The continuous dryer has a dehumidification module (Airgenex) attached. This module provides and controls the process air for the dryer. The module may be placed separately, even on another floor if required for space restrictions, and is connected to the dryer through plastic tubing. In Stiwa's application, dryer and dehumidification module are placed next to each other.

Energy Efficient and Economical

Harter's heat pump based dryer is very economical by its operating principle. The connected load of Stiwa's dehumidification module is 6 kW. The 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.

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