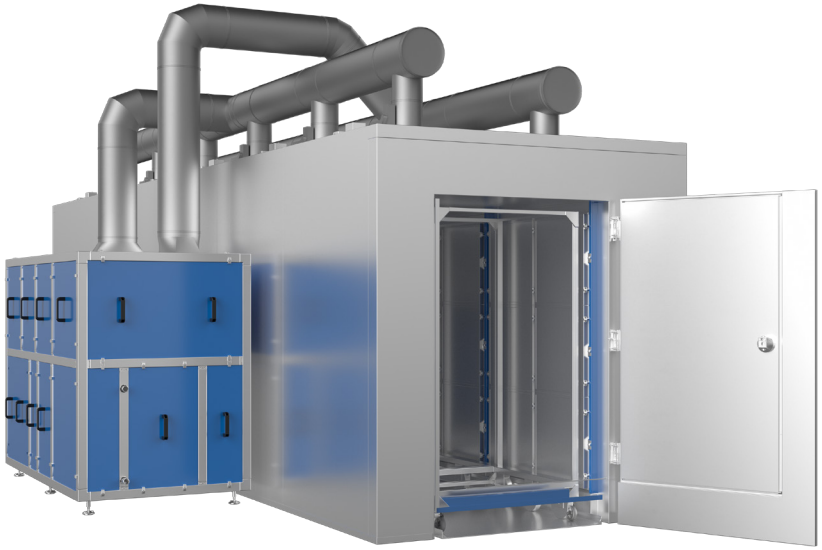
Expanding Capacity with a Heat Pump Dryer

Investing in a new drying system a producer of pet food could increase output, cut energy cost, optimize product quality, and shorten the drying period. Let us look at an alternative dehumidification technology based on the use of a heat pump.



The 8-chamber dryer is designed to process daily batches of about 1,500 kg of sausage meat placed on Intercarne's existing trolleys

Intercarne of Upper Bavaria, Germany, is a producer of special dog food. The company founded in 1985 sells snacks and chews made from 100 percent natural, pluck and grain free raw materials, also organic, on international markets. Intercarne, as so many other manufacturers, used a dryer that did no longer work efficiently enough. The company based at lake Chiemsee also intended to expand their capacity. „We also wanted to find a solution that would allow the continued use of our existing drying trolleys", explains Philipp Hibler, Managing Director of Intercarne GmbH. So, it was time for an up-to-date, energy efficient technology and a versatile drying solution. Hibler found such a solution through an internet search – a heat pump assisted, chamber-type condensation drying system.

Harter of Stiefenhofen, Germany, developed this drying technique more than 30 years ago. Nobody was interested in a heat pump at that time, it was the quality result that mattered. „Today, efficiency and saving of energy are of equal value as meeting the specified residual humidity requirement ", explains Stephan Ortmann of Harter Technical Sales. „Another plus of our heat pump assisted process is that its low drying temperatures have positive effects on the flavour, the ingredients, and the look and feel." Each manufacturer has, of course, their very special requirements.

Tests and Solution

The German drying system manufacturer normally runs tests in their in-house pilot plant station to establish the drying response of the relevant product. The station includes several dryers to determine the relevant parameters. For Intercarne, the tests were conducted using a loan system on site. Upon instruction by an engineer, the dog food producer tested samples of products from horse meat, strips of beef, turkey, venison, or salmon. Depending on their size and properties, some snacks showed a residual humidity below 10 percent after only a few hours, while others – with originally higher humidity – needed 30, 40 or more hours. Another factor is the desired final consistency – soft or rather firm to the bite. This has, of course, an impact on the drying period. The temperatures used for test purposes were between 50 °C and 55 °C. The data obtained from the tests was used to create individual recipes. The recipes are stored in the controller of the drying system built and may be called up by the operator.

The tests are also used to establish the design of the drying system best suited for the product in question. Sensitive products, for example, are often dehumidified on trolleys whereas more robust material may also be dried in barrels. Continuous solutions, such as belt dryers, are rather used for semi or fully automatic processes.

The solution for Intercarne was given from the beginning because they wanted to continue to use their existing drying trolleys. Harter designed and built an 8-chamber dryer to process the manufacturer's 1,500 kg approx. batches of dog snacks. The dryer was sized to exactly accommodate the existing trolleys. The trolleys are manually moved into the drying chambers, the appropriate recipe is selected, and the drying process started. Temperature and humidity sensors pick up the relevant parameters. Once the desired result is obtained, the drying system shuts down automatically. Snacks and chews are then forwarded for further processing.

Managing Director Philipp Hibler inspects dried material for conformity with defined quality features including the defined residual humidity, the desired consistency, and a uniformly dry product.

Heat Pump and Government Subsidy

The core of each Harter dryer is the heat pump technology integrated in the dehumidification module. Where the module is installed depends on the space available on site – directly next to the drying chamber or, alternatively, in another room or on another level. Irrespective of its installation space the module is connected to the drying chamber through insulated piping. Ortmann explains: „The heat pump module conditions the process air and is also responsible for the condensation process." The process air is extremely dry and, thus, unsaturated. It is passed through or over the items to be dried. It perfectly absorbs any humidity present. Subsequently, the air is cooled, and the humidity condenses to form water. The air is reheated and returned to the drying chamber. Drying temperatures are normally between 20 °C and 75 °C. High temperature steps or cooling stations may easily be integrated if desired.

The drying period depends on the desired or required residual humidity to be achieved. For packaged food, where the wet package is to be dried, the drying period is often in the order of minutes to meet the specified cycle time. For direct product drying, the drying period is often longer and as required to obtain the desired residual humidity of the product.

A critical factor for drying to be successful is air routeing because the air, by its very nature, always follows the path of least resistance. The method to force the air onto the desired path is one of Harter's recipes for success. „Special system engineering is our strong suit because every customer has their own product and their own process", says Ortmann. „What counts at the end of the day is that the product is perfectly and uniformly dehumidified and the process is reproducible – and this goal we do achieve."

The power rating of the 8-chamber dryer is only 45 kW. The closed air system contributes to even higher efficiency. Our drying technique was classified by the government as future fit technology in 2017. So, Harter's heat pump systems stand out by their high energy efficiency. „Constant quality, shorter drying periods through optimized air routeing, lower energy consumption - for us, this drying method has fulfilled more than we had desired. Consequently, we ordered another two large size Harter drying systems", summarizes Hibler contentedly.

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Residual humidities below 10 percent were obtained in tests at 50 °C to 55 °C. This corresponded to the desired consistency. Defined temperature limits enable exact dry matter contents to be achieved. Absolute process reliability is thus ensured.