

How Solutions for Heat Pump Dryers are Worked out

Pet food production processes probably include a drying operation. Existing dryers often do not meet present-day requirements mostly in terms of quality and, of course, energy. Existing and also new products are tested in a Test Center with a view to create a suitable drying solution.



Photos: Harter GmbH

10 kg of black soldier fly larvae were tested in this barrel dryer. Extremely dry air was passed horizontally through the barrel. The larvae showed a final 96 percent dry matter content and were uniformly dry. The customer's goal was thus achieved.

Such Test Center is an important location on the premises of drying system manufacturer Harter based in Southern Germany. Fabian Baur is the manager of the Test Center which is equipped with various dryers. The food technologist runs series of tests in the Test Center to determine the drying properties of pet foods. „The Test Center provides a reliable basis for designing customised drying systems which perfectly fit into a manufacturer's existing or new process“, explains Baur.

The drying method used by Harter is the so-called heat pump based condensation drying. Harter developed this drying method more than 30 years ago and has since continually optimised it. Harter has successfully realised more than 2,000 drying systems to date. The family business can thus draw on a wealth of experience. For new projects, feasibility is most often pivotal. Many prospective customers want to replace existing dryers by state-of-the-art ones because their obsolete technology fails to achieve the desired quality. Today, energy and carbon savings are equally important issues, of course. Some examples shall illustrate the day-to-day activities in the Test Center to address all these issues.

Barrel Solution for Insect Larvae

Black soldier fly larvae are a known pet food. In this case, prospective customers arrived from Italy. They were working on developing a new product. Their intention was to extract the protein from the larvae, after drying, and submit the protein to further processing. They specified a low temperature, not precisely defined, and a dry matter content of 96 percent. „We conducted two series of tests at 55 °C and 75 °C, respectively. These tests showed that 10 kg batches of larvae could not be dried in a chamber dryer.“, reports Baur. So, the Test Center Manager ran further tests, first in a continuous dryer and then in two different barrel dryers. The barrels varied in material and air routing. Baur: „Ultimately, we achieved very good results in a closed barrel with horizontal air routing.“ The larvae did not clump together and were uniformly and thoroughly dry.

The barrel rotates during drying. Barrel rotation is defined for each specific application. For the larvae tests, a final 8 rpm was used. Such slow rotation is gentle to the product. Compared with chamber drying, mixing the larvae in a barrel makes it much easier to achieve exactly 96 percent dry matter content. The dried larvae are currently in the lab to be tested for the next process operation, namely extraction.



*Stephan Ortmann
Technical Sales at Harter drying solutions*

Dog Snacks in the Chamber Dryer

A manufacturer has already one dryer in use. The dryer is gas operated, so it consumes a lot of energy. It also takes in fresh ambient air and releases exhaust air to the environment. This situation is a burden, both financially and in several other respects. Now, the intention is to find a new and up-to-date solution. For the tests, the dog snack manufacturer brought refrigerated sausage meat for two products and their own equipment. Using this equipment, the customer manually extruded the meat in the Test Center. It was essential to perform this process locally because otherwise the consistency of the extrudate would have changed during transport to Harter. Such preliminary operations in the Test Center appear to be reasonable in order to arrive at drying results as close to reality as possible.

The customer also carried two existing product samples. The meat dried using a heat pump was expected to have exactly the same quality as the samples. All tests of the two products were performed in a chamber dryer. The extruded snacks were placed on stainless steel trays for drying. In the end, the ideal drying temperature turned out to be 40 °C. After drying for 14 or 48 hours, as required for the individual product, the dog snacks had the consistency and the look and feel desired by the customer.

The dryer intended for use by the snack manufacturer will be a chamber dryer featuring a single large chamber with 11 rack spaces. This will allow them to dry their daily quantity of 3,210 kg. The rated power of the chamber dryer is 27 kW in production operation. Besides high quality and energy savings, heat pump based drying has another benefit - the process uses a closed air circuit. This means that it does not need any fresh air and does not produce any exhaust air. The snack manufacturer is therefore independent of the climate and the seasons. There is also no more unpleasant odour.

Seaweed: Sustainability and Upcycling

A Scandinavian company processes seaweed and sells it to the cosmetics and pharmaceutical industry. The main product is the stalk. The leaves used to be waste products. As the manufacturer is concerned about sustainability they have developed an upcycling solution for the leaves. For this purpose, they got Harter on board. „Being innovation-minded we are the right partner for such a project“, states Baur. The Scandinavian business hit on the idea to dry the weed leaves. The leaves will also undergo some kind of extraction after drying but the visitors stayed tight-lipped about this process. The only information Harter got was that the leaves are very rich in mineral nutrients intended for use in pet food.

Baur reports that the project was extremely interesting in terms of engineering. The solution finally envisaged is absolutely customised and very special. But let's take on thing at a time.

Extruded sausage meat for dog snacks was tested at various temperatures. 40 °C turned out to produce the best results. Drying in a closed air circuit has positive effects on the consistency, appearance, taste and aroma of any kind of food.



Photos: Harter GmbH



A total of 600 kg of seaweed leaves were dried in tests that took several days. The leaves are slick and slimy which prevents the passage of air through them. Therefore, only drying in single layer was possible. The chamber dryer could not be used because the customer wanted a continuous drying process. Tests in the belt dryer were performed at 75 °C. The leaves, however, tended to stick to the stainless steel belt of the dryer. „So, we retrofitted the dryer with a plastic belt which demonstrated to be the solution for this issue“, says Baur. The leaves showed the desired dry matter content after two hours of drying. Each single test provides for some optimisation, small or large. So, Baur could dry more material with each drying pass and ultimately raise the throughput by 40 percent.

The solution devised by Harter is a five belt dryer with some sophisticated features. The upper three belts have leaves placed on them at the same time. The weeds are dried in single layer on these belts. All leaves initially dried on these three belts fall onto belt #4 for finish drying at a certain bulk height. The bulk material is slowly conveyed on belt #4 and #5. This way, Harter can reduce the space required by the dryer, which is highly welcome to the seaweed specialist.

Benefits and Bonus

In conclusion it can be said that heat pump based condensation drying is extremely efficient and energy saving. Low temperatures are easy on the products. The closed air system is exhaust air free. Years ago, Harter dryers were classified future fit technology eligible for government subsidy in Germany, Austria and Switzerland. High savings of energy and carbon make heat pump assisted drying a technology attractive under environmental, quality and economic aspects. „And the Test Center is the ideal opportunity to put all this to the test“, says Baur in conclusion. 🐾

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A Scandinavian business wants to upcycle seaweed leaves formerly put to waste for use in pet food. This requires drying of the material which is highly resistant to the passage of air. A plastic belt finally did the trick.

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