

Innovative Drying Yields New Products

Energy Efficient Heat Pump Dryer an Ideas Provider

A gentle and likewise energy efficient drying technique has also found successful applications in the food sector in recent years. Benefits for operators of such drying systems include the retention of aromas, vitamins, and other ingredients in as well as an appealing appearance of the dried food. Government subsidy has meanwhile become available for using this heat pump based, low temperature drying technique.

The German drying system manufacturer Harter developed the so-called heat pump based condensation drying technique more than 30 years ago and has installed more than 2,000 dryers in various industrial sectors ever since. Food producers have also discovered the benefits of such systems. Harter has successfully realised many human and pet food projects.

The big success of this low temperature drying technique is based on its physically alternative approach. Drying is accomplished using extremely dry and, thus, unsaturated air passed over or through the items to be dried. Such air perfectly absorbs any humidity present. Subsequently, the humid air is cooled – the humidity condenses to form water – reheated and returned to the drying chamber. For drying to be successful, air routing is critical. The air must be routed precisely to obtain a good and uniform result. The drying temperature may be varied between

20 °C and 75 °C, as required for the specific product or process. If sterilisation is desired, Harter will add an optional 110 °C high temperature stage. Likewise, a cooling stage may be added if required for the specific process. The drying time depends on the residual humidity desired or required. For packaged food, where the wet package needs to be dried, drying time is often accomplished at a minute's pace to meet the specified cycle time. For direct food drying, the drying time is often longer and as needed to obtain the desired residual humidity of the product.

Product Novelty Date Flour

Date palms are one of humanity's oldest cultivated plants. Their fruits, which are rich in healthy ingredients, are truly venerated in North Africa and the Middle East. The many minerals and vitamins contained in dates are real energy boosters. And their high sugar content does not only make them a treat



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but also provides prolonged keepability. So, basically, dates do not require drying unless there is a special purpose for doing so. This was the case for Al Foah of Abu Dhabi, a regionally well-known producer of date products. They process the "desert bread" – another name for dates – to produce snacks, bars, spreads, sirup and the like. Their new idea was to make flour from dates. Since natural drying would have taken too much time, investment in a drying system appeared reasonable.

For Al Foah, Harter built a H03 chamber dryer featuring three chambers in a row. The system includes three trolleys holding 40 baskets each. Dates are filled in these baskets about 70 mm high. The humidity content in the dates is about 15 percent before and 5 percent or lower after drying. The dates are dried at about 60 °C for 24 hours. The power rating of the whole system in production operation is about 23 kWh.

From Horseradish Byproduct to Medication

A likewise old companion of humankind is horseradish. It was used as an immune system booster and an aphrodisiac as far back as in ancient Egypt. Horseradish root is not only used to give spice to dishes but is also an active agent in many naturopathic applications. The essential oils in horseradish root promote the function of the gastro-intestinal system and antagonise many kinds of harmful substances in the body. Growing horseradish entails the laborious removal of head and lateral shoots. These shoots have properties which make processing an onerous task.



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Fig. 1: 1,000 kg of dates are gently dried at 60 °C. The "desert bread" is then processed to obtain date flour.



Fig. 2: Horseradish lateral shoots are upgraded by drying and then sold to the pharmaceutical industry.

The renowned company SCHAMEL MEERRETTICH has turned towards another use of the lateral shoots – they dry the shoots and then sell them to the pharmaceutical industry. Horseradish root is combined with nasturtium to make an herbal medicament against coughs and sneezes. For SCHAMEL, the ideal solution was a barrel dryer. The barrel is filled with 250 kg of horseradish shoots to dwell in the drying chamber for 23 hours. The horseradish shoots are dried to a residual humidity of five percent at a temperature of 55 °C. The barrel is slowly turned once per hour during the drying process. The lateral shoots of largely varying geometry are uniformly dry upon completion of the drying process. The rated power of the drying system in production operation is about 15 kW.

Wheat Flakes for Veggie Burgers

A third project is a two-stage belt dryer used in the production process of a meat analogue product. A major German milling company, which manufactures various kinds of grain mill products, produces special flakes from wheat. They have a meat-like texture and are perfectly suited to be processed to make patties for vegetarian and vegan burgers. The flakes are made by washing the proteins out of the wheat and extruding the resulting mass. Subsequently, the extrudate must be dried.

Owing to the very special drying properties of the wheat extruda-

te, a continuous drying system turned out to be the ideal solution. The system is complemented by a chute for feeding the extrudate on the conveyor and an outlet hopper for discharging it upon completion of the process. 2,000 kg/h maximum of wheat flakes placed about 120 mm high on the conveyor run through the dryer. First, the material is sterilised at 90 °C for about one minute. Subsequently, the flakes are dried at 70 °C for another 10 minutes. The specified post-drying residual humidity is 10 to 12 percent.

Extruding causes very much steam. This waste steam is very rich in humidity. It used to be emitted into the environment. As drying takes place in a closed system, the company decided to invest in a second drying system for waste steam dehumidification.

Exhaust-Air-Free and Eligible for Government Subsidy

Harter's system is fully self-contained energetically. It goes without saying that this has a very positive effect on the appearance, ingredients and flavour of the material being dried, if important. The exact impact on the specific product is assessed by drying tests run in Harter's in-house pilot plant station. This way, the prospective user will get a pretty good idea of the potential of condensation drying for their product. This procedure provides a solid basis for determining all process parameters and for the later design of the dryer. If their product in non-transportable the prospective

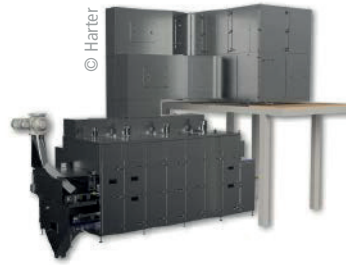


Fig. 3: Protein-free wheat extrudate is processed to make vegetarian patties. This requires uniform drying including sterilisation in a belt drying system.

buyer may obtain a drying system on loan to run tests at their site. Exhaust-air-free drying in an air-wise self-contained system, however, implies even more benefits. Users will appreciate the freedom from any impact of the climate or the seasons. Also, production areas will not be affected by humidity and exhaust air emitted by the dryer. Humans, materials, and machinery are all spared from such adverse effects.

Moreover, the heat pump integrated in each dryer is so efficient that Harter dryers were classified as future technology eligible for subsidy by the German, Austrian and Swiss governments in 2017. So, operators get high drying quality with high energy efficiency plus subsidy by the government.

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