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ENERGY-SAVING DRYING
WITHOUT EXHAUST AIR

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Chamber Dryer by Harter Helpful in Drying Vanilla Pods

There are a good many reasons for investing in a new drying system. Some introduce new products or processes and need assistance by a technology partner. Some others have worn-out ovens. The focus is often on quality improvement, and presently also on reduced energy consumption. A renowned vanilla trader wanted to have an optimal and energy efficient drying solution that would resolve their exhaust air issue and the resulting smell pollution as well.

The "black flower", as vanilla was once named, originally grew in Mexico. Europeans brought the coveted spice to Spain where it was first consumed only by the rich. Seedlings were illegally spread all over Europe, to Indonesia, Madagascar, and the Île Bourbon, what is now La Réunion. The global cultivation of this tasty orchid started and vanilla found its way into all social classes.

The above mentioned spice trader is Aust & Hachmann of Hamburg, Germany, one of the world's most traditional vanilla traders. For more than 140 years, the family company has been importing vanilla pods from various growing areas of the world. The two company founders, Hermann Aust and Rudolph Hachmann, gained enormous expertise of the plant, the spice, and how to best process it. And they passed their expertise to the generations that followed. This became the basis of the company's on-going success. Whole pods, cut, ground, powdered – Aust & Hachmann have always

supplied vanilla in various forms to their customers.

Tests for Successful Drying

Aust & Hachmann had used an exhaust air dryer for their cut vanilla pods. The dryer had got long in the tooth, did no longer provide the desired quality, and required way too much energy. A major problem, however, was the air vented by the dryer. Although vanilla is a very popular and fragrant spice in many dishes its persistent smell in the ambient air is indeed a pollutant. This is why freedom from exhaust air was a requirement for the new dryer on top of the quality and efficiency expected.

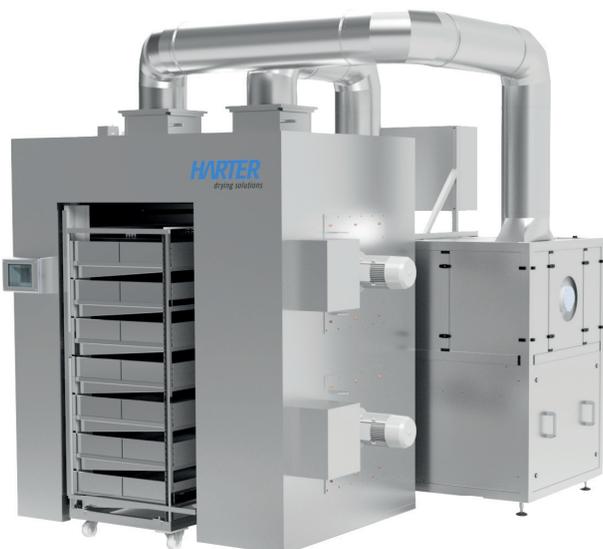
Director Goran Hachmann found drying system manufacturer Harter through an internet search. The German drying system manufacturer had launched an energy efficient and emission-free low temperature technique on the market more than 30 years ago: heat pump based condensation drying.

Harter usually offers prospective customers to have their products tested in Harter's in-house pilot plant station to see if they may be dried satisfactorily and to determine the parameters for best drying results. "For us, it was important to do our own testing in a laboratory system and to process our own vanilla" says Hachmann. "During the series of tests conducted it became quickly clear to us that this drying method would meet all our requirements." This opened the way for investment.

Multi-purpose Chamber Dryer

The dryer built for Aust & Hachmann was a chamber type with a multifunctional trolley. Both dryer and trolley are made from 1.4301 stainless steel and meet hygienic design requirements. The drying chamber has an in-built air recirculation system with two special process air fans. They can be infinitely controlled by a frequency converter. An electric heater battery boosts the initial drying process heating the process

An exhaust-air-free chamber dryer with an integrated heat pump ensures highly efficient drying of vanilla pods.



Vanilla chunks in fill heights of about 150 mm are uniformly dried at 75 °C.



The multifunctional trolley may be loaded with pans and trays providing maximum flexibility to the operator.

air, and shuts off automatically later. Sensors installed at the entry and exit ends of the dryer are used to measure the temperature and humidity of the air. The system is controlled through an HMI panel in the control cabinet of the chamber dryer. The rated power of the drying system in production operation is about 15 kW.

One of the special features of this system is the multifunctional trolley. Stephan Ortmann of Harter Technical Sales explains: "Our trolley may be loaded with pans and trays of various sizes. It may thus be used for many applications and products. This provides extreme flexibility to the operators." Aust & Hachmann uses pans, only, for their purposes. A trolley of this size accommodates 14 pans. An employee fills in cut vanilla pods to a height of about 150 mm. The size of the chunks varies between 3 and 11 mm.

500 kg max. of the capsule fruits (which is the correct botanical term) are dried per batch. The as-dried weight is about 350 kg. The drying temperature may be infinitely controlled between 40 °C and 75 °C. The Hamburg based company pres-

ently uses 75 °C for drying. For sterilization, the vanilla chunks are heated to 110 °C for a short period. The residual humidity of the vanilla chunks after drying is less than 10 percent. The bulk material is evenly dehumidified to become uniformly dry. Using these parameters the quality requirements of Aust & Hachmann were fully met.

No More Smell Pollution

As for the critical exhaust air issue, Harter has a ready-to-hand solution because all their systems are exhaust-air-free by design. Drying takes place in a closed air system so that there is no interchange with the ambient air. This has many benefits. For one thing, smell emission is finally off the table for the vanilla trader, who is located in the centre of Hamburg. For another thing, the closed air circuit raises the efficiency of the heat pump system, which is high anyway. Moreover, the closed energy system makes operators independent of the climate and seasonal variations in temperature and humidity. It does not matter any longer if Hamburg's air is wet from rain or extremely dry from bitter cold. The drying technique has also positive effects on the appearance, taste, and ingredients of the food. And the well-being of the employees.

The closed system, which is characteristic of Harter's heat pump based condensation dryers, always consists of a drying chamber and a heat pump module. These two components are either part of one assembly or connected through insulated piping. Chamber and module may also be placed at different levels or in different rooms if space is restricted. The design of the system depends on the application, the product, the process, and the space available.

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Comprehensive view of Aust & Hachmann drying parameters

The drying chamber accommodates the items to be dried. The heat pump module conditions the required process air and is also responsible for the condensation process. In decades of business activity, Harter has established themselves as creator of ideas and problem solver in many industrial sectors. “Many of our customers have great problems with their drying systems. At the process planning stage, they assume that drying will simply work out. This is not, however, what it actually does.” reports Ortmann. The German drying system manufacturer hears daily reports of prospective customers saying their poorly working drying system undermines their whole production process. Yet, what exactly is the basis for the great success of this alternative technology?

Success is in the Air

Harter uses a physically alternative approach for their highly efficient technique – extremely dry air for dehumidification. The air is passed over or through the items to be dried. Being unsaturated the air readily absorbs any humidity present. It is then cooled in two steps in the heat pump module. The humidity in the air condenses and the condensate is drained off the system. Subsequently, the air is reheated in two steps and returned to the drying chamber in the closed air circuit. Dry air alone, however, does not produce good drying results.

Air routeing is critical to obtain reliable and uniform drying. Air, by its nature, follows the path of least resistance. So, it is important to direct the unsaturated air to exactly pass over or through the items to be dried. “We have acquired much know-how [of air routeing] over the years,” says Ortmann, „and this is applied fully in Aust & Hachmann’s project.“ Harter developed a special air routeing system for drying the bulk material in pans. It ensures that the air is passed, in a precise and uniform way, through the pans and the vanilla chunks – and off again. The spice chunks can thus be uniformly dried. Ortmann explains: „Such great technical success is only possible by perfectly matching air dehumidification with air routeing.“



Stephan Ortmann, Harter Technical Sales

where the wet package needs to be dried, the drying time is often restricted to a few minutes to meet the specified process cycle time. For direct food drying, the drying time may often be longer and as needed to meet other requirements such as consistency, appearance, and aroma.

Energy Efficiency and Government Subsidy

This heat pump based drying technique ensures that food may not only be dehumidified with little energy input but also at low temperatures. The drying temperature may be varied between 20 °C and 75 °C as required for the specific product or process. Temperature equalization or cooling may be integrated easily. The drying period depends on the desired or required degree of residual humidity. For packaged food,

Harter systems were classified sustainable technology eligible for government subsidy some years ago. Customers in Germany, Austria and Switzerland investing in low carbon and low energy heat pump technology may thus obtain government grants. The Hamburg based traditional company also enjoyed a 30 percent subsidy for using efficient heat pump technology.

Hachmann’s contented summary is: “This is the optimal drying method for us. Our vanilla is dried in a gentle and uniform way. Today, we have a state-of-the-art dryer, without exhaust air and with constant process quality. And the government subsidy was the icing on this project.”

For more information:
www.harter-gmbh.de

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