

Energy Efficient, Heat Pump Assisted Condensation Dryer

Gentle Drying of Insects for Food

Harter's heat pump assisted condensation dryers stand out for their high energy efficiency and gentle operation. This prompted a startup to buy a chamber type system. The items to be dried are insects for food.

Drying is one of the processes required to produce snacks, spreads, or other products from edible insects. A North German startup company was looking for a system to ensure adequate drying

Ingredients to be Preserved

Drying must be gentle to preserve the precious ingredients of the insects. Another critical factor for investment is, of course, low energy consumption. The new business found these two requirements fulfilled by the heat pump assisted condensation dryers developed by Harter. Condensation drying is both efficient and energy-saving through the integrated heat pump technology. The

Harter technology is also capable of dehumidifying at low temperatures, which has many benefits for the operator. For food, gentle drying is certainly the primary goal. Appearance, aroma, and the preservation of the ingredients are also important. And the technology must be capable of drying the required quantity completely and uniformly.

Single or Multiple Belt Dryer

There are several types of heat pump assisted condensation systems for drying bulk material. Among them is a continuous belt type. The choice of a single or multiple belt design is determined by the production

situation. Harter systems including heat pump technology – the heart of each condensation dryer – are very versatile and may be integrated in any process.

Drying in a Barrel

Condensation drying in a barrel is another possible system variant. It may be used for drying smaller quantities in manual operation. This means, an operator moves the barrel into the drying chamber. For semi-automated or fully automated solutions, the barrel is a component complemented by appropriate conveying means. Such solutions are used for higher or repeated quantities.

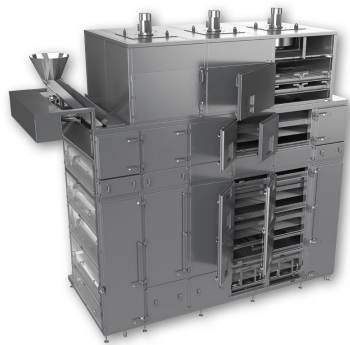


Robert Lefmann – stock.adobe.com

Edible insects – including the house crickets and mealworms above – progressively enter the European diet



CHAMBER DRYER



BELT DRYER



BARREL DRYER

Photo: Harter

Various types of heat pump assisted condensation dryers are available for drying bulk material such as insects for food

Barrel drying is effected sometimes in static mode, more often in minimum intermittent movement mode. The exact movement parameters are critical and are determined in drying tests. Owing to the intermittent movement involved, barrel condensation drying is suited for less sensitive products, e. g. products subjected to subsequent grounding.

Chamber Dryer with Modular Extension Potential

Chamber dryers with trolleys are also frequently used. They are particularly suited for manufacturers processing dissimilar products. Harter developed a batch dryer with a multifunctional trolley. The latter may be loaded with pans of various sizes and heights, and with trays. The trolley offers the operator an opportunity to dry their items either in bulk or in single layer. The chamber dryer is versatile in that it may be extended by additional modules to increase the overall capacity of the system. Chamber drying is always effected in static mode. The startup company chose a chamber dryer. It can dry insect batches of 370 kg to a residual humidity of 5 percent for further processing. The insects to be dried are normally mixtures of crickets, larvae, and mealworms. Sometimes, batches of a single species are dried. The condensation dryer and the trolley are made from 1.4301 stainless steel, and they comply with hygienic design regulations. The drying chamber features an integrated air recirculation system with two special process air fans. They are infinitely controlled by a frequency converter. An electric heater battery boosts the initial drying process heating the process 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. With a rated power of only 12 kW this dryer is highly energy efficient.

Dry Air for Dehumidification

The products – in this case insects – are dehumidified using extremely dry air. Such air, by its physical nature, removes humidity from the items to be dried. The humid air 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. Air routing is critical for the efficiency and the success of the drying process. A special air routing system forces the air to exactly pass over or through the items to be dried. Upon completion of the process, insects dried in a gentle and energy-efficient way leave the heat pump assisted chamber dryer. The drying temperature may be selected within the limits of 20 °C to 75 °C as appropriate for the specific product or process. The drying period depends on the desired residual humidity. Temperature equalisation or cooling zones may easily be integrated.

No Exhaust Air

All Harter condensation dryers do not produce any exhaust air. Drying takes place in a closed air system so that there is no interchange with the ambient air. This further raises the already high efficiency of the heat pump system, and makes the system independent of seasonal variations in temperature and humidity. Harter heat



Photo: Harter

The optimal parameters for drying edible insects were determined in Harter's pilot plant station

pump assisted condensation dryers are classified as future fit technology eligible for government subsidy. German, Austrian, and Swiss companies investing in this carbon and energy-saving technology may obtain such subsidy.

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