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Cannabis buds are an important raw product for the pharmaceutical industry. Their importance will grow with the partial legalisation of cannabis products.

PROFI-GUIDE	Industry	Pharma	● ● ● ●	ENTSCHEIDER - FACTS	For Operators	<ul style="list-style-type: none"> ● Sensitive products such as cannabis buds require a gentle drying process to achieve a very high product quality. ● Heat pump based condensation drying is a technology capable of drying at low temperatures and still within short time. ● The tray dryer solution presented below was customised for a producer of cannabis buds. It reduced the drying time significantly while raising production throughput and product quality.
		Food	● ● ● ●			
		Cosmetics	● ● ● ●			
	Function	Chemical	● ● ● ●			
		Planner	● ● ● ●			
		Operator	● ● ● ●			
		Buyer	● ● ● ●			
		Manager	● ● ● ●			
			● ● ● ●			
			● ● ● ●			

Gentle Drying of Cannabis Buds

Dry on the Cannabis Market

Germany has legalised the use of cannabis for medical purposes on prescription, effective from March 2017. The buds of the cannabis plant have been an important product before - for example to produce the non-psychoactive cannabidiol (CBD). CBD, a cannabinoid derived from the female cannabis plant, suppresses spasms, staves off inflammation and curbs anxiety. The substance is predominantly used in medicine. Potential beneficial effects on cancer are being researched. The pharmaceutical industry, however, is not the only purchaser of the liquid extract. The cosmetics industry also uses CBD, for example in creams for certain skin diseases.

cannabis plant to produce pharmaceuticals, cosmetics and food products. The Swiss enterprise has bred and crossbred 70 varieties of cannabis for these purposes to date. The cannabis plants grow in special indoor gardens. Specific lighting and humidity provide the best environment for plant growth.

Condensation Drying with a Heat Pump

To meet the high quality and technology standards of the industry and to optimise the production and processing methods director Daniele Schibano had a close look at the drying process. It was the drying of cannabis buds which appeared to provide the highest potential for optimisation. Once harvested, the valuable cannabis buds were stored in a drying room at that time. Warm air was passed through this room with the airflow not subject to controlled routing. Besides negative effects on taste and

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The Swiss Ai Fame, as GMP certified company, has been in the business of growing, breeding, producing and further processing of cannabis plants since 2000. Their customers use individual components of or substances extracted from the



Stacked for drying - Three drying modules accommodate four trolleys with ten trays of cannabis buds each.

ingredients of the cannabis buds, the drying time of almost one whole week appeared much too long. And the exhaust system consumed a lot of energy at that.

A business partner of Ai Fame recommended to contact the South German drying system manufacturer Harter. Harter's alternative „heat pump based condensation drying“ method combines seemingly conflicting features such as low temperatures and short drying times. The Allgöian company with roots in the surface finishing field has optimised its technology for pharmaceutical applications following rising inquiries by this industry. Today, Harter manufactures drying systems in conformance with GMP requirements, and also systems meeting hygienic design standards. „Once I learned about and understood Harter's technology, I instantly knew that this was the perfect answer to our requirement“, says Schibano.

As a standard procedure, the first thing to do is subject the customer's product to be dried to drying tests in Harter's in-house pilot plant station - a service offered by the drying system manufacturer. The purpose of these tests is to determine the product specific drying parameters such as temperature, time, humidity, air speed and airflow rate. The tests form the basis for system layout and design and have proved to be a reasonable approach for this effort. This standard procedure, however, was abandoned in the case of Ai Fame. Director Schibano wanted to skip the tests because of the high pecuniary value of the cannabis buds. His conviction that this me-

thod of drying is ideal for cannabis buds turned out to be right, even without previous testing.

Gentle Drying at Low Temperature

The heat pump based condensation drying system is flexible. It may be used for any type of process. Ai Fame chose to use batch drying for optimum integration into



Employees harvesting sensitive cannabis buds.



Courtesy of Harter

Heat pump based condensation drying - Airgenex controlled air routing ensures fast and gentle drying inside the tray dryer.

its operating procedure. Harter responded by building a hygienically designed stainless steel tray dryer. Its drying chamber consists of three modules with a floor space the size of a standard European pallet each. The tray dryer was designed to hold the existing harvest trays, as desired by the customer, and is 3,900 mm long, 2,150 mm wide and 2,340 mm high.

The drying process is as follows. 600 mm long, 400 mm wide trays are manually loaded with cannabis buds. Ten trays each are stacked on a trolley. Each drying module can hold four trolleys. Thus, twelve stacks totalling 120 trays can be loaded into the dryer. The drying system can process full or partial loads to accommodate various batch sizes. The buds dwell in the tray dryer at a temperature below 30 °C for 24 hours to become completely and gently dried.

Drying with Optional Rehumidification

The water extraction rate is 32 l/h. The three dryer modules include two speed controlled, 2.3 kW max. rated process air fans each. The fans produce an airflow rate totalling 42,000 m³/h approx. The complete process air passes a class F9 filter with an efficiency of 95 percent relating to 0.4 micron sized particles. The drying system includes a so-called Airgenex Food Dehumidification Module. It controls the air dehumidification and the entire environmental conditions inside the drying chamber. The average power rating of the whole system with the parameters set is between 15 and 18 kW. The tray dryer is programmable logic controlled. The PLC is used to select the drying recipe for the specific batch with individual settings of the process parameters temperature, time, humidity, airflow rate and air speed.

If buds are not subjected to extraction but rather sold as-dried the situation is different. With a residual water content of no more than 8 percent the buds would just begin to crumble upon transport. To prevent this the drying system includes a special rehumidification unit which may be activated as required. When in operation, the unit will slightly rehumidify the surface of the through-dried buds. The rehumidification process is selected such that the buds will not deteriorate while on their, sometimes long, way to their destination.

Dry Air in the Right Place

But what exactly is special about this drying process? Heat pump based condensation drying systems with its variants Airgenex Med and Airgenex Food use an alternative physical approach. Extremely dry and, thus, unsaturated air is passed over the items to be dried absorbing moisture in this process. The air is stripped of the humidity it carries. The humidity is condensed and drained off the system. Subsequently, the cooled air is reheated and returned to be passed over the items to be dried again. The drying process is always a closed circuit and, thus, independent of the environmental conditions. Production and clean room environments are not affected. The system is capable of drying products made from plastics, glass or metal, or organic products such as food or feed. Drying is accomplished in a gentle and, thus, stress-free manner at low temperatures between 20°C and 90°C, as required for the specific application.

Besides efficient air dehumidification, there is another factor which is essential for successful drying. For condensation drying to be fully effective, air routing is critical. The drying chamber includes an air recirculation system customised for the specific product. Air, by its very nature, follows the path of least resistance. So, it takes a lot of know-how to force it to follow the right path. It is the perfect combination of de-humidification technology, air routing, air speed and airflow rate that ensures best condensation drying results for the specific product. With little modification, condensation drying systems may also provide cooling if desired or required for the applicable process.

Less Power Consumption, More Throughput

In summary, the cannabis bud producer is satisfied with this drying solution. He sees this technology as a first in this field. Besides the fact that drying is fast and gentle, his products now have much better quality in terms of bioactivity, aroma and ingredients. The power saved is a welcome side effect. And there may be another bonus: Existing 190 mm high trays are only filled to half their height because higher fill levels would weigh down the sensitive buds enough to become deteriorated. As the trays are well ventilated, the use of lower trays with the same loads is being considered. This would increase throughput by up to 100 percent. ●

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