HOSOKAWA MICRON

Freeze drying Technology

Active Freeze Dryers

Freeze drying (lyophilisation) has been used industrially for decades to preserve foodstuffs and organic materials. However, traditional tray-type freeze dryers have proven to be slow and labour intensive. The Hosokawa Active Freeze Dryer eliminates these drawbacks and is a big step forward in the field of freeze drying bulk solids as well as in powder technology in general.

Active Freeze Drying offers unique possibilities for turning a variety of materials into a fine loose powder in just one single step. Material consistencies include:

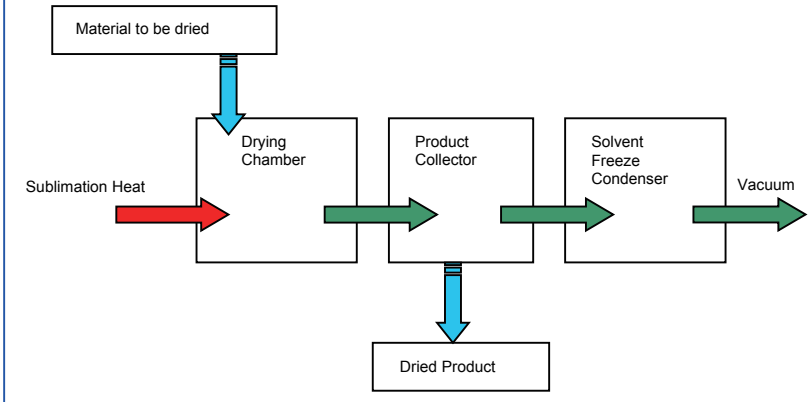
- Solutions
- Dispersions
- Pastes
- Wet solids

Efficiency, minimal handling and product quality are the key benefits of this new, unique technology. Typical applications include pharmaceuticals like antibiotics, proteins, collagens, API's and electrolytes. Numerous successful applications are also found in food and food additive applications like herbal extracts, milk derivatives, enzymes, broth extracts, vegetables, lipids, insects, flavours, fibres, proteins and soups. This new technology has also proven its suitability to the freeze drying of special materials like nanomaterials, polymers, ceramics, pigments, fillers, lime stone, catalysts, glass powder and salts.

Working Principle

In an Active Freeze Dryer, the product is first frozen dynamically in a specially-designed chamber. Whether the material to be dried starts off as a liquid, granular solid or paste, the movement inside the drying chamber ensures that it freezes quickly in the form of free-flowing solid granules. Once the product is fully frozen, a deep vacuum is applied and the sublimation starts. Heat applied to the vessel jacket is effectively distributed throughout the product due to the dynamic environment. The initially coarse, frozen granules gradually shrink as the ice structure connecting the frozen material sublimes, yielding a loose powder consisting of fine, dry particles.

As the solvent disappears, the product temperature starts to rise until it equals the jacket temperature. This marks the end of the drying process. Once the vacuum has been released, the chamber is opened and the powdered product can be discharged.





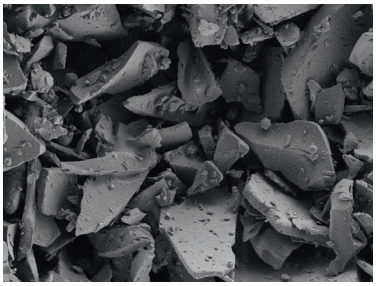
Key features

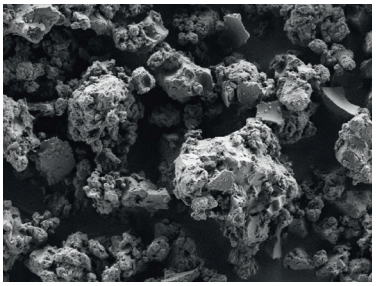
Efficient and contamination-free

The Active Freeze Drying process is faster and less labour intensive than the traditional tray freeze drying process. This new process produces lump free, free-flowing powders in one single step. Consequently, the handling is significantly shorter and simpler, and perhaps more importantly: there is hardly any room for contamination which is ideal for sterile materials.

High Quality

Due to this alternative and much faster method of freezing the substrate, the structure of the end product is different and in the majority of cases, will result in an amorphous-like structure with better redispersibility and free-flowing properties. In addition to this, the particle size of the final product is often extremely fine and uniform.


API in tray dryer


Same API in Active Freeze Dryer

Compact

The Active Freeze Dryer is a compact piece of equipment that requires much less floor space than conventional tray drying installations which usually comprise of horizontal vessels, freezer and tray handling machinery. Hosokawa Micron has converted all of this into a single vertical dryer.

Faster

High product quality

Less labor-intensive

Free-flowing powder

Simple

Efficient

Models & specifications

Our Active Freeze Dryers are available with vessels of 1 up to 1,000 litres. The basic characteristics of 7 different models are specified below.

Model	AFD-	1	5	60	120	500	800	1000
Water filling capacity	(ℓ)	1	5	60	120	500	800	1000
Max. net product volume*	(ℓ)	0.7	3.5	45	85	370	600	750
Jacket surface area	(m^2)	0.06	0.13	0.69	1.02	2.84	3.93	4.58
Max. sublimation capacity at p=0.1 mbar	(kg/h)	0.2	0.5	2.6	3.9	10.4	15	17.6
Max. sublimation capacity at p=0.2 mbar	(kg/h)	0.1	0.3	1.7	2.6	7.2	9.9	11.4

* : Depends on material

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