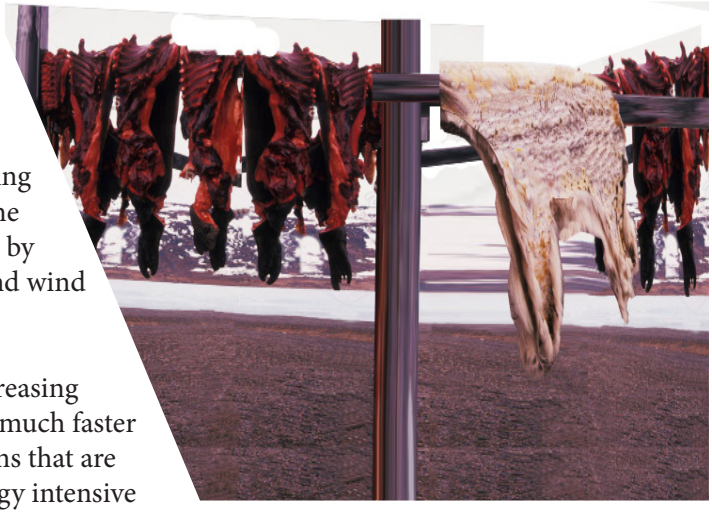
MinESS®

Heat Pump Container Drying

Isı Pompalı Konteyner Kurutucu

Drying Process

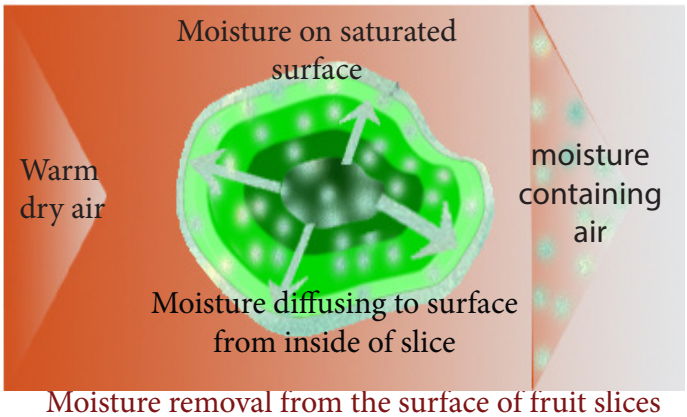


Drying is the world's oldest method of preserving food, processing building materials, making pigments and drying animal skins. In the last few centuries, people had used the smoke from the fire to dry meat, herbs, vegetables or fish by circulating hot air. Drying in the open air with the sun and wind has been practiced since ancient times to preserve food.

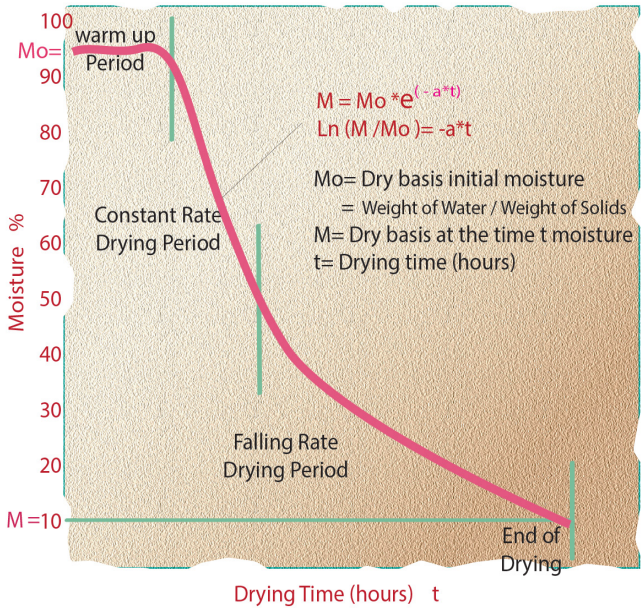
In addition to traditional drying,in order to meet the increasing needs with the population, the drying processes must be much faster and healthier. Nowadays, drying is done in hygienic rooms that are free from dust, insects and similar pollution. It is an energy intensive process.

We focus on developing high quality innovative heat pumps for drying technology that are tailored to consumer needs, are more environmentally friendly, use energy more efficiently, generate less waste and emit fewer greenhouse gases.

Our innovative heat pumps can save more than 70 percent energy compared to conventional dryers and precisely control and optimize the drying process in order to produce a high-quality product with maximum nutrient retention and taste as well as microbial safety



Moisture removal from the surface of fruit slices during drying



The drying takes place principally through two mechanisms: the movement of humidity from the interior of a material to the outside -called diffusion- and the evaporation of humidity from the hot surface of a material to the surrounding.

The drying process depends on how quickly the moisture can diffuse to the surface. The figure shows the moisture content of a material against the drying time.

The straight line in the graph indicates that water is being removed at a constant rate. As soon as the moisture on the surface is depleted and no more water can diffuse to the surface, the drying process runs with a falling moisture rate.

Our innovative heat pump dryers can automatically adjust the temperature and humidity exactly according to its curve.

If the dryer cannot adjust its temperature and humidity according to the curve, the hot air creates a hard dry layer- "case hardening" - on the outside of the material . This layer is much like a skin that can trap moisture inside the slices and causes the following problems;

1. It reduces the efficiency of the drying process ,
2. The moisture remaining inside causes mold to grow on the product. Of course, every growth of mold makes the product unsaleable and no longer edible.

3. One of the primary functions of food is to provide nutrients to the body. .These include vitamins that are sensitive to temperature. When subjected to excessively high temperatures the beneficial properties of these components are either completely destroyed or substantially reduced.
4. Products can become brittle and literally crumble into small pieces instead of retaining their original desired structure.
5. Taste and aroma are often lost when they are driven off by the heat or oxidized by chemical reactions with oxygen in the heated air.

The key advantages of heat pump dryers

1. A wide range of drying temperatures,

Standart Type from 20 °C to 70°C;
High Temperature Type from 40 °C to 85°C;
Extra High Temperature Type from 60 °C to 110°C

2. Excellent control of the drying environment for high-value products and reduced energy consumption;

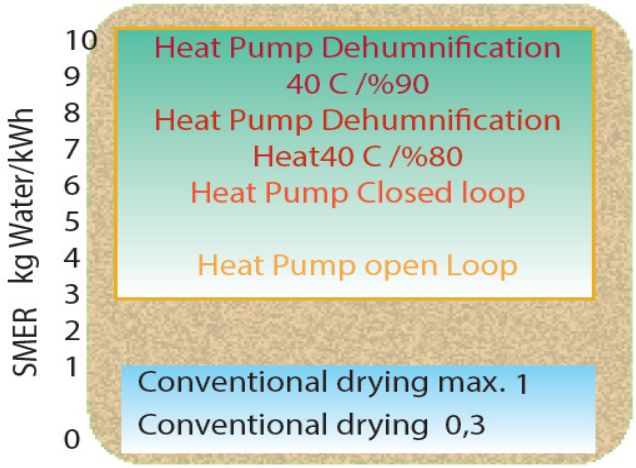
For drying, a more appropriate efficiency parameter is the specific moisture evaporation (extraction) rate (SMER) defined by

$$\text{SMER} = \frac{\text{amount of water evaporated}}{\text{energy used}} = (\text{kg/kWh})$$

Alternatively, the reciprocal of the SMER is the heat pump dryer efficiency (HPDE), which is the energy required to remove 1 kg of water.
A typical SMER value achieved by a heat pump is 3 kg/kWh, which compares very favorably with conventional convective drying, for which values ranging from 0.5 to 1 kg/kWh are standard. A summary of moisture that heat pump dryers are about 10 times as effective as traditional drying systems, such as vapor-recompression dryers and hot-air dryers.

3. Aseptic processing ;

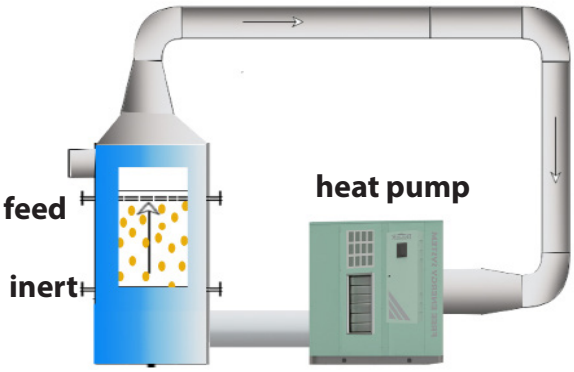
Free from contamination caused by harmful bacteria,



viruses, or other microorganisms.The drying parameters practically unaffected by ambient thermal conditions products because drying is achieved in almost closed systems ,

4. Improved quality of heat sensitive products compared to conventional hot air dryers;
5. Technology environmentally friendly due to lower energy requirement and no release of gases and fumes into the atmosphere
6. Drying with inert gases

In a closed system of a heat pump dryer, N, CO or other inert gases can be used as drying agents to reduce fire and explosion hazards and to prevent the degradation of oxygen-sensitive products.



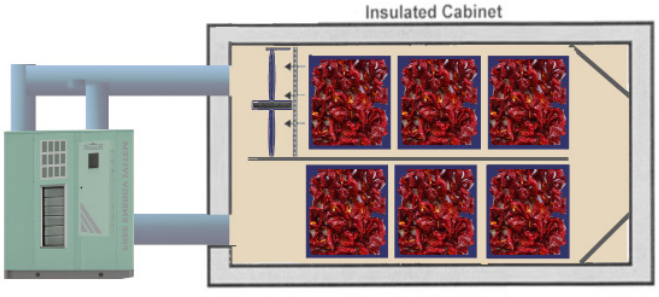
heat pump fluid bed dryer

7. Application

Drying is an essential operation İn chemical, agricultural, biotechnology, food, polymer, pharmaceutical, pulp and paper, mineral processing, and wood processing industries

The heat pump is used wherever air drying is possible and serves two purposes: heating and dehumidifying the air circulating in the dryer.

Although batch and continuous heat pump dryers are most widely used today, other types are in use in conjunction with pneumatic fluidized bed, vibratory bed, conveyor belt, centrifugal, and similar convection dryers.



Heat Pump-Assisted Drying

MinESS®

NOMENCLATURE
Type: Berliner Dry-A/A 30 S

A: Air Source
A: Supply Air
S: Standart
30 : Nominal Starting Capacity- kW
H: (Optional) High Temperature

Model	Nominal Starting cond.	Berliner A/A 30 Dry-S			Berliner A/A 30 Dry-H	
Ambient Temp. °C	20	-10 // 40				
Drying Operation Temp. °C	40	50	60	70	80	90
Heating Capacity Qc (kW)	30,9	45,6	42,2	37,9	32,6	24,6
Cooling Capacity Q (kW)		39,8	35,1	29,7	23,4	16,1
Power input (kW)	4,4	6	7,05	8,2	9,21	10,4
COP	7	7,6	6	4,6	3,5	2,27
Electric Heater (kW)	12					
Dehumidification Capacity (kg/h)	25 // 50				18 // 30	
Unit Dimension (mm)	2200*1200*1500					
Advised Chamber Size (m3)	20-60 m3					
(SMER) specific moisture evaporation rate	3 // 8				2 // 3	

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