Working Principle of industrial Drying Machine

First, single drum dryer
The steel hollow drum rotates slowly and the rotation speed is 4~10 rpm. The heated steam is heated and condensed in the cylinder, and the condensate is sucked out by the siphon. During the rotation of the drum above the slurry, the slurry having a thickness of about 0.3 to 5 mm is dispersed on the drum to be vaporized and boring, and the dry material is scraped off after one rotation.

Features:

The heat supply of the conduction type dryer is mainly based on heat conduction, and it is required to have the touch as tight as possible between the dry material and the heating surface. Therefore, the conduction drying machine is more suitable for the boring of the solution, the suspension and the paste-like solid-liquid mixture.

The first strength: the economical use of thermal energy, because this boring machine does not need to heat a lot of air, the heat energy consumption is much less than that of the hot air drying machine; the second conduction is dry under vacuum, especially suitable for easy oxidation The food is boring.

Second, the tunnel is boring
Dry wood and brick slabs, the need for less boring speed, the use of tunnels is boring. Hot air closes the loop in the tunnel. The material truck can walk on the light rail, open the two ends to close the door, release a dry material, sweep a part of the water vapor, and enter a wet material to make up part of the air. The length of the tunnel can reach 30-40 meters.

Features:

Strengths:
1 has very sensitive handling conditions, allowing the food to be under the required temperature-humidity-speed airflow, so it is especially suitable for test operations;
2 Each line of the skip further, the direction of the airflow is switched once, and the moisture content of the product is more uniform.

defect:
1The structure is messy, the sealing requirements are high, and the special equipment is required;
2 The pressure is lost and the energy is much more expensive.

Third, the infrared is boring
The wet material is fed into the machine with a belt conveyor, and the material is heated and boring during the transportation process. Use a radiant heat source. Adjust the air inlet and outlet flow with a controllable valve.

Features:

The infrared boring machine uses the electric energy to generate infrared rays, so that the dried and boring object can absorb the infiltration from the outside to the inside. The boring rate is higher, the thermal efficiency is higher, and there is no shadow left when shining.

Fourth, the intermittent tunnel is boring
A number of cars propel the tunnel together and close the door. Hot air circulates in the tunnel, and there are controllable gates that operate the air inlet and outlet to sweep away the water vapor. Once the boring is over, the tunnel is launched and an intermittent operation is completed.

Features:

Strengths:
Accustomed to the production of a variety of small batches, especially seasonal strong food production;
Single-machine operation, one device has a problem, it will not affect the normal operation of other devices;
Facilitate the processing, repair and maintenance of equipment;
It is convenient to control the heating temperature and vacuum according to the freezing and tidy process requirements at different stages.

defect:
Because the preparation time for loading, unloading, and launching is long, the equipment utilization rate is low;
In order to satisfy the certain output value requirements, multiple single machines are often required, and the corresponding subordinate systems must be equipped, resulting in the cost of equipment investment.

Five, fluidized bed dryer
The preheated hot air is fed from the bottom and sent from the top to the cyclone. The solid particles in the fluidized bed are violently washed, churned, and enhanced by heat and mass transfer.

Features:

Strengths:
The equipment is small, the production capacity is large, the material can be arbitrarily adjusted at the time of stay, the equipment structure is simple, the floor space is small, the equipment cost is not high, and the materials are easy to move.
The mechanical part of the equipment is abbreviated, except for some subordinate parts such as fans, feeders, etc., there are no other active parts, so the repair cost is low.
Compared with the turbulent airflow, the destruction of the material particles and the wear of the equipment are relatively small due to the low speed of the jubilant and boring airflow.

defect:
Operation and control are rather messy.

Six, spray boring
A diluent (such as a solution having a water content of 75-80% or more) is sprayed into a mist by a sprayer to be dispersed in a hot air stream to hydrate the water to obtain a solid product. The boring time usually takes only 3-10 seconds. The sprayer is a vital part of the spray dryer.

Features:

Strengths:
(1) The boring speed is fast.
(2) The product quality is good. The crispy hollow granule product has good activity, dispersibility and solubility, and can adhere to the original color, aroma and taste of the food.
(3) Less nutrient loss. Rapid boring greatly reduces the loss of nutrients, such as the loss of heat-sensitive vitamin C in the processing of milk powder is only about 5%. Therefore, it is particularly suitable for heat-sensitive food processing which is easy to differentiate and denature.
(4) The product has high purity. Spray boring is carried out in a closed boring chamber, which not only ensures hygienic conditions, but also avoids dust flying, and then improves product purity.
(5) The process is relatively simple. After the solution is dried by spraying, the powdery or fine granular product can be directly obtained.
(6) High yield. It is easy to complete mechanization, active production, convenient operation and control, suitable for large-scale production, and has fewer operators and low labor intensity.

defect:
(1) The capital contribution is large. Because the water transpiration intensity of the general drying room can only reach 2.5~4.0kg/(m3·h), the equipment is huge, and the atomizer, dust recovery and cleaning equipment are more messy.
(2) High energy consumption and low thermal efficiency. Under normal circumstances, the thermal efficiency is 30%~40%. If the thermal efficiency is to be improved, the inlet air temperature and the residual heat of the exhaust air can be used to preheat the inlet air without affecting the product quality. In addition, due to the high moisture content in the exhaust gas, in order to reduce the moisture content in the product, it is necessary to consume more air, and then the electric energy consumption fee of the blower and the dust recovery equipment are added.

Seven, grape dry house
A four-sided airy room above the roof facilitates natural ventilation and airs the grapes into raisins. The raisins in Xinjiang are produced in this way. This is also a naturally ventilated driers.

Eight, air flow driers
To date, straight tube airflow dryers are most commonly used. The hot air is sent to the

destroyer together with the material, and after the material is destroyed, the bottom of the dryer is blown up by the high-speed hot air. The muddy, granulated material is suspended in the air stream and boring during the air transport process. At the bottom of the cyclone, the solid activity distributor punctually discharges the dry matter as part of the product or dry material.

Features:

1 boring strength is large. Because the material is suspended in the hot air, it can touch the hot air at the maximum limit, and because the gas velocity is high (generally 20~40m/s), the high-speed agitation of the air vortex makes the gas film of the gas-solid boundary layer continuously Being washed, the heat transfer and mass transfer resistance are reduced, and the volumetric heat transfer coefficient can reach 2300~7000W/m3·K, which is 20~30 times larger than the drum dryer.
2 boring moments are short. Most materials need only 0.5~2s, and the longest does not exceed 5s. Because it is a cocurrent operation, it is especially suitable for the boring of heat sensitive materials.
3 small footprint. Because the airflow dryer has a large volumetric heat transfer coefficient, the required volume of the dryer can be greatly reduced, that is, the principle of large-scale production of small equipment can be completed.
4 high thermal efficiency. Because the heat dissipation area of the dryer is small, the heat loss is small, and the maximum is not more than 5%, so the thermal efficiency of the dry non-bonded water can reach about 60%. When combined with water, it can reach about 20%.
5 No dedicated shipping equipment. The airflow dryer has fewer moving parts, simple structure, easy creation, easy repair and low cost.
6 operation is stable in succession. The process can be completed in one time, such as boring, destruction, transportation, packaging, etc., the whole process can be carried out under closed conditions, reducing material flying, avoiding impurity pollution, improving product quality and improving recovery rate.
7 Wide applicability, can be applied to a variety of powder materials, particle size up to 100mm, wet content up to 10% ~ 40%.

Nine, double drum dryer
The directions of the two rollers are opposite, the slurry is sprayed to the gap between the two rollers, the material is heated to a temperature close to the outer surface of the drum, and the scraper continuously scrapes off the dry material.

Features:

The thermal energy supply of the conduction type boring machine is mainly based on heat conduction, and the contact between the dry material and the heating surface should be as tight as possible. Therefore, the conduction drying machine is more suitable for the boring of the solution, the suspension and the paste-like solid-liquid mixture.

The first strength: the economical use of thermal energy, because this boring machine does not

need to heat a lot of air, the heat energy consumption is much less than that of the hot air drying machine; the second conduction is dry under vacuum, especially suitable for easy oxidation The food is boring.

Ten, microwave driers
The wet material is fed into the machine with a belt conveyor, which is boring and heated during the transportation process. Micro-heat source is selected, the moisture content of the material is boring from the inside, and the drying speed is uniform inside and outside, which is suitable for heat sensitive materials.

Features:

The microwave heating is attributed to internal heating, so that the microwave energy of the received material can be converted into heat energy uniformly inside and outside, and then the inside and the outside are heated together.
This type of heating has many advantages with regard to lyophilization of irregular foods.

However, due to the disorder of the microwave heating system, there has been no practical industrialized freeze-drying equipment for microwave heating.

XI, box type dryer
The air is sent to the preheater by the fan, heated to a certain temperature, and boring from the upper right into the disk. The exhaust gas partially circulates. Intake and exhaust are used to take away the water vapor in the object.

Features:

Strengths:
It is easy to make and repair, and it is sensitive. The food industry is often used for materials that require long periods of boring materials, a small amount of materials, and materials that require particularly dry conditions, such as fruits, vegetables, spices, and the like.

defect:
The first is boring and uneven, it is not easy to inhibit microbial activity, the labor intensity of loading and unloading is large, and the use of heat energy is uneconomical (about 1kg of steam per vaporization, about 2.5kg or more of steam).

Twelve, vacuum boring
Heating the steam to heat the paste material inside the jacket. A vacuum is applied inside the charging device. The horizontal mixer replaces the forward and reverse rolling every few minutes, scraping and mixing the material adhering to the wall. Four rollers are placed freely between the mixer blades, and the rollers fall down the impact blades to shake off the material adhering to the blades. After the boring is finished, the heating is stopped, the atmosphere is turned on, the material is discharged, and an intermittent operation is completed.

Features:

Strengths:
(1) Habitually strong, widely used because the squat vacuum dryer uses jacket heating and high vacuum exhaust, so it is accustomed to all materials of different natures and conditions, especially used to be explosive, easy to oxidize, paste The material is boring.
(2) Good product quality Because of the boring process, the molars are constantly rolling back and forth, being evenly mixed by the dry materials, avoiding the overheating of the materials, the moisture is also easily escaped, and the shell is obtained with a low temperature product. Because the product is fine-grained, it can be packaged without damage.
(3) Low steam consumption Because the vacuum boring dryer uses steam to pass into the jacket, the latent heat is used to heat the material, and the steam consumption per kilogram of finished product is small, generally 1.3-1.8kg steam.
(4) According to the different characteristics and requirements of dry materials, the sealing system of the drying machine can choose two kinds of packing sealing and mechanical sealing. The special planning guarantees the sealing and service life.
(5) Easy to operate The vacuum boring machine is easy to operate, has fewer staff, and has low labor intensity. Environmental sanitation is improved because material loss is reduced.

defect:
The structure is messy and the cost is relatively expensive. Because it is intermittent operation, the boring time is long, the stock output value is low; and because it is difficult to clear the material, it is not suitable for the production of the interchangeable species. Together, in order to ensure the degree of vacuum, it is necessary to maintain and repair the vacuum equipment frequently.

Thirteen, drum drying device
The drum rotates slowly, the material to be dried is copied and sprinkled, and the hot air is boring in the drum. The drum axis is tilted and a boring product is obtained at the low end.

Features:

Strengths:
1 production capacity is large, can be operated in succession; 2 simple structure, convenient operation; 3 less problems, low repair costs; 4 suitable for large scale (such as filter cake boring); 5 operation flexibility; 6 cleaning brief.

defect:
1 equipment is huge; 2 equipment, difficulty in dismantling; 3 small heat capacity coefficient, low thermal efficiency; 4 material stays in the driers for a long time, and the difference in the time between the material particles is large.

Fourteen, happy bed driers
The clean hot air is distributed into the bed through the valve plate, and the wet material entering from the feed is composed of hot air to form a jubilant condition. Because of the wide touch of hot air and materials, the process of heat and mass transfer is added, so it can be boring in a short time. Entering from one end of the bed, after a few tens of seconds to a few minutes, jubilant and boring, actively flow out from the other side of the bed. This equipment is

generally operated under negative pressure.

Features:
The structure is simple, the production is convenient, the operation is simple, and the boring speed is fast. Suitable for a variety of difficult to dry granular, sheet and heat sensitive materials. However, the thermal efficiency is low, and the habits of various types of small-value materials are poor. This type of dryer is used for boring sugar, casein, calcium gluconate and solid beverages.

Fifteen, belt drying machine

The belt type drying machine is a continuous drying device for batch production, which is used for the boring of flakes, strips and granular materials with good gas permeability, and has high moisture content and materials for dehydrated vegetables, catalysts, Chinese herbal medicine pieces and the like. The material with high temperature does not agree is particularly suitable; the series of drying machine has the advantages of fast drying speed, high transpiration intensity and good product quality. For the dehydrated filter cake, the paste material needs to be granulated or stripped before it can be boring. .

Features:

(1) The oscillating and impact of the material on the dryer is subtle, and the material particles are not easy to be pulverized and broken, so it is also suitable for boring and some are not allowed.

Fragmented material.
(2) With the dryer is not only the material is boring, sometimes the material can be baked, burned or matured.
(3) The structure of the dryer is not messy, the equipment is convenient, and it can run for a long time. When there is a problem, it can enter the interior of the cabinet for repair and repair.
(4) It can adjust the air volume, heating temperature, material staying time and feeding speed to obtain the best boring effect.
(5) The equipment is sensitive, and the mesh belt scouring system and material cooling system can be used.
(6) Most of the air circulation is used to save energy.
(7) The common air separation equipment makes the hot air distribution more uniform and ensures the consistency of product quality.
(8) The heat source can be selected from steam, heat transfer oil, electric or coal-fired (oil) hot blast stove

Sixteen, film driers

A film drier, which relies primarily on the mechanical force of the blade to create a fierce turbulent liquid film. This boring technology is based on the WFE wiper transpiration machine and the experience of boring technology for a long time; the WFD driers can work at temperatures ranging from -20 to 1100 ° C, operating pressures from 0.01 to 30 bar, and

staying from seconds to seconds. The size of the hour. In order to avoid fouling of the feed liquid on the heating surface, the swinging blade has a high gap of 1 mm with the heating surface, so that the liquid film layer can be less than 1 mm thick, but there is no self-cleaning effect on the heating surface. Generally, the boring process of the film dryer can be divided into three areas: preheating zone, coalescence zone, and boring zone; in the preheating zone, the material reaches the boiling point and begins to transpire, and the solid begins to form; in the agglomeration zone: the solid concentration is added, tending to form a mass During the block phase, many products are crushed by the swaying blade. In the final dry area, moisture (low boiler) transpiration and boring process are completed; the length of each area depends largely on the feed rate and moisture content of the product, the feed rate is added to the preheating zone and the coagulation is added, after all The result is a boring cut that results in the addition of wet ingredients after all. The heating medium has full steam, heat transfer oil, and far infrared electric heating;

Features:

1. The material is heated for a short time, and this boring can ensure gentle transpiration under vacuum conditions.
2. The operation is closed and continuous, so there is no loss or contamination of the concentrate.
3. This wiper prevents the material from agglomerating or forming on the heating surface.
4, the concentrate is transported into a