Siddhi Vinayak Engineering

Perfect Drying Solution







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Product Range

Spray Dryer
- Rotary Atomizer Type
- Nozzle Atomizer Type

Spin Flash Dryer

Flash Dryer

Evaporator
- Multiple-Effect Evaporator
- Falling Film Evaporator
- Forced Circulation Evaporator
- Hybrid Evaporator

Fluid Bed Dryer
- Continuous Type Vibratory Fluid Bed Dryer
- Batch Type Fluid Bed Dryer

Hot Air Genertor
- Direct Fired Hot Air Generator
- Indirect Fired Hot Air Generator
- Fluidized Bed Combustion Type
Solid Fuel Fired Hot Air Generator

Others
- Centrifugal Fan
- Rotary Atomizer
- Bag Filter (Dust Collector)
- Screw Conveyor

Spray Dryer

Spray Drying is a technique used to convert either solutions or free-flowing slurries, into powder particles having specific characteristics. Spray drying is the process of contacting an atomized stream to be dried with a gas stream that is at a higher temperature than the liquid stream. The higher temperature of the gas stream causes evaporation of the liquid from the droplets, forming particles.

There is a wide variety of spray dryer configurations, each suited to a particular type of powder or feed consistency. Spray drying technology is widely applied system in the entire manufacturing industry.

Intensive research and development during the last two decades has resulted in spray drying becoming a highly competitive means of drying a wide variety of products.

Spray Drying Principal

Spray drying involves evaporation of moisture from an atomized feed by mixing the spray and the drying medium. The drying medium is typically air.

The drying proceeds until the desired moisture content is reached in the sprayed particles and the product is then separated from the air. The mixture being sprayed can be a solvent, emulsion, suspension or dispersion.

Design of Spray

Dryer Fundamentally, the spray drying process is a simple one. However, the design of an efficient spray drying plant requires considerable expertise along with access to large scale test facilities, particularly where particle size and bulk density requirements in the dried product are critical.

The sizing of spray dryers on a purely thermal basis is a comparatively simple matter since the evaporation is entirely a function of the ****T across the dryer. Tests on small pilot scale equipment are not sufficient in the face of such imponderables as possible wall build-up, bulk density and particle size predictions. It can provide primary essential information to design the spray dryer. Atomization of the feed is of prime importance to efficient drying and three basic feed devices are used extensively:

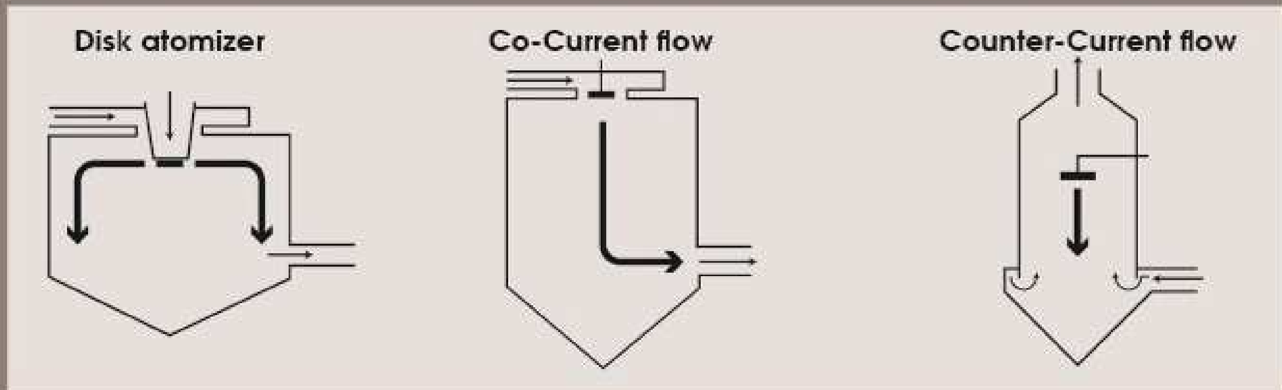
(1) Single Fluid Nozzle or Pressure Type,
(2) Two-Fluid Nozzle or Pneumatic Type and
(3) Centrifugal (Rotary Disc)

The single fluid nozzle produces a narrow spray of fine particles. While a multiplicity of nozzles of this type are used in tonnage plants to obtain the desired feed rate.

As an alternative, the two-fluid nozzle with external mixing is used for a variety of abrasive materials. This system generally is limited to small capacity installations.

Centrifugal atomization achieves dispersion by centrifugal force, with the feed liquor being pumped to a spinning (Rotary) disc. This system is suitable for, and generally used on, larger productions.

Mixing of Spray and Drying Medium (Hot air / gas) with Heat and Mass transfer

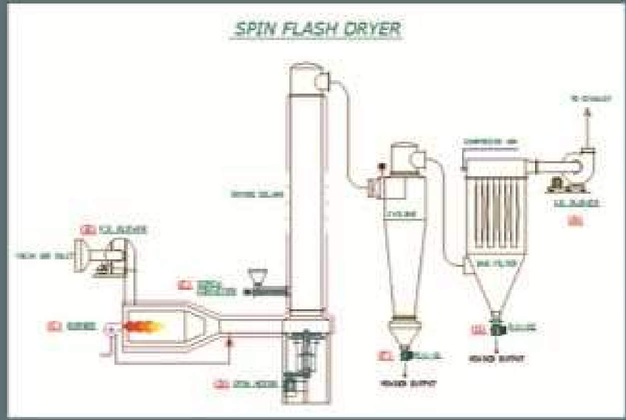


Spin Flash

Dryer While mechanical dewatering of feed slurry is significantly less expensive than thermal drying, this process results in a paste or filter cake that cannot be spray dried and can be difficult to handle in other types of dryers.

The Spin Flash dryer, as one option available for continuous powder production from pastes and filter cakes without the need of grinding.

The Spin Flash dryer was developed and introduced in 1970 and is widely used to produce a uniform powder on a continuous basis from highly viscous fluids, filter press wet cake, thick / cohesive paste, sludge, and semi hard lumps-lumpy materials etc. This equipment is ideally suited for such type of applications.



Salient Features:-

- ✓ Continuous Operation & Single Step Drying with disintegration of products
- ✓ Uniformed product quality and particle size
- ✓ High thermal as well as drying efficiency
- ✓ Compared with conventional dryers, there is lower operating cost from spin flash drying system
- ✓ Effective dust collector ensures emission of clean exhaust process air
- ✓ No pollution and environmentally friendly

Flash Dryer

Flash Dryer is a versatile equipment and ideal for drying of moist powder. It is a continuous drying plant, the entire system is fully automatic requiring no handling of human involvement. The feed rate is adjusted automatically as per the variation in moisture content in material thereby achieving consistent product quality.

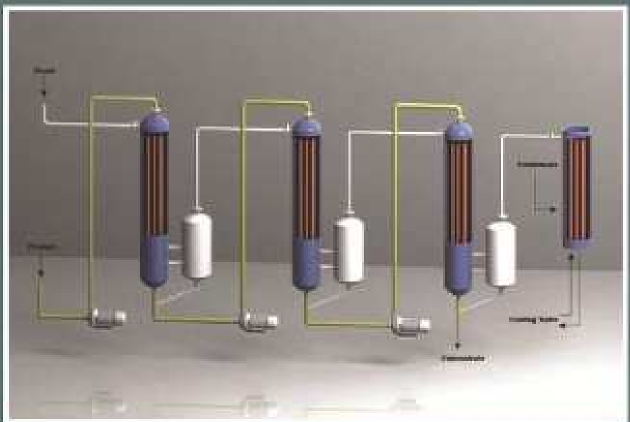
In Flash Dryer, the word 'flash' is used as the system is working on very low drying as well as residence time. The feed is fed into the venturi throat by means of screw conveyor in controlled manner. Simultaneously the drying air passed through the venturi, conveyed to the flash drying duct at high velocity and comes in contact with the material. The drying process takes place within the conveying duct and the dried product is collected by high efficiency cyclone and effective dust collector. These unique features make the flash dryer an ideal replacement for conventional tray/rotary dryer.

Salient Features:-

- ✓ Continuous Operation Equipment.
- ✓ No manual handling involvement hence substantial saving in labour cost
- ✓ Negligible material wastage and dusting
- ✓ Uniformed product quality and particle size
- ✓ High efficiency and low pressure drop
- ✓ Effective dust collector ensures the emission of clean exhaust process air
- ✓ No pollution and environmentally friendly

Multiple-Effect Evaporator

Unlike single-stage evaporators, these evaporators can be made of up to seven evaporator stages or effects. The energy consumption for single-effect evaporators is very high and makes up most of the cost for an evaporation system. Putting together evaporators saves heat and thus requires less energy. Adding one evaporator to the original decreases the energy consumption to 50% of the original amount. Adding another effect reduces it to 33% and so on. A heat-saving-percent equation can be used to estimate how much one will save by adding



a certain amount of effects. The number of effects in a multiple-effect evaporator is usually restricted to seven because after that, the equipment cost starts catching up to the money saved from the energy-requirement drop.

There are two types of feeding that can be used when dealing with multiple-effect evaporators. Forward feeding takes place when the product enters the system through the first effect, which is at the highest temperature. The product is then partially concentrated as some of the water is transformed into vapor and carried away. It is then fed into the second effect which is a little lower in temperature.

The second effect uses the heated vapor created in the first stage as its heating source (hence the saving in energy expenditure). The combination of lower temperatures and higher viscosities in subsequent effects provides good conditions for treating heat-sensitive products, such as enzymes and proteins. In using this system, an increase in the heating surface area of subsequent effects is required. Another way to proceed is by using backward feeding. In this process, the dilute products are fed into the last effect which has the lowest temperature and are transferred from effect to effect, with the temperature increasing. The final concentrate is collected in the hottest effect, which provides an advantage in that the product is highly viscous in the last stages, and so the heat transfer is considerably better.

Falling Film Type Evaporator

Falling Film Evaporation is a process controlled by two different heat transfer processes. First of all thin film evaporator is a heat transfer mechanism controlled by conduction and / or convection across the film. In Falling Film Evaporator film normally flows downwards under the force of gravity in the form of a thin film along with vapor at the core in parallel. The product which is to be handled in falling film evaporator is introduced at the top part of the

vertical tubes inside surface of the tubes. The feed gets well distributed to all the tubes due presence of a properly designed efficient liquid distributor. The liquid gains heat by heat transfer due to condensing hot vapors on outside surface of tubes. The liquid starts evaporating at constant boiling temperature and both liquid film and evaporated vapors travel down. The concentrate is collected at bottom portion of calandria from where it is pumped further. The evaporated vapors enter the vapor separator connected at the bottom where due to centrifugal action the droplets get separated out. These droplets are pooled back to the concentrate leaving the bottom portion of calandria. The vapors leave the vapor separator from the top.

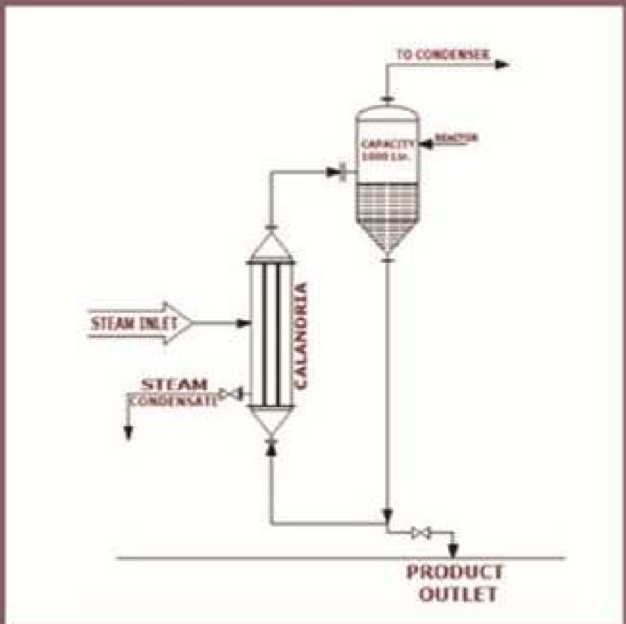
The entire system works under vacuum evaporation and hence boiling point of liquid decreases and the system can be applied for heat sensitive products.

Forced Circulation Type Evaporator

This system is an ideal for concentration of liquid when the boiling of feed liquid on the heating surfaces is to be avoided due to the salting and fouling characteristics of the liquid. Hence in these evaporators the flow velocity in the tubes is kept very high. Forced Circulation evaporators, sometimes are used in series with falling film evaporator as finishing effect for achieving higher concentration. In this type of evaporator, liquid is pumped through heat exchanger tubes at high velocity avoiding precipitation and creating high turbulence; the liquid is then passed through vapour separator for separation of vapour and finally condensing the vapour in the condenser. Concentrated liquid is continuously discharged from bottom of vapour separator.

Natural Circulation Type Evaporator

Natural circulation evaporators are based on the natural circulation of the product caused by the density differences that arise from heating. The product in liquid form travels up the tubes and reaches boiling point, vapour forms and carries liquor to the separator. In an evaporator using tubing, after the water begins to boil, bubbles will rise and cause circulation, facilitating the separation of the liquid and the vapor at the top of the heating tubes. The amount of evaporation that takes place depends on the temperature difference between the steam and the solution. These types of evaporators are widely used in sugar, salts and caustic soda industries.



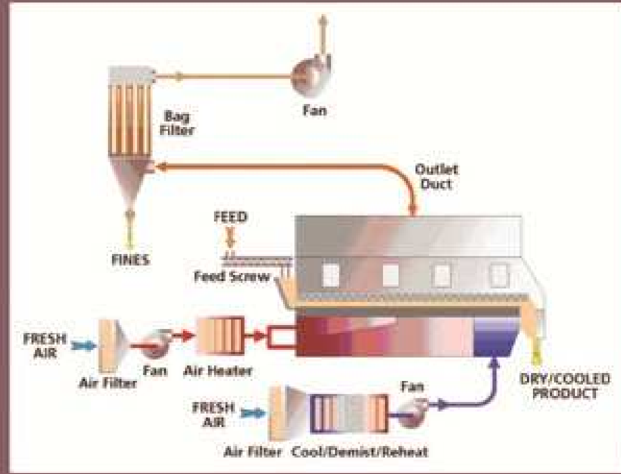
Vibratory Fluid Bed Dryer

Vibratory Fluid Bed Dryer is ideal drying equipment for Crystalline, Heat sensitive and non-heat sensitive products. It is widely spread and used in entire drying industry for fluidization, granulation, crystallization and agglomeration.

Process Description

The process of vibratory fluid bed dryer involves mainly Drying, Fluidizing, Cooling and Granulating of particulates. It is an effective method of drying for heat sensitive products and particle size can be achieved through proper control on fluidization of product, residence time, velocity, better heat transfer. The material to be processed is fed into the vibratory bed either by a screw conveyor or by an air lock rotary valve. The feed can be regulated through providing a variable speed drive. There are two no. of zones in system i.e. hot zone and cooling zone.

The hot air is introduced through a heavy duty centrifugal fan into the hot zone of vibratory fluid bed dryer. The hot air gets distributed through a special perforated screen ensuring proper fluidization and optimum heat transfer along with effective pneumatic transportation of solids. The product gets dried and fluidized while passing through the hot zone. Transportation of solids can be achieved in the fluid bed by combination of proper vibration and fluidization.



Similarly in cooling zone, cold process air is drawn into the system through a centrifugal fan and well distributed where the dried particulate gets cooled. The cooling zone prevents overheating of heat sensitive product. The dried and cooled particulates of heavy density are collected at the bottom of the vibratory fluid bed dryer and fine particulates are further pneumatically conveyed to secondary powder collection system through introducing an exhaust fan.

A dust collecting bag filter separates the fine particulates from the air which is exhausted to atmosphere and it is discharged through an air lock rotary valve at the bottom.

Proper instrumentation and controls are provided for the smooth operation of the system.

Hot Air Generators

Our Hot Air Generator consists of combustion chamber, expansion bellow, inspection cum man hole, process air inlet connection and hot air outlet connection, burner fixing arrangement etc.

Type of Hot Air Generators

- ✓ Direct Fired Hot Air Generator
- ✓ Indirect Fired Hot Air Generators
- ✓ Direct Fluidized Bed Combustion Type Solid Fuel Fired Hot Air Generator
- ✓ Indirect Fluidized Bed Combustion Type Solid Fuel Fired Hot Air Generator

Hot air at a wide range of temperatures and pressures is produced for applications like Drying Equipments in different industries. Furnace Filtered Oil, LDO – Light Diesel Oil, HSD-High Speed Diesel, LPG-Liquefied Petroleum Gas, CNG-Compressed Natural Gas or PNG-Piped Natural Gas, Wood, Coal, Saw Dust, Lignite etc. may to be used as fuel in our hot air generators.

Direct Fired Hot Air Generator

Indirect Fired Hot Air Generator

Salient Features of our Hot Air Generators

- ✓ Supplies clean soot-free hot air at any pressure and temperature,
- ✓ Uses of any of oil or gas as fuel,
- ✓ Fully automated or manually temperature control & burner ignition
- ✓ Excellent fuel economy
- ✓ Customized manufacturing

Fluidized Bed Combustion Type Indirect Fired Hot Air Generator

- ✓ The Fluidized Bed Combustion Type Solid Fuel Fired Hot Air Generation System consist of a Radiative Heat Exchanger, Convective Heat Exchanger, Heat Recovery Unit, Pollution Control Equipment and Fludized Bed Combustion Furnace having Controlling Fans etc.

- ✓ Where the cold process air is fed in the Heat Recovery Unit through C.A. Fan, gradually is heated and passes to a Convective Heat Exchanger and then Radiative Heat Exchanger to Process.

- ✓ Flue Gas passes from Furnace to Radiavtive Heat Exchanger, Convective Heat Exchanger, Heat Recovery Unit, Pollution Control Equipment and I.D. Fan to Chimney respectively.

Fluidized Bed Combustion Type Indirect Solid Fuel Fired Hot Air Generator

Rotary Atomizer

Centrifugal Fan

Screw Conveyor

Model	Discharge Capacity	Wheel Dia	Power Load	Speed
SVE-60	25 LPH	Ø 60 mm	0.5 HP	14000 – 16000 RPM
SVE-100	75 LPH	Ø 100 mm	2.0 HP	14000 – 16000 RPM
SVE-125	120 LPH	Ø 125 mm	3.0 HP	14000 – 16000 RPM
SVE-160	300 – 450 LPH	Ø 160 mm	5.0 HP	12000 – 14000 RPM
SVE-175	500 – 850 LPH	Ø 175 mm	7.5 HP	12000 – 14000 RPM
SVE-200	1000 – 1200 LPH	Ø 200 mm	15.0 HP	12000 – 14000 RPM
SVE-250	1500 – 2000 LPH	Ø 250 mm	30.0 HP	11000 – 12000 RPM
SVE-300	3000 – 4000 LPH	Ø 300 mm	40.0 HP	10000 – 11000 RPM

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