



PRODUCT BULLETIN

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Spray Dryers

PRINCIPLE OF SPRAY DRYING

Spray drying begins with the atomization of a liquid into a spray of fine droplets as it is fed into a Drying Chamber. Various methods are used including a high-speed **Rotary Disc**, a **Pressure Nozzle**, a **Two Fluid Nozzle**, or our newly developed **Air Assisted Pressure Nozzle**.

The fine droplets sprayed into the Drying Chamber become suspended in a heated gas stream. Then droplets are evaporated and dried to spherical powder.

This dried powder is separated from the gas stream and collected at the bottom of the Drying Chamber or Cyclone.

The exhaust gas is treated to meet environmental requirements and is either released into the atmosphere or, in some cases, re-circulated in the system.



Pilot Scale Spray Dryer



Lab Spray Dryer

Material is fed to spray dryer in a liquid slurry form, atomization occurs under pressure, the spray/air contact occurs, conveying material into drying chamber where evaporation occurs, leaving spherical dried powder, and the dry powder is separated from the gas stream by the dust cyclone, or gravity, in some instances.

A few industries using Spray Dryers are Ceramics, Industrial Minerals, Paint (Pigment), Plastics, Pharmaceutical and Chemical industry.

Typical Particle Size Range produced by spray dryer applications is 20 Microns to 500 Microns. A very narrow particle size range may be produced, if required.

Spray Dryers

FEATURES OF SPRAY DRYING

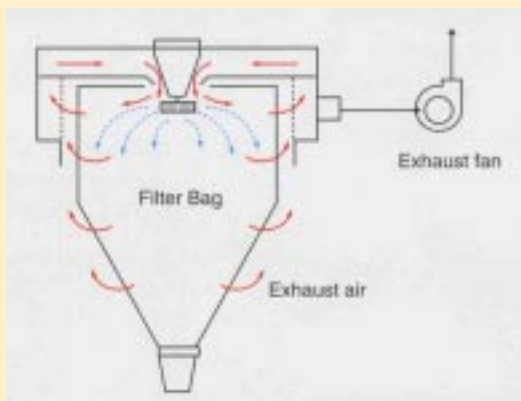
- The production process is simpler than the other dryers because the dried product can be obtained directly and continuously from the liquid without contamination
- Less heat deterioration
- Heat sensitive materials such as pharmaceuticals and foods can be dried into products because they spend very short time in contact with the sprayed liquid and heated gas
- Spherical, porous products
- The products are spherical and porous thus offering high flowability, high solubility and dispersability



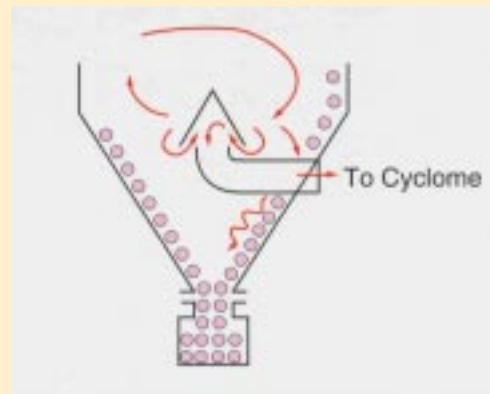
M type Rotary Disc in photo above. High speed rotary disc atomizers are available for a wide range of operations. They can produce customer designed particle size distributions.



Air assisted Pressure Nozzle enables particle size to be controlled without changing the Nozzle.

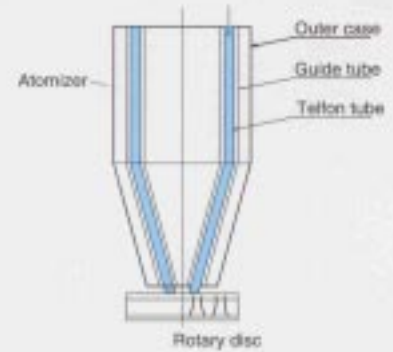
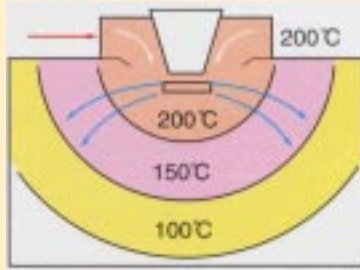


Above illustrates a Spray Bag Dryer, which is a large removable filter bag, which is used as the drying chamber. This is a new concept in spray drying. It requires no washing and is high yield.



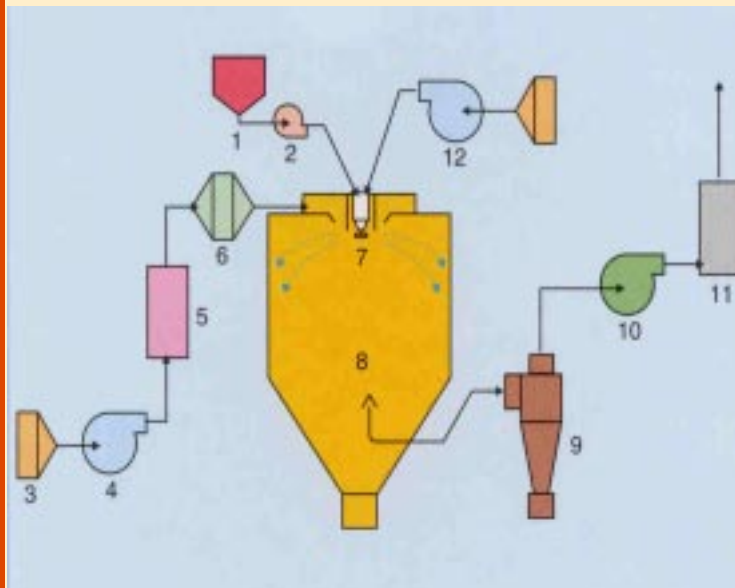
The illustration above shows a Low Cap Exhaust, which allows most of the particles to settle at the bottom of the drying chamber after they are dried. The remainder of particulates are separated in the air cyclone.

Spray Dryers



The top and center mounted air disperser provides the most suitable temperature distribution in the drying chamber for optimum speed drying. The air disperser gives spherical and highly flowing particles. The air flow direction can be controlled freely with an adjustable air fin.

The Liquid Distributor in the rotary atomizer has multi-layer liquid feed construction, and protects against liquid drying in the pipe. Dual liquid feeding pipes or our liquid distributor distributes liquid constantly in the drying chamber.

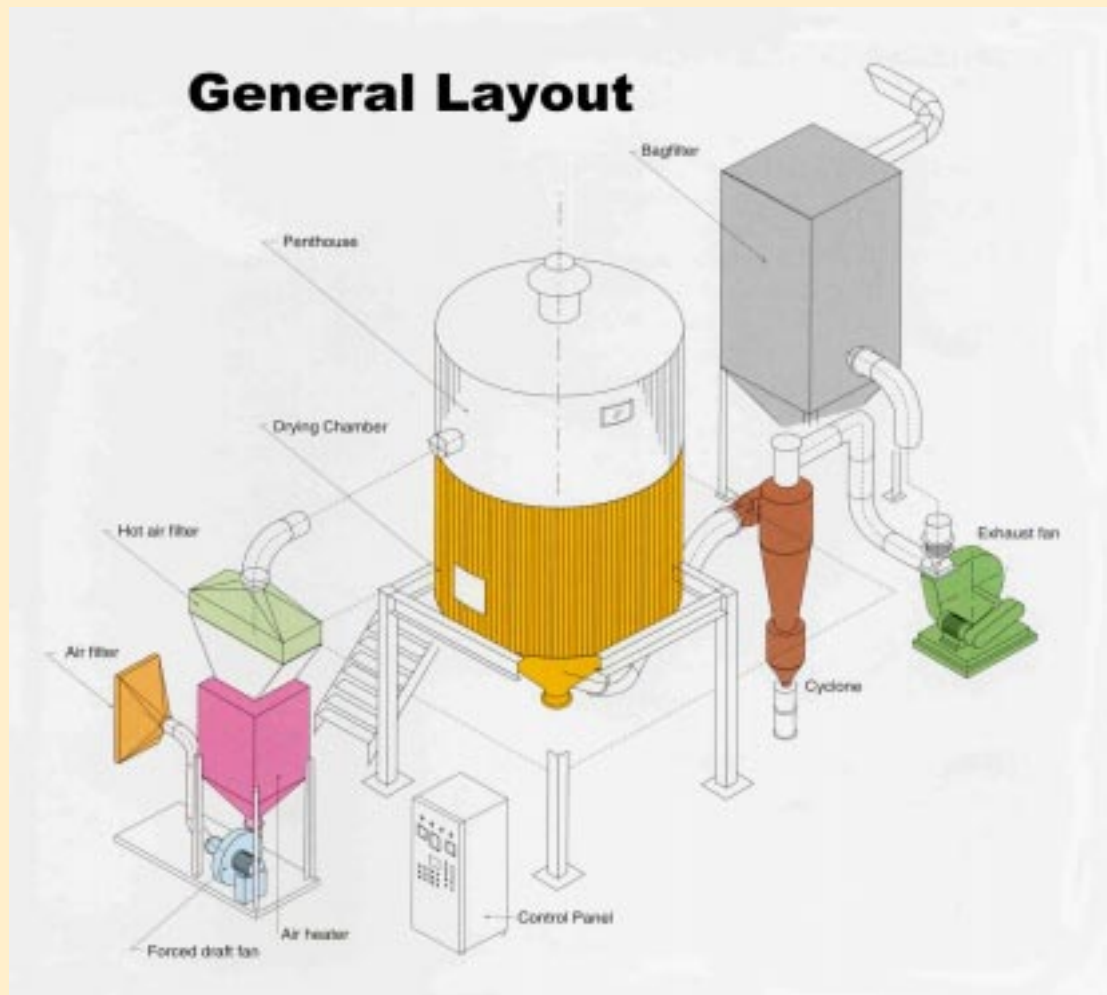


A typical basic process flow for a Ceramics application is illustrated at left. The Legend is shown below the illustration.

DESCRIPTION OF BASIC COMPONENTS

- | | |
|----------------------|--|
| 1) Liquid tank | 6) Hot air filter |
| 2) Liquid pump | 7) Atomizer(Disc, Nozzle) |
| 3) Air filter | 8) Drying Chamber |
| 4) Forced draft fan | 9) Cyclone |
| 5) Hot air heater | 10) Exhaust fan |
| | 11) Dust collector(Bagfilter, Scrubber) |
| | 12) Primary Cooling Fan |

Spray Dryers



Major Benefits of Spray Drying

- A Spray Dryer gives an extremely large surface area per material weight ratio, which is a major factor in the operation of spray dryers. A feed atomized to 100μ droplets generates approximately $15,400 \text{ Ft}^2$ of surface area per pound of feed. A feed atomized to 20μ droplets generates approximately $77,021 \text{ Ft}^2$ of surface area per pound of feed.
- Particle size can be easily controlled, by the size of the atomization droplets. In some instances, this can eliminate the requirement for classifying equipment for powders less than 500μ . Dust from powders is virtually eliminated, since powders dry at uniform, spherical sizes.
- Heat sensitive material may be dried in a spray dryer, since evaporation removes the water, and the particle does not increase in temperature significantly, until all water is evaporated. Suitable design of the drying chamber prevents overheating of particle from occurring.
- Short drying time for spray dryers is due to the large surface area produced when fluids are atomized, typically ranging from 3 to 40 seconds. This short drying time prevents harmful degradation of the material being dried.
- Little corrosion in the drying process, due to the drying chamber remaining dry, allowing corrosive materials to be processed in carbon steel chambers.
- Spray dryers produce spherical particle shapes, which produce fluid like flow properties. This makes transporting the dried powders much easier, since they flow so well.