



Thermo-Venturi Dryers



Mitchell Dryers Limited

Thermo-Venturi, or pneumatic dryers offer an economical means of continuously drying a wide range of granular, powdery or pasty materials. Mitchell's TV Dryers have been installed for many years in all the process industries, drying a large variety of food, chemical, pharmaceutical and mineral products.

Due to the dispersion of the feed material and high degree of turbulence, the rates of heat transfer and evaporation are high. Only a short residence time is required – no more than a few seconds – to achieve the required moisture reduction. Relatively high inlet air temperatures can be employed, since thermal damage to the material is prevented by flash evaporation of moisture which keeps the material cool. This makes the Thermo-Venturi dryer ideal for drying heat sensitive materials.

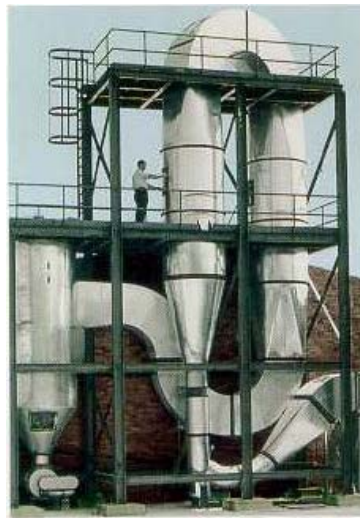
Operation

The Thermo-Venturi Dryer operates by passing heated air upwards through a vertical column at a velocity such that the wet material, when introduced by a suitable feeder, is simultaneously dispersed, pneumatically conveyed and dried. The exhaust air from the drying column is passed to a suitable product collection system designed to meet appropriate emission standards.



TV Dryer for mineral concentrates

The basic 'flash' dryer comprises fans and an air heater to supply the hot air, a feeder to introduce the wet material, the drying duct and a product collection system.



TV Dryer for PVC powder

Fans

One or two fan systems are available to suit the application. Two fan systems incorporate control dampers to set the air volume and pressure balance at the feed point. When the overall system pressure drop is not high, a single fan system can be employed.

Dryer Column

The dryer column is designed to suit the particular application, by applying factors such as the evaporative duty, drying temperature and velocity required to convey the material. The column length is decided by the required residence time. Drying tests are usually required to arrive at the optimum design.

High velocities are employed at the feed point to assist with product entrainment and dispersion. Lower velocities are used in the subsequent drying duct to achieve the desired residence time.

Since the dryer comprises a system of ducting, it can be tailored to suit an existing building, or to provide the dried product at a required position. The equipment can be situated outside a building with only the feed and product delivery points given weather protection.

Air Heater

In most TV drying systems, hot air is provided using oil or gas as the heat source. These heaters are supplied to comply with appropriate safety standards.



TV Cooler for glucose

When materials cannot come into contact with the products of combustion, an indirect heating system can be provided using an intermediate heat exchanger. Alternatively, steam heating can be used. Other options are electric heating, or the utilisation of hot waste gases from another process.



Paddle back-mixer

Feeders

Materials already in a friable condition can be fed directly using vibrating or paddle type feeders. A granulator can be included to break up any lumps. Alternatively, a disintegrator can be incorporated in the base of the drying column. Hoppers with appropriate discharging facilities can be provided for continuous metering from batch charges.

Feed Conditioning

Some materials may require conditioning prior to drying, for example, they may be too sticky to be dispersed in the airstream, or too wet to dry in a single pass through the system. In these cases, a proportion of dried material is returned from the product collection equipment into a back-mixer where it is blended with a continuous supply of fresh feed. The amount of recycle is adjusted such that the resultant mix is in a suitable condition for feeding to the dryer. A granulator can, if required, be included to break up any residual lumps.

Dryer Controls

All Mitchell's TV Dryers are supplied fully automated with monitoring and control instrumentation. The normal requirement is to run with a fixed exit gas temperature since this relates directly to product moisture. Depending on the application, either the inlet gas temperature since this relates directly to product moisture.

Depending on the application, either the inlet gas temperature, or the feed rate, can be controlled to maintain the desired exhaust temperature.

Product Collection

A high efficiency cyclone separation system is normally supplied complete with rotary discharge valve which prevents air leakage into the dryer. An automatic self cleaning bag collector can also be used as the sole method of product collection.

A secondary system, such as a bag collector can be included when:-

- a) the product particle size is particularly small
- b) the material is toxic
- c) there are environmental considerations

As an alternative, a wet scrubber can be supplied for secondary collection – particularly in cases where it is possible to feed the recovered material to an upstream filter.

Another option is to use an electrostatic precipitator.

Safety Precautions

Safety equipment is included with all directly heated dryers to protect against fuel/air explosion and where flammable materials are being handled that might give rise to a dust explosion. Common earth bonding is used for all metal items to prevent static build up.



TV Dryer for nickel sulphide

Pneumatic Cooling

Thermo Venturi systems, similar to the basic 'flash' dryer, but excluding the heater, employ ambient air to simultaneously cool dried products and to convey them to storage facilities. Other cooling systems using air, cold water, or refrigeration equipment, are available from Mitchell Dryers.

Materials of Construction

There is a wide choice of construction materials to suit the application. Wear resistant components are included when handling abrasive materials.

Heat Recovery

An appreciable amount of heat can be lost in the exhaust of a 'flash' drying systems depending upon operating conditions. Various options can be included to recover heat from exhaust gases after the product collection. Systems incorporating heat exchangers, heat wheels, heat pipes, or run around coils are available to enable pre-heating of the cold inlet air to the dryer or the recovered heat can be used for some other purpose.

Materials dried in a Mitchell Thermo-Venturi Dryer

Alumina Trihydrate
 Aluminium Hydroxide
 Aluminium Oxide
 Ammonium Phosphate
 Ammonium Sulphate
 Aspirin
 Barium Sulphate
 Bleaching Powder
 Blood
 Borax
 Breadcrumbs
 Calcium Carbonate
 Calcium Formate
 Copper Oxide
 Corn Starch
 Dextrose Monohydrate
 Dicalcium Phosphate
 Expanded Polystyrene
 Ferro Silicon
 Flour
 Fly Ash
 Itaconic Acid
 Lead Stearate
 Lime
 Magnesium Silicate
 Metal Powder
 Nickel Carbonate
 Paracetamol
 Penicillin
 Potato
 PVC
 Rubber Powder
 Sand
 Sodium Nitrate
 Soya Meal
 Starch
 Sugar
 Zinc Carbonate

Test Centre

The Mitchell Dryers Test Centre is equipped with our complete range of dryers, calciners and coolers and to date we have tested over 2500 different materials.

This enables optimum selection and design of equipment to meet customer processing requirements. Where appropriate, heat recovery options and air pollution control can be offered as an integral part of the plant.

An ongoing programme is in place investigating new drying processes and improvements to our existing range. This ensures that optimum, cost effective solutions are available to meet customers' present and future requirements.



Vacuum Pan Dryer



Indirectly Heated Rotary Dryer



General View of Test Centre



Laboratory facilities

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