

# / VetterTec Ring and Flash Dryer



- ▶ Use of direct or indirect fired gas or oil as energy source – 100% convection drying
- ▶ Utilisation of hot exhaust gases (e.g. turbine or boiler exhaust gases)
- ▶ Preferred for drying of fine particle and/or heat sensitive products with shortest residence time = Highest Product Quality
- ▶ Water evaporation up to 33 t/h per dryer
- ▶ Exhaust gas recycle option for improved energy efficiency and self-inerting (improved safety)
- ▶ Integrated cooler, with energy recovery as an option
- ▶ Simple design – low maintenance – no large rotating parts

# / Ring & Flash Dryers

## Types of Dryers Available

### – Flash Dryers

- Short residence time
- Low cost and maintenance
- Fed by screw/venturi, sling or cold disintegrator

### – Full Ring Dryers

- Extended residence time with convective recycle (air)
- In-line classifier with adjustment of internal recycle
- In-line de-agglomeration by hot disintegrator

### – Feed Type Ring Dryers

- Extended residence time with non-convective recycle
- In-line classifier with adjustment of internal recycle
- Cold disintegrator feed into venturi

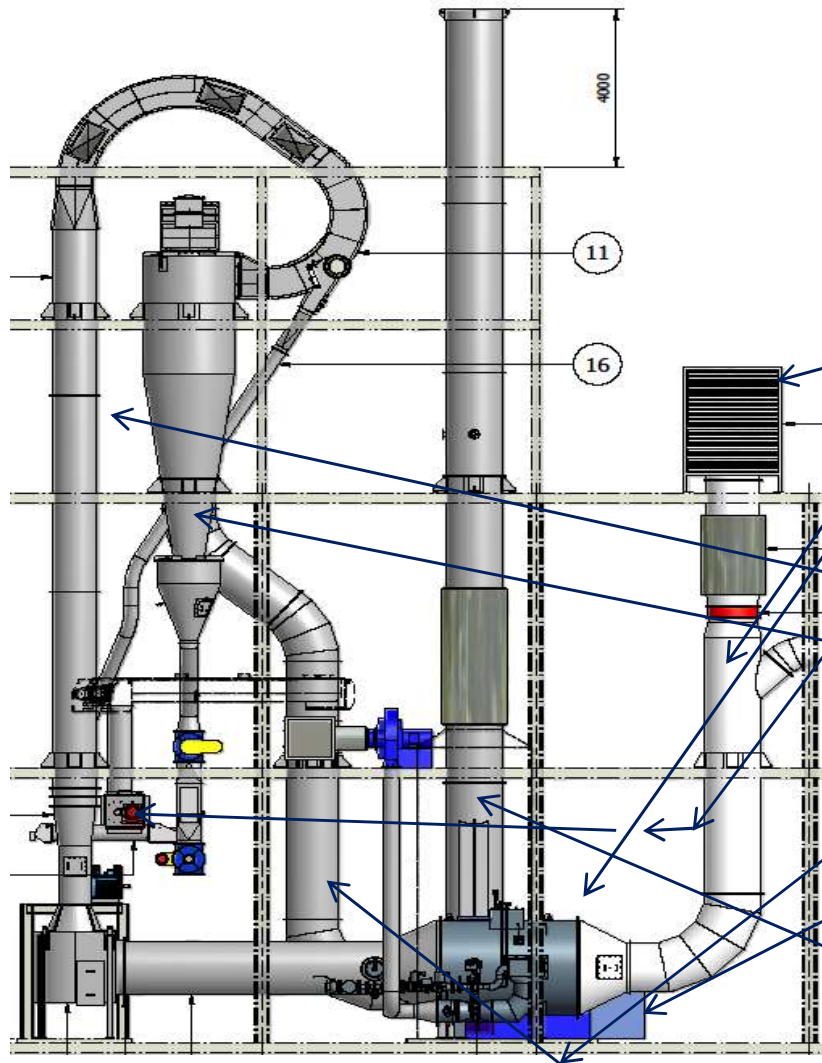
### – ‘P’ Type Ring Dryers

- Extended residence time inc. simplified convective recycle
- In-line classifier with adjustment of recycle
- Sling or cold disintegrator feed



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## Working Principle



All ring and flash dryers are **co-current airstream (convective)** type dryers, utilising hot air to dry the product.

Each system comprises the following main components:

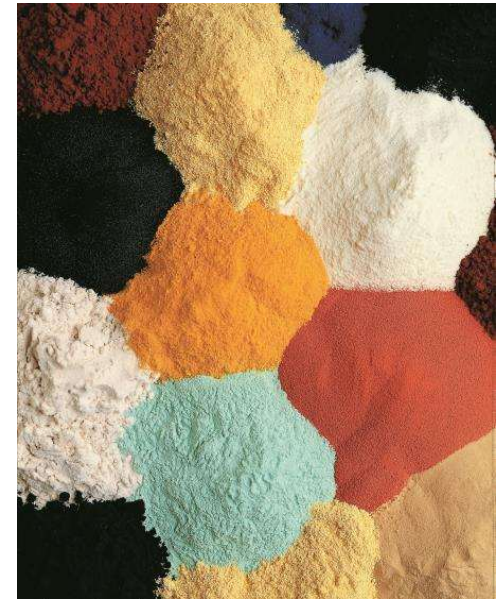
- Air inlet filter and ducting to heater
- Air heater (direct or indirect)
- Wet material feeder into drying duct (venturi)
- Drying column and top bend
- Product collection system
- Exhaust duct (clean air)
- Dryer ID fan
- Stack

# / Ring and Flash Dryers

## Size Ranges and Typical Applications

### Size Ranges

- Evaporative rates of 10 – 66,000 lbs/h in a single unit depending on material and inlet temperature
- Inlet air temperatures of 250°F to 1150°F
- Exhaust air temperatures from typically 140°F to 285°F
- Exhaust air volumes of 140 to 175,000 acfm



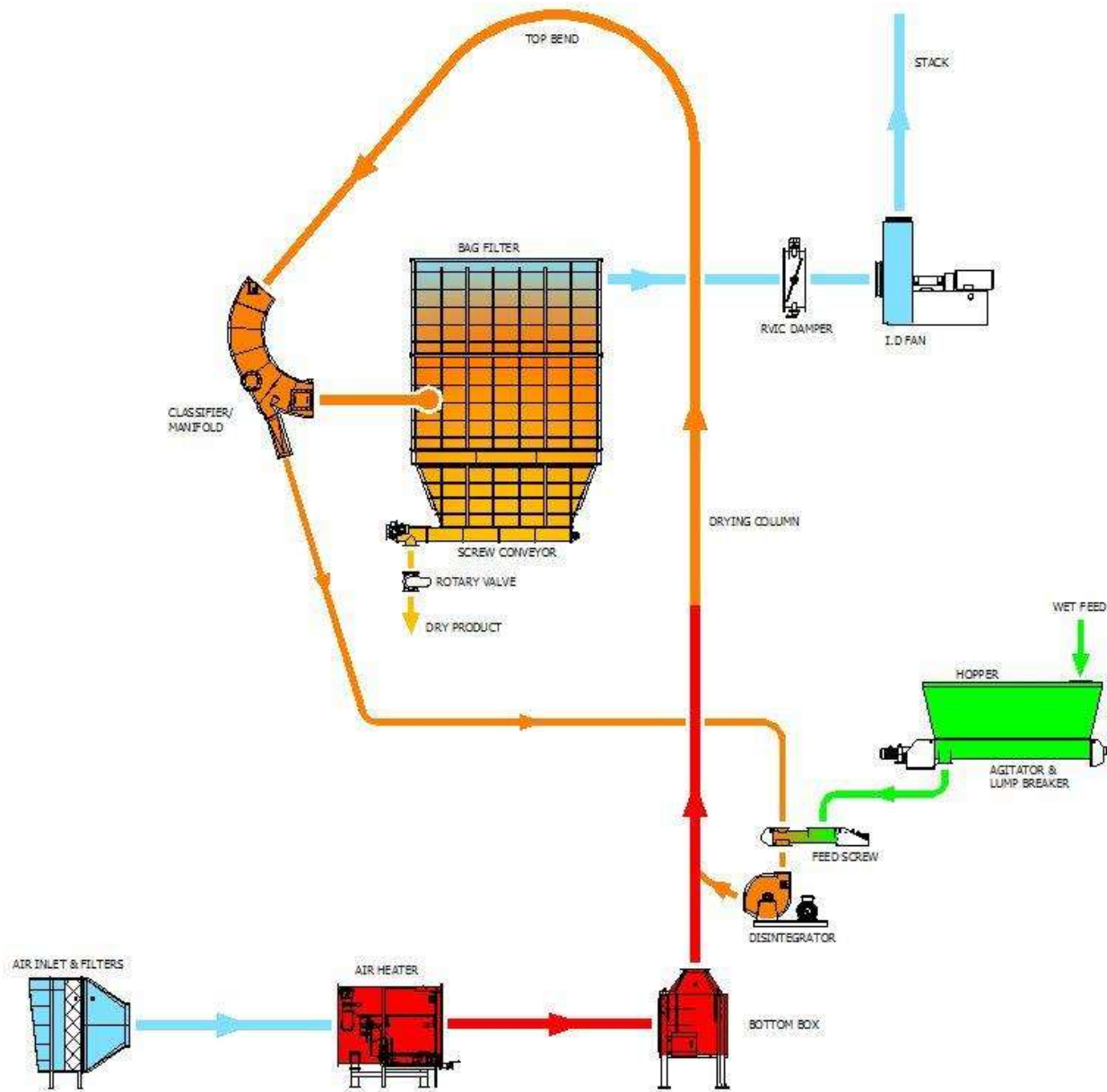
### Typical Products – Flash Dryers

- Native and Modified Starches (wheat, corn, potato, tapioca)
- Flour
- Chemicals (e.g. sodium sulphate)
- Pigments
- Carbon
- Fly Ash

### Typical Products – Ring Dryers

- Vital & Fodder Wheat Gluten
- Corn (Maize) Gluten
- Foods (e.g. gravy powders)
- Fibres
- Calcium Carbonates
- Silicates and Bentonites
- Citrus Peel

# / Ring Dryer – Simplified Flow Diagram



## / Ring and Flash Dryers

### Full Ring Dryers – Hot Disintegrator

The hot disintegrator is used in full ring dryers, located in the hot air stream, to provide disintegration of the wet feed material (e.g. wheat gluten) together with dispersion of the recycled product stream.

The units can either incorporate tangential or 'U-shaped' configuration. Maximum installed power 2.4 MW.

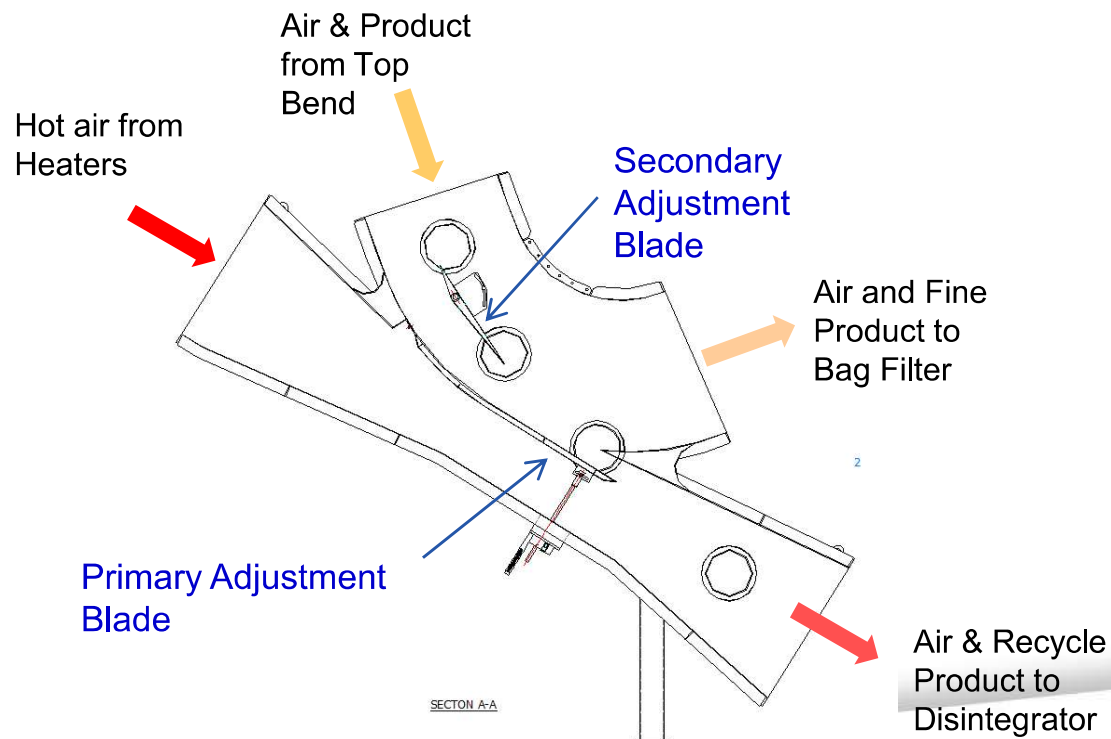


Disintegrator Rotor undergoing Dynamic Balancing

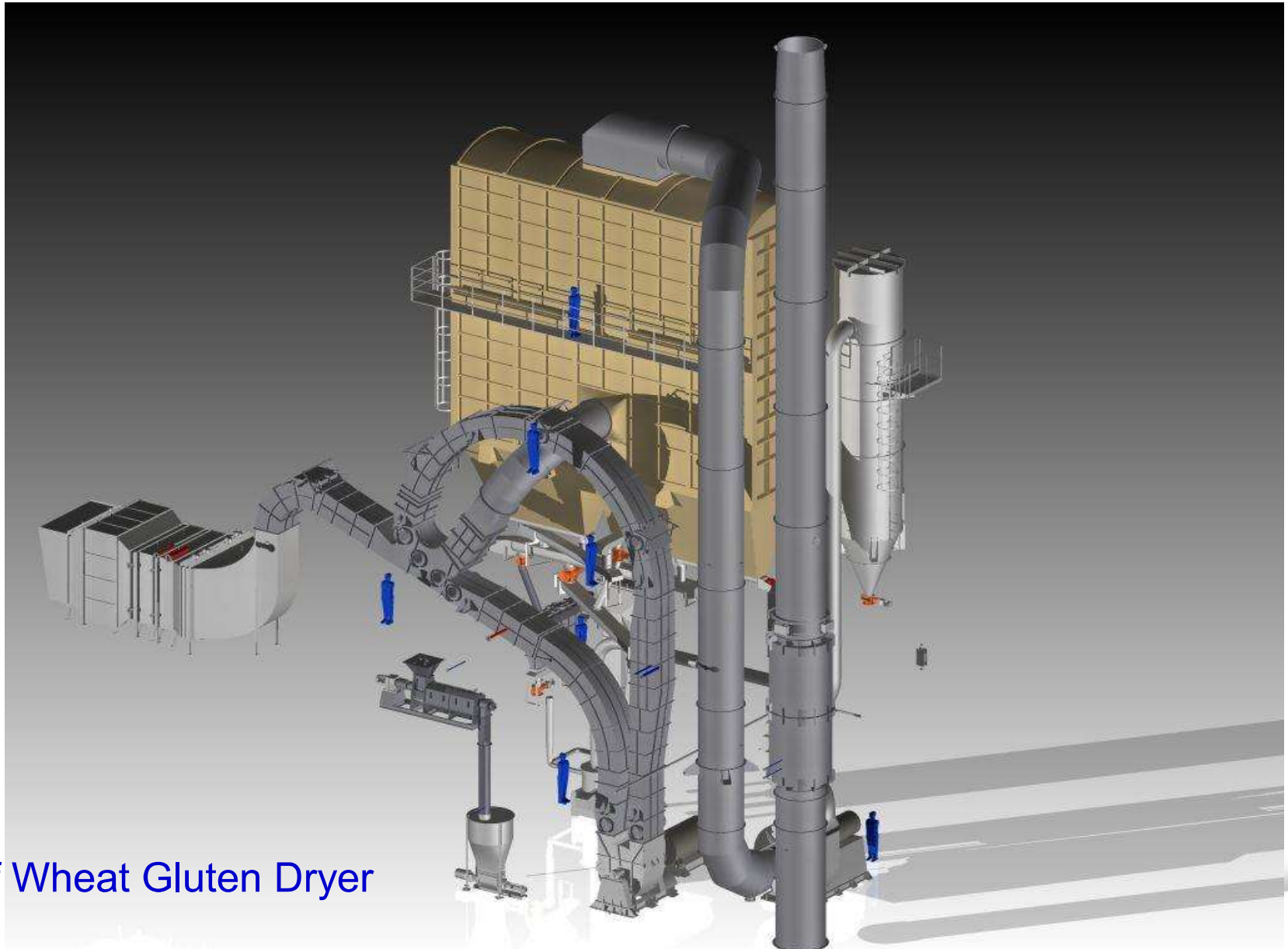
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## Full Ring Dryers – Classifier (Manifold)

- Located in circuit within the ring dryer to provide selective recycle (of larger and therefore wetter material) back into the dryer with remaining product directed out to the product collection system.
- Simple low-maintenance design with windows to allow optimisation of settings
- Internal adjustable blades provides for variation of recycle quantity
- Maximum size currently built is 175,000 acfm



## / Full Ring Dryers



Typical 3D of Wheat Gluten Dryer

# / Ring and Flash Dryers

## Partial Gas Recycle Systems (PGR)



The majority of the dryer exhaust gases are recycled back to the heater for re-use in the dryer.

### Advantages

- By directly re-utilising up to 75% of the exhaust gases, the heat is recovered reducing the energy consumption per tonne of water evaporation by 10-15%
- Water vapour in the exhaust displaces the oxygen resulting in self-inertisation where the oxygen levels are reduced to typically 5-8%  $v/v$  - well below the level required for combustion (>12%)
- Exhaust dew point temperatures are able to be elevated to 180-185°F which can then be utilised if relevant in the first stage of an evaporation or scrubber heat recovery system, further enhancing the overall energy efficiency.
- Automatic control of recycle gas quantity by means of pressure control, maximising the re-use of dryer exhaust gases.

### Disadvantages

- Higher exhaust dew point temperatures require elevated dryer outlet temperatures in order to maintain the driving force. Typical dryer air outlet temperatures of 240-260°F are used.
- Bag filter collection is not always suitable for product collection at the higher outlet gas moistures (particularly for sticky products) necessitating the use of cyclones and scrubbers.

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## Full Gas Recycle Systems

### Process Description

The dryer in full gas recycle utilises an indirect heating system (heat exchanger) to heat a re-circulating water vapour drying stream together with a direct or indirect condensing unit to remove the water of evaporation. This provides for high thermal efficiencies together with low emissions.

### Advantages

- High thermal efficiency with low particulate emissions
- Inertising atmosphere reducing explosion risk
- High outlet gas humidity (96-98% RH), heat recovery
- Can incorporate thermal oxidation of exhaust stream for VOC removal
- Higher product temperatures can be achieved to assist in the destruction of pathogens.

### Disadvantages

- Higher outlet gas temperature and high humidity results in higher product temperatures and often darker product.
- Additional cost – in particular heat exchanger (typically \$ 1 – 1.5 M additional)
- A very small off-take stream is usually necessary to remove any non-condensables