The Spray Drying Process

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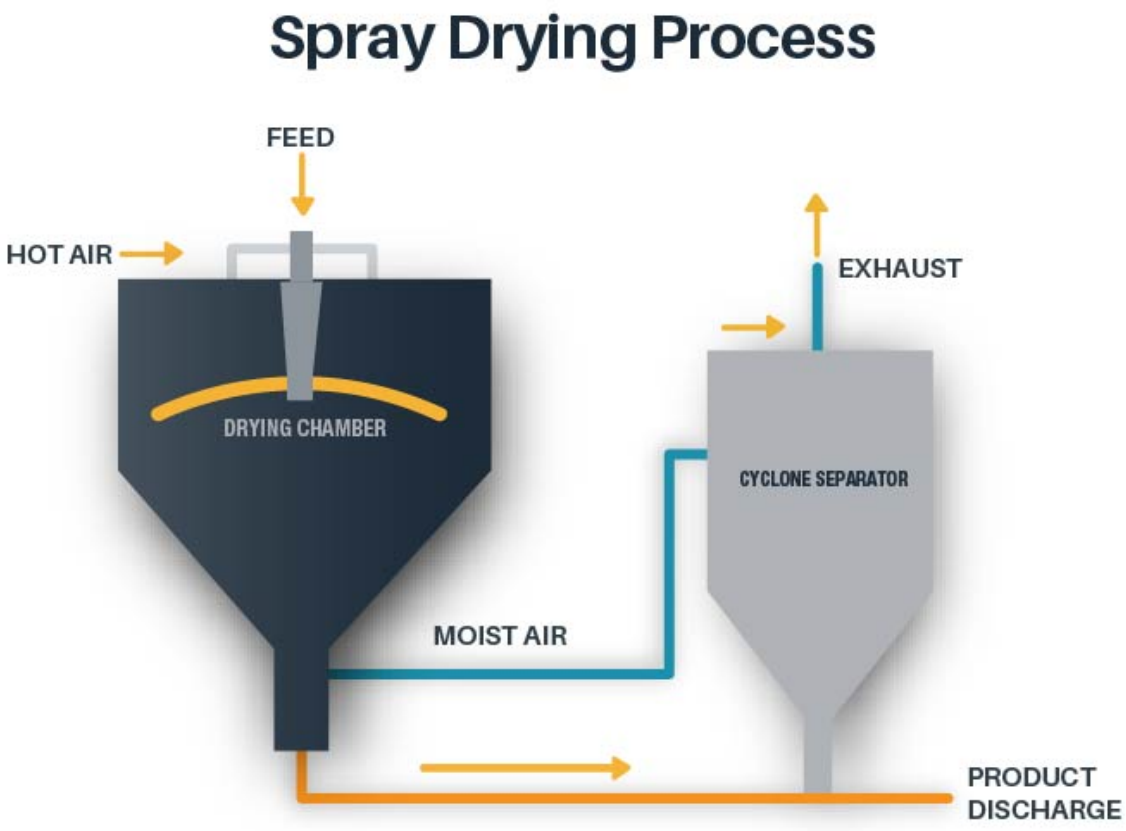

The spray drying process is older than might commonly be imagined.

Earliest descriptions date from 1860 with the first patented design recorded in 1872. The basic idea of spray drying is the production of highly dispersed powders from a fluid feed by evaporating the solvent. This is achieved by mixing a heated gas with an atomized (sprayed) fluid of high surface-to-mass ratio droplets, ideally of equal size, within a vessel (drying chamber), causing the solvent to evaporate uniformly and quickly through direct contact.

Spray drying can be used in a wide range of applications where the production of a free-flowing powder is required. This method of dehydration has become the most successful one in the following areas:

- Pharmaceuticals
- Bone and tooth amalgams
- Beverages

- Flavours, colourings and plant extracts
- Milk and egg products
- Plastics, polymers and resins
- Soaps and detergents
- Textiles and many more

Design and Control

The challenges facing both designers and users are to increase production, improve powder quality and reduce costs. This requires an understanding of the process and a robust control implementation.

Spray drying consists of the following phases:

- Feed preparation: This can be a homogenous, pumpable and free from impurities solution, suspension or paste.
- Atomization (transforming the fed into droplet): Most critical step in the process. The degree of atomization controls the drying rate and the dryer size. The most commonly used atomization techniques are:

1. Pressure nozzle atomization: Spray created by forcing the fluid through an orifice.This is an energy efficient method which also offers the narrowest particle size contribution.
2. Two-fluid nozzle atomization: Spray created by forcing the fluid through an orifice. This is an energy efficient method which also offers the narrowest particle size distribution.
3. Centrifugal atomization: Spray created by passing the feed through or across rotating disk. Most resistant to wear and can generally be un for longer periods of time.

- Drying: A constant rate phase ensures moisture evaporates rapidly from the surface of the particle. This is followed by a falling rate period where the drying is controlled by diffusion of water to the surface of the particle.
- Separation of powder form moist gas: To be carried out in an economical (e.g. recycling the drying medium) and pollutant-free manner. Fine particles are generally removed with cyclones, bag filters, precipitators or scrubbers.
- Cooling and packaging.

A control system must therefore provide flexibility in the way in which accurate and repeatable control of the spray drying is achieved and will include the following features:

- Precise loop control with setpoint profile programming
- Recipe Management System for easy parameterization
- Sequential control for complex control strategies
- Secure collection of on-line data form the system for analysis and evidence
- Local operator display with clear graphics and controlled access to parameters

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