



Air Components, Inc.

M & P Air Components, Inc. provides Components, Technologies, Guidelines, Sales and Technical Services for Industrial Air and Dry Solids Processes.

Our Goal is to provide Clients with the correct components selection and system design to achieve the best Utilization, Reliability, Safety and Economy for their plant processes.

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Technical Bulletin

Air Pollution Control – Types & Control of Dry Contaminants

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Contaminants in Industrial Processes are classified as Aerosols and are either liquids or solids.

Aerosols are a stable suspension of particles in air or gas and are distinguished by their composition and method of formation.

Liquid Aerosols such as Mist and Fog are normally collected by wet collectors, and are outside the discussion of this Bulletin.

Solid Aerosols are Dust, Smoke and Fume, and are normally collected by dry collectors.

Dust is solid particles formed by breaking of materials in mechanical processes or by disintegration of minerals and organic matter. Dust particles are normally 1.0 micron and larger.

Smoke is solid particles formed by sublimation or incomplete combustion, typically organic in nature and having a greater optical density and tendency to settle by gravity than fumes. Smoke particles are normally 0.5 micron and smaller.

Fumes are solid particles formed from vapors of solid materials through combustion, sublimation, and condensation. Fumes are normally 0.1 micron and smaller.

A proper understanding of the *Type of Contaminant* is necessary in order to determine the *Type of Control* required. Contaminants can be controlled by either *Separation* or *Filtration*.

Separation isolates the contaminant(s) from the mixture while in suspension. Mechanisms are:

Centrifugal Force uses rotational velocity to artificially increase the mass of the particle to separate it from the carrier airstream and depends on the ratio of centrifugal to gravitational force. Normally effective on particles 0.5 micron and larger. Example: Cyclone.

Electrical or Thermal Force uses either an electrically charged field to charge particles onto a collection plate

or thermal currents to increase irregular molecular movement for more efficient collection. Useful for contaminants 0.5 micron and smaller and is effective at the molecular level. Example: Electrostatic Precipitator.

Magnetic Force uses magnetic attraction onto a collecting plate and is useful for particles 3 to 5 micron and larger. Example: Magnetic Separator.

Gravitational Force is effective when the gravitational force is greater than the terminal velocity of the particle and is useful for particles 10 micron and larger. Example: Gravity Drop Out Box.

Filtration is a barrier media or mass used to remove solid aerosols from fluid while in suspension. Mechanisms are:

Straining uses a fixed media or membrane to physically restrain contaminants on its surface. Used for contaminants with good release characteristics.

Inertia or Impingement occurs when contaminants, due to inertia, impinge on the media surface or another collected particle, but do not penetrate and are removed from the airstream. Useful for particles 1.0 micron and larger.

Interception occurs when contaminants are captured as the airstream moves through the media, slowing enough for the particles to be intercepted. Media porosity decreases, as particle residence is partially permanent. Useful for particles 1.0 micron and larger.

Diffusion is represented by Brownian movement at the molecular level and requires high residence time inside the media. Useful on particles 0.5 micron and smaller.

Inertia & Interception normally account for about 99.9 % of contaminants collection 1.0 micron and larger.

Summary: A good understanding of Contaminant Types and Control Mechanism(s) is necessary for selecting the best APC Equipment for the application.

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