

materials. Wet filters or packed towers will eventually become clogged because of retention of inert dusts. Units employing fabric or other filter media will have resistance influenced by the concentration, particle size, shape and packing characteristics of the aerosol. Their overall resistance during the operating cycle may increase gradually over a known or determined period. Auxiliary cleaning devices such as separate compartments, alternately shaken, reverse air flow, or reverse jet air flow may maintain constant or nearly constant resistance or insure only small fluctuations in air or gas flow. Electrostatic precipitators have the outstanding characteristic of maintaining a constant air flow with an accompanying low resistance. Adsorbers behave similarly to packed towers in that they provide constant resistance until the voids become seriously plugged with inert dusts. This generally requires a matter of several months on normal applications.

It has been found that inertial separators require the least maintenance. Simple wet collectors rank next in this respect. Complex wet collectors and fabric arrestors require maintenance on a definitely scheduled basis. Electrostatic precipitators require the usual maintenance connected with high voltage equipment and may vary widely. The maintenance of adsorber type units is minimal and is based primarily on the amount of inert material encountered.

INERTIAL SEPARATORS

There are many types in this group. These range from simple settling chambers utilizing gravitational forces, to complex centrifugal devices using abrupt directional changes or motor driven rotors. They all have the desirable features of constant resistance during their operating cycle and do not require any special construction for temperatures under 750 F. Usually they require less maintenance than other types of collectors.

On the basis of their important characteristics inertial separators may be classified according to Table 1.

SCRUBBERS AND OTHER WET COLLECTORS

In these collectors many methods are used to wet the contaminant and remove it from the air stream. A number of wet collectors are similar in design to dry collectors with the addition of sprays or liquid contactors. The mechanism of separation in wet collectors depends on inertial forces such as impaction and impingement, and in some cases, diffusion.

Wet collectors do not require any special construction for high temperatures. They are suitable for use on mixed contaminants such as gases and solid or liquid particles. The collection of dust in a wetted form eliminates a secondary dust problem in disposal of collected material. Protection against corrosion and freezing may be necessary and disposal of waste liquids may become a problem. With the exception of the packed towers and wetted filters they all have a constant resistance during their operation.

On the basis of their important characteristics wet collectors may be classified according to Table 2.

FILTERS

Filters for industrial air and gas cleaning consist primarily of cloth dust collectors and the ultra or absolute type of filter.

Cloth dust collectors are generally constructed in the form of housings with cloth envelopes drawn over wire screen frames or with vertical cloth bags or tubes. Cloth filters depend to a great extent on the accumulated dust layer for their effectiveness. Their basic or initial efficiency depends upon the type of fabric employed; felted media such as wool gives higher

TABLE 1. INERTIAL SEPARATOR CHARACTERISTICS

	EFFICIENCY PARTICLE SIZE RANGE IN MICRONS			RESISTANCE (PRESSURE DROP)	DESCRIPTION AND REMARKS
	>100	100-10	<10		
Settling and baffle chambers	Medium	Low	Low	Low	A large chamber to reduce velocity to permit settling. Auxiliary baffles are sometimes used to improve performance. Requires large space.
Large diameter cyclones	High	Medium to Low	Low	Low	Considered as single body over 3 ft in diameter. Gases and material must be dry. Air-tight dust bins or continuous removal of material must be provided. Space requirements moderate.
Refined design centrifugals	High	High	Medium to low	Medium	Available as multiple small diameter tubes, scroll shaped bodies, and multiple louvers. Gases and material must be dry. Air-tight dust bins or continuous removal of material must be provided. Space requirements moderate.
Integral rotor type	High	High	Medium to low	See remarks	Rotor acts as air mover and separating element. Usually limited to dry granular materials and dry gases. Low space requirements. No external pressure loss involved but power requirements are higher than usual exhauster.
Slotted scroll fan	High	Medium to low	Low	See remarks	Separation takes place in fan scroll. No external loss involved but power requirements are higher than usual exhauster.

initial removal than woven fabrics. The increase in resistance to air flow, resulting from the accumulated dust layer, is related to rate of flow, concentration, and characteristics of the contaminant. Removal of the collected material is accomplished through periodic shaking by single mechanisms or combinations of them employing rapping, or through reversal of air flow, or by means of high velocity reverse air jets. With shaking or rapping, air flow is not constant and filtering velocities are usually held under 6 fpm. With reverse jets or reverse air flow, substantially constant air flow is maintained and filtering velocities are generally higher (up to 35 fpm). Filtering velocities in all fabric collectors are highly dependent upon the aerosol, fume, or dust being collected.

The ultra or absolute type of filter⁹ may consist of pleated cellulose asbestos paper, deep sand beds, composite glass wool layers, compressed glass fiber in the form of paper or batts and resin wool. The use of this