



Figure 6. Rotary centrifugal separator. (Courtesy American Air Filter Co., Louisville)

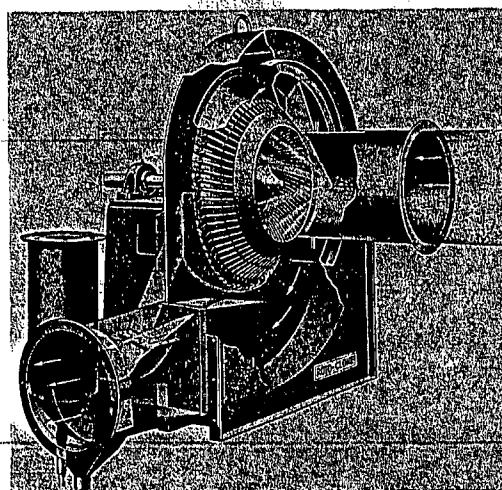


Figure 7. Rotary centrifugal scrubber. (Courtesy American Air Filter Co., Louisville)

within practical limits. "Throwaway" units are discarded when the air-flow resistance becomes too great. Large industrial installations are provided with manual or automatic arrangements for dislodging the "filter cake" and restoring the pressure drop to a point near its initial value. It is best to provide some form of pressure-indicating instrument connected across the filter to give warning

of excessive resistance that would reduce air-flow capacity or increase power consumption.

Separation ability is likely to increase as the accumulated deposit increases the internal air velocities by decreasing the pore sizes. At the same time, dust-holding capacity is limited by the permissible increase in resistance. Therefore, performance of filters should be specified in terms of initial and final pressure drops, dust-holding ability in weight per unit area or volume of medium, and initial and final separation percentage or degree.

Resistance through filters used for light duty in air conditioning ranges from 0.05 to 0.1 inch of water at velocities from 200 to 500 linear feet per minute, based on the gross area presented to the air stream. Industrial dust and fume filters, or dust arresters, operate usually at resistances from 2 to 5 inches of water at velocities from 0.5 to 10 linear feet per minute. Hemeon³ has reviewed the characteristics of these filters in some detail. The new "absolute" filters of feltlike structure composed of paper pulp and asbestos perform at velocities and resistances comparable to those occurring with cloth arresters.

Service Life. The life or period of service of an accumulating separator, such as a filter, depends upon the upper limit of resistance to air flow through the filter. This depends not only on the structure of the collecting medium, but also upon the size and shape of the particles in the deposit and the concentration of particles in the air stream.

The life expectancy of a filter may be expressed in terms of the accumulated weight of deposit per square foot of area of the medium that will result in a specified increase of resistance from the initial value to the maximum value at the required volume of air flow.

In the filter is the cleanable type, its service life depends in part on the ability to restore its resistance to a value low enough to give a workable margin below the allowable maximum pressure drop. Some media cannot be returned to their initial resistance because of the tenacity of collected particles. Eventually, the improvement by cleaning is so slight, or the interval between cleanings so short, that it becomes less expensive to install a new filter.

A. IMPINGEMENT FILTERS

Standard-size panel filters for air-conditioning or ventilating systems have been constructed of practically every material that can be formed into fibers, wires (Figure 8), perforated or expanded sheets, granules or beads. They remove particles from the air stream by a combination of screening, straining, or sieving; interception or impingement; and surface attractive forces, chiefly electrostatic. Most impingement design usually emphasizes straining and impingement and, consequently, they exhibit best performance against coarse particles, and those of irregular shapes that are easy to capture in filters.

Impingement filters are available in metals, such as steel, bronze, and aluminum, and in nonmetals, such as glass, cellulose, rubber, animal hair, and as-

³ W. C. Hemeon, *Plant and Process Ventilation*. Industrial Press, New York, 1955.