

Fig. 28-10. Principle of electrostatic precipitation. Particles passing through electrostatic field (left) become ionized (electrically charged). They are then attracted to collector plate that has the opposite charge. Collector plates are cleaned off periodically.

Courtesy American Conference of Governmental Industrial Hygienists "Industrial Ventilation"

(Text continued from page 28-19)

to a point where the particles would be no longer conveyed However, space requirements are excessive, and the presence of eddy currents nullifies the effective velocity Settling chambers can be used only for bulk coarse materials Nevertheless, this solution to collection problems is offered perennially in manifold forms—settling barrels, "dust boxes," water drums, etc These appeal to the layman because of their straightforwardness A simple calculation will show that dusts of health significance (5 microns and under) cannot possibly "settle out"

Settling chambers have their place as chip traps and as precleaners for high efficiency cleaners

Filters Two classes of filters are in common use "throwaway" and cloth filters The first type is *not* suitable for industrial exhaust air cleaning, as their principal use is in general ventilating systems It is profitless to use them in local exhaust systems

Cloth filters are generally made with cotton cloth (cotton warp sateen) sewed in the shape of tubes (hung vertically) or envelopes that fit over frames to keep the cloth sides from collapsing (Fig. 28-11). They are equipped with manual or motor-driven shakers which dislodge the collected dust when the exhaust fan is shut off, letting the dust fall into hoppers below, from where it can be removed for disposal. The cloth may also be made of glass, asbestos, wool, synthetic fiber, or metal screen for use when the air is hot or the contaminant is corrosive to cotton Filtration occurs by building up a layer of dust on the fabric which then filters additional incoming dust New cloth filters, therefore, may pass dust for a brief period—perhaps to the consternation of someone who has installed new bags for the first time—before the dust layer, that actually does the filtering, accumulates As the filter operates, its resistance gradually rises, until the fan must be shut down, and the filter shaken Its resistance then falls, but never to as low a point as it was when the filter was new. The residual dust mat needed for efficient separation always remains

Cloth filters operate at low velocities 1 to 5 cfm per square foot of cloth They have relatively high resistance 2 to 5 in water gauge They have high efficiencies, removing 99 per cent or more of the incoming dust if its particles are 1 micron in size or larger. Against smaller particles, their efficiency is lower but still eminently satisfactory

Cloth filters are relatively expensive—at least in the opinion of the heating and ventilating contractor who is used to throwaway filters—because their cost may run $0 25 to $0 75 per cfm filtered Their resistance means operating cost can be high, for example, a system handling 10,000 cfm might expend 7½ horsepower (hp) or more just overcoming the filter pressure drop They can be used only against *dry* dust Sticky or oily materials clog the bags, and when the temperature is below dew point, condensation results in exorbitant pressure drops and ineffective cleaning by the shaker

Cloth filters are ordinarily used for intermittent operation, which means the fan is shut down every few hours to permit shaking of the cloth They may also be installed for automatic-continuous use Periodically, a section is shut off from the system and the bags in this section are shaken This involves enlarged cloth area, and additional air dampers and controls

Wherever possible, the shaker should be motor driven Also, it should be connected with a timer, so that the exhaust fan is