

AIR CLEANING EQUIPMENT

Primary dust separators depend for their air cleaning action on centrifuging out the dust particles or on imparting to the transporting air stream a quick change in direction, accompanied by a sudden reduction in velocity. They may be applied to exhaust systems from polishing and buffing wheels and, in some cases, as a preliminary separator ahead of a final dust arrester.

Dust particles which cannot be caught in inertia type separators are usually removed by one of the following methods:

1. *Filtration.* Of the filter arresters the cloth type, either of the screen, envelope, or bag construction, is most generally used for industrial exhaust systems. Cloth arresters properly engineered for this job and handling dust for which they are suited operate at a good efficiency.

2. *Wet Collectors.* Wet collectors have been in use for many years, but only recently have been introduced for collection of industrial dust from exhaust systems. They are particularly applicable where moisture is present in the air being exhausted. The resistance is relatively low in wet collectors suitable for dust removal and remains constant for a given exhaust system.

3. *High-tension Electrical Precipitation.* High-tension electrical precipitation has been applied to removal of dust, fumes, and mists from air and other gases. (See section on Electric Precipitators in Chapter 28).

4. *Dynamic Precipitators.* This equipment effects removal of entrained dusts by means of a specially designed fan in which the rotating element imparts a centrifugal force to the dust particles. Originally these precipitators were intended for the collection of dry dust, but recently the construction has been modified to permit the introduction of water into the dirty air intake, thus increasing its application to more kinds of dust. Consideration must be given to the type of dust handled¹².

For additional information on dust and cinders, see Chapter 28, Air Cleaning Devices.

RESISTANCE OF SYSTEM

The maintained resistance of the exhaust system is composed of three factors: (1) loss through the hoods, (2) collector drop, and (3) friction drop in the duct system.

The loss through the hoods is usually assumed to be equal to the suction maintained at the hoods. Where possible the resistance of the particular collector to be used should be obtained from the manufacturer.

Friction drop in the pipes must be computed for each section where there is a change in area or in velocity. The velocities should be found in each section of pipe starting with the branch most remote from the fan. The friction drop for these sections can be determined by reference to Table 8 in this chapter and Fig. 2, Chapter 31. Total friction loss in the piping system is the friction drop in the most remote branch plus the drop in the various sections of the main, plus the drop in the discharge pipe.

EFFICIENCY OF EXHAUST SYSTEMS

The efficiency of an exhaust system depends upon its effectiveness in

¹²The National Silicosis Conference Report (*Bulletin No. 13*, U. S. Department of Labor, February 3, 1937).

TABLE 9. ACCEPTED STANDARDS FOR TOXIC CONCENTRATION OF FUMES, DUSTS AND MISTS^a

FUMES	MILLIGRAMS PER CUBIC METER
Cadmium oxide	0.1
Chlorodiphenyl	1.0
Lead or oxides of lead	0.15
Mercury or mercury compounds	0.1
Pentachloronaphthalene	0.5
Trichloronaphthalene	5.0
Zinc oxide	15.0
DUSTS	MILLION PARTICLES PER CUBIC FOOT ^b
Asbestos	5
Cement	100
Gypsum	100
Lead or compounds of lead	0.15 ^c
Manganese	6 ^c
Marble	100
Silica (more than 70 per cent free silicon-dioxide)	5
Silica (more than 10 per cent free silicon-dioxide)	10
Silica (less than 10 per cent free silicon-dioxide)	100
MISTS	MILLIGRAMS PER CUBIC METER
Chromic acid	0.1
Sulphuric acid	5.0

^aAdapted from Safe Concentrations of Certain Common Toxic Substances Used in Industry, by M. Bowditch, C. K. Drinker, P. Drinker, H. A. Haggard, and H. Hamilton (*Journal of Industrial Hygiene and Toxicology*, Vol. 22, No. 6, June, 1940). Industrial Code Bulletin No. 35 (New York State Labor Department). Study of Asbestosis in Asbestos Textile Industry (*U. S. Public Health Bulletin No. 241*, 1938). Chronic Manganese Poisoning in an Ore Crushing Mill (*U. S. Public Health Bulletin No. 247*, 1940).

^bDetermined by light field or equivalent technique.

^cMilligrams per cubic meter.

reducing the concentration of dusts, fumes, vapors and gases below the safe or threshold limits¹⁴.

Too much emphasis cannot be placed on the necessity of testing exhaust systems frequently by determining the concentration of atmospheric contamination at the worker's breathing level¹⁵. Commonly accepted values of threshold limits for usual atmospheric contaminants, such as fumes, dusts and mists are given in Table 9. Similar data covering gases and vapor will be found in Chapter 27.

AIR FLOW PRODUCING EQUIPMENT

In any type of exhaust system some form of air flow producing equipment should be required to create the pressure necessary to cause the air to flow through the system to the discharge stack. Natural draft should not be depended on to remove harmful or dangerous gases, fumes, mists, dusts, or other matter when it is imperative that such matter be removed from the work place or room atmosphere.

The principal types of air moving equipment are chimney exhausts,

¹⁴Criteria for Industrial Exhaust Systems, by J. J. Bloomfield (A.S.H.V.E. TRANSACTIONS, Vol. 40, 1934, p. 353).

¹⁵Keeping Dust Under Control, by John M. Kane (presented to the 31st National Safety Congress, October 28, 1942, and reprinted in part in *National Safety News*, January, 1943).