

sections of the trap are closed off at intervals by means of dampers and the dust is shaken off the roughened surface into a hopper below.

These devices work very well in catching large size dust and cinders and trap much of the fine dust. They have been used most extensively on stoker-fired installations. They have the advantage of low pressure drop, relatively small space requirements, and low first cost.

Centrifugal Catchers

Centrifugal catchers obtain separation by projecting the particles tangentially out of the gas stream. The effectiveness of this type of catcher varies directly as the specific weight of the dust and as the square of the tangential velocity, and inversely as the radius of rotation.

Electrostatic Precipitators

Electrostatic precipitators are used for catching fine dust. These precipitators consist of dust-tight chambers in which are suspended reinforced concrete slabs on about 10-in. centers. Between the slabs are suspended bare metal rods. High-voltage unidirectional current is applied to the reinforcing rods in the concrete slabs acting as positive electrodes, the bare rods acting as negative electrodes. The dust-laden gas flows horizontally through the precipitator and the dust particles migrate toward the concrete slabs to which they adhere and then fall or are scraped off into the dust hoppers below.

Gas Scrubbers

Wet scrubbers have been used for many years for removing dust from gases. A number of different types of scrubbers are now being built for removing dust from boiler flue gases. One type depends upon saturating the gas and washing the dust out of suspension by a spray of water. For best results with this type, the water should be atomized into as fine a spray as possible.

Another type depends upon splitting the gas into thin strata and subjecting these strata to a number of abrupt changes in direction, throwing the dust against the wet surfaces. The main problem in developing a satisfactory wet dust catcher is to find suitable materials of construction that will resist the corrosive action of the wash water for a reasonable length of time.

Filters

Filters of many kinds have been used with variable success. The filter bags are made of cotton, wool or asbestos fabric.

One of the serious objections to all of these dust catchers is their relatively high cost of installation and maintenance, and space requirements.

Chapter 39

PHYSICAL DATA

Physical Units; Conversion Equations; Instruments for and Methods of Measurement; Water; Steam; Air.

MODERN engineering practice depends upon the correct application of basic principles already developed and established in such branches of physical science as mechanics, thermodynamics, hydraulics, physics and chemistry. In the United States the system of units in general use by engineers is known as the *foot-pound-second system*. The definitions of many common terms used in heating and ventilating work are given in Chapter 1.

PHYSICAL UNITS

Acceleration: $(a) = \frac{V}{t}$. Rate of change of velocity. Unit, one foot per second per second.

Acceleration Due to Gravity: (g) . Rate of gain in velocity of a freely falling body; 32.174 fps per second, but usually taken as 32.2 fps per second. Unit, one foot per second per second.

Area: $(A) = \text{length} \times \text{width}$. Unit, square foot or square inch. (See Table 1 for areas of circles).

Density: $(\rho, \text{rho}) = \frac{W}{V}$. Weight of a unit volume. Unit, one pound per cubic foot.

Force: $(F) = \frac{WV}{gt}$. The action on a body which tends to change its relative condition as to rest or motion. Unit, pound.

Length: $(L) = \frac{1}{2} at^2$. Unit, foot, which is $\frac{1}{32}$ of the value of the standard U. S. yard, or 0.3048 meter. The symbol h is used for height.

Mass: $(m) = \frac{W}{g}$. The quantity of matter, in pounds, to which the unit of force (one pound) will give an acceleration of one foot per second per second. Unit, slug.

Mechanical Equivalent of Heat: $(J) = 1 \text{ Btu} = 777.5 \text{ ft-lb}$.

Power: $(P) = \frac{W}{t}$. The rate of performing work. Unit, horsepower. One horsepower is 550 ft-lb of work per second, or 33,000 ft-lb per minute.

Specific Gravity: Ratio of the weight of a body to the weight of an equal volume of water at some standard temperature, usually 39.2 F. (See Table 2).

Specific Volume: $(v) = \frac{1}{\rho} = \frac{W}{V}$. Volume per unit weight. Unit, one cubic foot per pound.

Time: (t) . Unit, second, which is $1/86,400$ part of a mean solar day. Time is also expressed in minutes and hours.

Velocity: $(V) = at = \frac{L}{t}$. Rate of motion of a body. Unit, one foot per second.