

Dusts and cinders in flue gas may be caught by various devices on the market, such as fabric filters, dust traps, settling chambers, centrifugal separators, electrical precipitators, and gas scrubbers, described in Chapter 29.

The cinder particles are usually larger in size than the dust particles; they are gray or black in color, and are abrasive. Being of a larger size, the range within which they may annoy is limited.

The dust particles are usually extremely fine; they are light gray or yellow in color, and are not as abrasive as cinder particles. Being extremely fine, they are readily distributed over a large area by air currents.

The nuisance created by the solid particles in the air is dependent on the size and physical characteristics of the individual particles. The difficulty of catching the dust and cinder particles is principally a function of the size and specific gravity of the particles.

Lower rates of combustion per square foot of grate area will reduce the quantity of solid matter discharged from the chimney with the gases of combustion. The burning of coke, coking coal, and sized coal from which the extremely fine coal has been removed will not as a general rule produce as much dust and cinders as will result from the burning of non-coking coals and slack coals when they are burned on a grate.

Modern boiler installations are usually designed for high capacity per square foot of ground area because such designs give the lowest cost of construction per unit of capacity. Designs of this type discharge a large quantity of dust and cinders with the gases of combustion, and if pollution of the atmosphere is to be prevented, some type of catcher must be installed.

NATURE'S DUST CATCHER

Nature has provided means for catching solid particles in the air and depositing them upon the earth. A dust particle forms the nucleus for each rain drop and the rain picks up dust as it falls from the clouds to the earth. However, it was found in recent studies⁵ that rain was not a good air cleaner of the material below about 0.7 micron.

⁵Atmospheric Pollution of American Cities for the years 1931-1933, by J. E. Ives et al (*U. S. Public Health Bulletin* No. 224, March, 1936).

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Chapter 29

AIR CLEANING DEVICES

Air Cleaners, Dust and Lint, Classification of Air Cleaning Media, Viscous Impingement Type Cleaners, Automatic Viscous Filters, Dry Air Filters, Electric Precipitators, Performance and Testing, Selection and Maintenance, Safety Requirements, Odor Adsorption

FOR the purposes of this discussion, an air cleaner is defined as a device for capturing and removing solid matter from a stream of air. This solid matter includes fibrous material such as lint as well as particulate matter such as dust, fumes, smoke, cinders, etc. Air cleaning is distinct from air purification in that the latter consists of removing harmful or unpleasant gases, vapors, or bacteria from an occupied space. Air purification is discussed in Chapters 2 and 28.

In general, air cleaners are not installed in buildings for the specific purpose of improving the health of the occupants. However, in some cases air borne solid matter does affect health and the removal of such matter from the air by means of cleaners is beneficial, such as pollen, house dust, and similar allergens which motivate attacks on persons having allergic sensitivity¹. The toxic elements in some war gases are in reality fine particles capable of air flotation.

It is known by experience that air cleaners greatly reduce the rate of dirt accumulation in buildings, but, in the present state of knowledge, an exact numerical expression for the cleaning effect of the filter cannot be given on account of the many unknown or variable factors involved. For this reason air cleaners are usually selected on a basis of experience or judgment, guided by the results of various test procedures.

AIR CLEANERS

A typical air cleaner consists of a frame, which may be metal, wood, cardboard, etc., and a filtering medium. The frame is designed to support the medium in a duct or chamber forming part of the air conditioning or ventilating system, so that the air passes through the medium while en route to spaces to be ventilated.

Unit Air Cleaners or Filters

Many air cleaners are available in the form of units of convenient size for handling during installation, cleaning or replacement, where required.

¹Bronchial Asthma and Allied Allergic Disorders, by S. S. Leopold, and C. S. Leopold (*Journal of the American Medical Association*, March 7, 1925, Vol. 84, p. 731-734).