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CHAPTER 33

AIR CLEANING

Filters, Dust and Lint, Viscous Impingement Type Filters, Dry Air Filters, Electric Precipitators, Air Filter Performance, Testing, Selection and Maintenance, Filter Installation, Adsorption of Vapors, Dust Collectors, Degree of Dust Removal Required, Factors Affecting Selection, Types and Application of Dust Collectors, High Voltage Electrostatic Precipitators, Wet and Centrifugal Collectors, Settling Chambers, Testing Methods

AIR cleaning devices remove contaminants from an air or gas stream. They are available in a wide range of designs to meet various air cleaning requirements. Degree of removal required, quantity and characteristics of the contaminant to be removed, and conditions of the air or gas stream will all have a bearing on the device selected for a given application. Definitions and a discussion of contaminant characteristics are given in Chapter 8, together with some consideration of their origin.

Air cleaning devices are divided in this chapter into two basic groups: Air Filters, described in Part I, and Dust Collectors, described in Part II.

Air filters are designed to remove dust concentrations such as are found in outside air, and are employed in ventilation, air conditioning, and heating systems where dust content seldom exceeds four grains per thousand cubic feet of air.

Dust collectors are designed for the heavier industrial loads encountered in local exhaust ventilation where dust content (loading) ranges from 100 to 20,000 grains per thousand cubic feet of air. This heavy loading from industrial dust control systems is often overlooked. Because of it air cleaning devices in the air filter group can seldom be used for control of process dust in industrial applications.

PART I—AIR FILTERS

Air filters are installed in ventilating systems to remove the airborne dusts which tend to settle out in the still air of the ventilated space and become a nuisance. Such dust comes under the classification of temporary atmospheric impurities listed in Fig. 1, Chapter 8, and includes most of the pollens, house dust, and similar allergens which motivate attacks upon persons of allergic sensitivity.[1]

The air filters classified as viscous impingement types are widely used in general ventilating systems, and will usually justify their cost through a reduction in housekeeping costs in the ventilated space. For industrial applications, and in locations where the larger part of the atmospheric impurities are of fine particle size such as smoke and fumes, more effective dry filters and electric precipitators are proving economical. By use of combinations of filters, advantage may be taken of specific characteristics of the various types of filters.

There is at the present time no generally accepted standard test method for measuring the cleaning efficiency of an air filter. Air filters are usually