ings, drives and motors outside the gas stream, centrifugal fans are usually used and in arrangements 1, 2, 4, or 8 (Fig. 6). The exception is in the case of fans handling explosive mixtures, where propeller or axial fans are permissible when built with explosion-proof motors and non-ferrous wheels.

Fans handling hot air or gas are generally of the centrifugal types and follow arrangements 1 or 8 so that bearings, drives and motors are remote from the heat. If of double inlet type, they have inlet boxes and long shafts to keep the bearings outside the stream. Propeller or axial types are rare when the temperature exceeds 150 F. With temperatures above 600 F special heat resistant materials may be required for the rotors. In addition to a remote location for the bearings, external cooling is frequently required when the temperature exceeds 200 to 250 F. This is often obtained by use of air cooled or water cooled jackets. With antifriction bearings a heat radiating disk or a small circulating impeller between the fan and the nearest bearing is sometimes sufficient. Oil lubrication rather than grease lubrication is commonly recommended.

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CHAPTER 34

AIR CLEANING

Atmospheric Air Cleaners: Airborne Particulate Matter, Viscous Impingement Filters, Dry Air Filters, Electronic Air Cleaners, Air Filter Performance, Selection, Maintenance, Installation, Adsorption of Vapors; **Industrial Air and Gas Cleaners:** Degree of Cleaning, Selection, Types, Application, Inertial Separators, Scrubbers, Wet Collectors, Filters, Electronic Precipitators, Adsorbers, Absorbers, Combustion Devices

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 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: Atmospheric Air Cleaners, described in Part I, and Industrial Air and Gas Cleaners, described in Part II.

Atmospheric Air Cleaners are ordinarily used to remove particulates such as are found in outside air, and are employed in ventilation, air conditioning, and heating systems where dust content seldom exceeds 4 grains per 1000 cu ft of air.

Industrial Air and Gas Cleaners are ordinarily used for the heavier concentrations encountered in local exhaust ventilation where the particulate content (loading) ranges from 100 to 20,000 grains per 1000 cu ft of air. Because of these heavier loadings, atmospheric air cleaners can seldom be used for the control of process aerosols in industrial applications.

PART I—ATMOSPHERIC AIR CLEANERS

Conventional air filters and electronic air cleaners are installed in air handling systems to remove dusts. These dusts constitute a mixture of particle sizes within the classification of temporary and permanent impurities listed in Fig. 1, Chapter 8, including bacteria, pollens, house dusts, and similar allergens which motivate attacks on persons of allergic sensitivity.[1, 2]

Since the purpose of the filter or cleaner is to free the air of as much existing contamination as practicable, the degree of air cleanliness required should influence the choice of apparatus. Atmospheric dusts are mixtures of particles in all sizes. The removal of these particles and fractions becomes progressively difficult as the particle size decreases. Smoke particles are of major importance in many applications. Air cleaners will justify their cost through a reduction in housekeeping expense in the