of dust and lint on a filtering medium is possible, though the medium itself may not burn.

ADSORPTION OF VAPORS OTHER THAN WATER

Many of the foreign gases in the atmosphere are selectively adsorbed by charcoal. Included are many of the organic gases, such as those emanating from animals and people, some of the gaseous constituents of combustion, alcohols, ketones, esters, and gaseous products of putrefaction.

Charcoals differ widely in their adsorptive capacity. Those which have marked adsorption characteristics, such as properly prepared coconut shell charcoals, are sometimes called *activated charcoals* or *activated carbon*. These materials can adsorb approximately 50 percent of their own weight of many organic gases at 70 F. The charcoal may be used for a long time by reactivation at high temperatures, under which condition it gives up the adsorbed gases. Temperatures of approximately 1000 F are desirable for reactivation. Charcoals for use in air handling systems should be able to stand physical handling, including reactivation, without excessive loss by breakage or dusting.

As applied in air handling systems, the charcoal is placed in perforated metal containers which are grouped in frames and set in the air stream. The percentage removal of an organic gas, such as carbon tetrachloride, is 95 percent or above, when placed in intimate contact with the carbon at 70 F. In commercial apparatus there may be a by-pass effect which depends on the physical arrangement of the charcoal containers. This by-passing reduces the percentage removed in the total gas passing through the adsorber. Resistance to air flow is usually selected within the general range of resistance of impingement filters.

The required quantity of recirculated air to be treated is determined by dividing the requirements for contaminant-free air, minus the outdoor air, by the fraction denoting the percentage removal of the gas in question in the adsorber bank which is to be used.

Adsorbers may be applied to reduce objectionable gases entering through the outdoor air inlet. They may also be used to reduce the odors caused by exhausts from processing. Adsorber beds, in all cases, should be protected from dust, free oil and grease.

PART II—INDUSTRIAL AIR AND GAS CLEANERS

Industrial development and growth of industrial areas have had a cumulative effect upon the problem of controlling contaminants. Not only has the atmosphere in many cities become more polluted, but the intensity of pollution at the points of control has increased. Accompanying this increase in pollution there has been a growing consciousness of the need for more effective air cleaning among housewives, store managers, industrialists and legal inspectors, and this has resulted in increasing severity of regulations pertaining to collection of dust and contaminants.

Air cleaning for the supply system is usually accomplished by means of some type of air filter. To prevent escape of industrial dust into the atmosphere, some type of collector is required. An industrial air cleaning installation is designed to perform one or more of the following 6 functions:

1. Prevent a nuisance or physical damage to an individual, a plant, or adjacent property.

2. Prevent re-entry of contaminants to working spaces.
3. Reclaim usable material.
4. Reduce fire, explosion, or other hazards.
5. Permit recirculation of cleaned air to working spaces.
6. Allow utilization of cleaned gases for processes.

DEGREE OF AIR CLEANING REQUIRED

The amount of material which can be discharged is established by local or state regulations prepared by pollution control, labor or health departments. Standards are established to prevent injury to persons or property. The need for control within the plant is often of prime interest to the industrialist for protecting his equipment, improving his product, and providing a clean working environment. The re-entry of contaminants to working spaces is prevented by effective air cleaning devices since only a clean effluent is discharged to the ambient atmosphere. Public nuisance complaints often occur even when the effluent concentration discharged to the atmosphere is below the permissible limits of concentration and visibility. Plant location, contaminants involved, and meteorological condition of the areas must be evaluated in addition to existing regulations or codes of good practice.

Fire and explosion hazards are created by combustible dusts, vapors, or gases. Safety may be affected by loss of visibility, settlement, or accumulation of various materials. The cleaning device can prevent these hazards by providing an effluent below the inflammation limit, visibility index, and point where settlement or accumulation will occur.

The degree of air cleaning for the recovery of useable material is a matter of economic evaluation which will vary with such factors as quantity and value of material collected, capital cost, and operating cost.

Air cleanliness must be of the highest order where toxic materials are involved and the cleaned air is recirculated to the workroom. Such recirculation is considered poor practice and is prohibited by many regulations where toxic materials are involved, except for those cases where discharge to atmosphere is impossible or decidedly impracticable. Where air is recirculated, its contamination must not exceed the established maximum allowable concentrations listed in Chapter 8. Usual requirements are a fraction, often $\frac{1}{5}$ to $\frac{1}{2}$, of this standard, depending on: regulation involved, air quantities recirculated in relation to the cubical content of working space, and the presence of other exhaust systems discharging to the atmosphere.

Cleaning requirements for the utilization of cleaned gases are dependent on the process and are generally of the highest order (usually comparable to atmospheric air cleanliness).

Regardless of standards it is good practice to install the most effective collection equipment available in the light of practical operation features, installation, and equipment costs. This is warranted because the required degree of cleaning is increasing continually.

FACTORS AFFECTING SELECTION

Selection of an industrial air cleaner for a given application requires an evaluation of the following 5 considerations:

1. Concentration, particle size, and size distribution of the contaminant.