

Local Exhaust System

- Low maintenance, that is, infrequent and quick servicing of the collector, is essential to keep to a minimum the exposure of the men doing the job
- Finally, the radioactive or highly toxic material must be concentrated during collection to the smallest possible volume. Disposal through discharge to air, water, or land in the usual manner is not permitted. Incineration is often used, with the irreducible residue consigned to a burial ground

Only a few types of collectors meet these requirements. Dry cyclones are no good because their collecting efficiency is too low. Any unit with an involved internal structure must be ruled out because of service difficulties.

The reverse-jet cloth arrester with wool felt media has become almost a standard where there is no problem of temperature or corrosion. Where such problems exist, the high-voltage electrostatic collector can be used.

Low-efficiency, low-cost filters are often used as integral parts of laboratory hoods or dry boxes in which radioactive materials are handled. They serve as scalping filters to keep high concentrations of contaminated material from entering the main exhaust system. They must be followed or backed up by an ultra-high-efficiency filter or dust arrester. They have limited capacity and must be changed frequently. Before they are changed, they can well be sprayed while still in position with an acrylic spray to fix any radioactive dust.

Air cleaners for fumes and smokes

Fumes come from reactions such as burning, sublimation, distillation, and especially the condensing of a vapor given off by a molten metal. The composition of fumes may be different from that of the parent material. Lead fume, cadmium fume, zinc oxide, and iron oxide (welding fume) are typical examples. Their particles are generally below 1 micron, so they show active Brownian movement (that is, they are far too small to settle out), and they are remarkably uniform in size. Smokes are commonly organic, coming from incomplete combustion of coal, oil, wood, and other fuels. They are usually dark or jet black in

color, and obscure light. Their particles compare in size to the particles of metallurgical fumes.

The high-efficiency dust collectors already mentioned—the cloth filter, high-efficiency wet collector, and electrostatic precipitator—are best for arresting fumes. For smokes, the answer is improved combustion, or the high-voltage electrostatic precipitator, or both.

Air cleaners for gases and vapors

Vapors may be defined as the gaseous form of a material which is normally in the liquid or solid state at room temperature. Gases and vapors are not particles, but are individual molecules dispersed among the molecules of the air. Gases and vapors diffuse. Arresters depending on the straining action of filters or on centrifugal force are not applicable. Methods generally used are as follows:

Absorption. A liquid is used in a packed tower or scrubber which dissolves or reacts chemically with the gas or vapor and removes it in a harmless state. The disposal of this liquid may then present problems of waste control and steam pollution.

Adsorption. Many solid particles have an adsorbing action for certain gases and vapors. The action takes place at the surface of the adsorbent where gas and solid come in contact with each other. The most widely used for removing odors is activated carbon, which is placed in granule form in trays, canisters, or perforated cans. Activated carbon can adsorb some vapors and gases up to 50 per cent of its own weight. It can then be reactivated by heating. One application is the removal of solvent vapors. The method is appealing because the solvent can later be reclaimed.

Combustion. If the gas or vapor can be oxidized to harmless or odorless products, combustion can be used for removal. All hydrocarbons can be so removed because on complete oxidation the only end products are water and carbon dioxide.

The most satisfactory method of consuming odorous or otherwise troublesome organic gases and vapors is by means of direct-flame afterburning. However, proper safety pre-