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CHAPTER 12

ODORS

Odors and Odor Control; Odor Detection and Measurement; Odor Sources, Humidity and Temperature Effects; Adsorption and Release of Odors; Odor Removal, Ventilation; Charcoal Adsorption; Washing and Scrubbing; Chemical Reaction; Neutralization, Masking, and Counteraction; Combustion Methods

CONTROL of odors would not be necessary if the air were clean and uncontaminated. This is usually not the case, particularly in crowded buildings, urban areas, and industrial centers where contaminants are concentrated and obnoxious or where harmful odors are generated. It is therefore necessary to select a suitable and economical means of improving the quality of the air. This is a problem similar to that of controlling air pollution by means of smoke abatement and dust removal. A knowledge of the nature and magnitude of the odor and its indoor or outdoor source is necessary for a satisfactory solution of the problem of odor control. Community planning and zoning will avoid much of the difficulty in the future, but meanwhile many industrial cities must resort to corrective measures by requiring installation of air cleaning devices, alteration of manufacturing processes, or termination of the offensive operation in residential or commercial districts.

Control of outdoor odor nuisance is especially troublesome because of the extremely minute quantities of contaminant that are capable of offending through a wide area. New industrial chemicals with strange or unfamiliar odors tend to receive more attention from the neighborhood than the customary odors generated by well-known processes and raw materials. Methods of odor control currently in use include charcoal adsorption, chemical reaction, scrubbing towers and air washers, chlorination, condensation, masking, passage of the odorous air through combustion chambers, dispersion through a tall stack, and best of all, substitution of less offensive materials whenever possible.¹⁻⁴

ODORS AND ODOR CONTROL

Odor is defined as that property of a substance which excites the sense of smell. To be odorous, a substance is usually in a gaseous or vapor state, or possesses a vapor pressure.⁵ Some odors are pleasant, others unpleasant, depending on their psychological and sociological associations.

Odors in themselves are not the cause of organic disease. The discomfort and disagreeableness that may be brought about by obnoxious odors, however, may cause some temporary ill effects. The effects that fringe upon ill health include

The general responsibility for this chapter is assigned to TC 1.6 Odor Causes and Control.

lowered appetite, lowered water consumption, impaired respiration, nausea, vomiting, and insomnia.⁶

Some odors may not always be recognized as such. Some people, for example, may characterize the air in a space as fresh or clean, stale or stuffy. Fresh air may be odor-free, or it may have a pleasant, outdoor-type of odor (such as the scent of pine oil). Stuffy air, on the other hand, usually is air that is contaminated with a conglomeration of occupied-space odors, which produces a depressing physiological or psychological response, rather than the sensation of odors. In some cases odors are sensed initially but the depressing effect remains after the nose has been desensitized. According to some authorities, stuffy odors do actually produce a physiological reaction; breathing becomes shallower, and pulse and respiration rate are slowed.

Odors associated with some dangerous gases and vapors serve as immediate valuable warning agents against poisoning or explosion. However, some toxic substances have no associated odors. Warning against such gases can be obtained by adding tracer or warning agents to the otherwise odorless gases, as is sometimes done with gas fuels. While odors give immediate warning to persons entering dangerous atmospheres, irritants are more satisfactory for warning against gradually increasing concentrations of a low order. Odors serve as an index to personal discomfort in enclosed spaces, but are not necessarily an index to harmful vitiation in respect to insufficient oxygen or an excess of carbon dioxide.

Odors can be characterized by three factors: (1) they must have a source, (2) they must enter the environmental air, (3) they must move to a biologic sensor which registers them as pleasant or unpleasant. Generally speaking, odors may be controlled by control of each of these factors: release from source, migration, or sensing. The most economical solution will vary with different odor problems.

An odor is simply one or more discrete chemical molecules capable of stimulating the sense of smell. The manner in which certain chemicals can elicit an olfactory response is not known at this time. It is, therefore, impossible to assign odorlessness as a property peculiar to certain chemical elements, compounds or structures, although odor qualities can be associated with such molecular arrangements as aldehydes, esters and ketones.