

Recognition and Control of

Fume and Dust Exposure

By V. J. CASTROP

RESPONSIBILITY for employee health is delegated by management to the *medical director*, while the *safety director* is charged with accident prevention activities. For the smooth functioning of either department, it is necessary that these individuals work in harmony.

The safety engineer spends much of his time in the plant and usually is well informed about working conditions. The doctor, on the other hand, must spend most of his time tending to the medical needs of the employee and to the administrative work of his department. As a result, he has insufficient time for plant surveys. This is particularly true in plants where the doctor is employed on a part-time basis.

A safety engineer who is capable of recognizing conditions which may be detrimental to health is an excellent team mate for the doctor in a health maintenance program. The safety engineer need not be capable of actually sampling air in the environment or designing a ventilation system for the control of toxic materials. He should, however, have knowledge of the materials which have been proved harmful, and should have some understanding of basic control measures.

The safety engineer, as well as the doctor, should be informed as to where he can obtain the technical personnel to do the sampling and detailed study of the environment and engineering personnel to render assistance in the control of exposure. Such assistance may be obtained from the industrial hygiene divisions of either the health or labor departments of many states. Some city governments likewise have industrial hygiene bureaus.

In addition to these governmental agencies, many insurance carriers have on their staffs men who are capable of sampling and rendering engineering assistance. Private consultants are also available, or you may find that an industrial hygienist is employed by your own organization.

V. J. Castrop is Assistant Head, Industrial Hygiene Department, Research Laboratories Division, General Motors Corp., Detroit, Mich. This article has been condensed from a paper presented at the Automotive and Machine Shop Section, 35th National Safety Congress.



Inside and outside views of vapor blasting equipment. Here either steel or water under pressure are used. Cabinets must be maintained so that leakage of solid does not occur.

Local exhaust ventilation of soldering operations.

This discussion will be limited to basic principles of industrial hygiene as they relate to fume and dust exposures, to indicate what control measures are available or used to protect the employee's health, and to call attention to operations and materials which are commonly used in industry, at the same time indicating generally accepted opinion as to their effect on health.

Many conditions are improved for reasons other than their effect upon health. Better products, better employee relationship, reduction in maintenance of equipment may be cited as justification for management's decisions for such correction.

Definitions

Laymen frequently designate as "fume" any vapor, fog, gas, etc., they may encounter. In industry, the plating mist over a chrome tank, the vapor or gases, at a metal-cleaning operation or the exhaust gases from a truck are frequently referred to as "fumes." To the industrial hygienist, the term has a more definite meaning. For this discussion, fume may be considered to be particulate matter formed by the condensation of a vapor. A molten bath of lead at a high temperature causes the metal to volatilize and form a vapor. Upon contact with the cooler surrounding atmosphere condensation occurs and the physical state changes from vapor to a solid metallic particle.

While dust is also a solid particle, it is formed by the disintegration of solid materials by grinding, crushing, abrasion, or similar action.

Fume particles are generally small in diameter, with the size dependent upon the type of fume, the extent of flocculation, and other factors. Dust particles of hygienic significance are those between one and ten microns in size. (25,400 microns are equivalent to one inch).

Generally speaking, there are two means of entrance of toxic compounds into the human body—by ingestion or via the respiratory tract through inhalation of fumes, dusts, mists or gases. Ingestion is of importance if toxic materials which have a systemic effect are used and adequate washing facilities are not provided, or, where the employees are slovenly in personal habits.

Inhalation is considered the most important portal of entry of fumes or dusts and the particle size, therefore, becomes significant in evaluating exposure. The particles which cause the physiological changes are those which are small enough to remain suspended in the air and not those which immediately fall to the floor. Flying particles, which may cause eye injuries are not of hygienic significance since they are not of respirable size. To judge the seriousness of an exposure by the quantity of detritus adjacent to an operation is often misleading. This is especially true where mechanical ventilation removes the fine material but is inadequate to trap or convey the larger particles.

In evaluating an exposure it is necessary to consider the toxicity of the material, the duration of the exposure, the average concentration of the contaminant with special attention being paid to those operations which produce high concentrations at some phase of an operating cycle, and the measures which have been provided

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