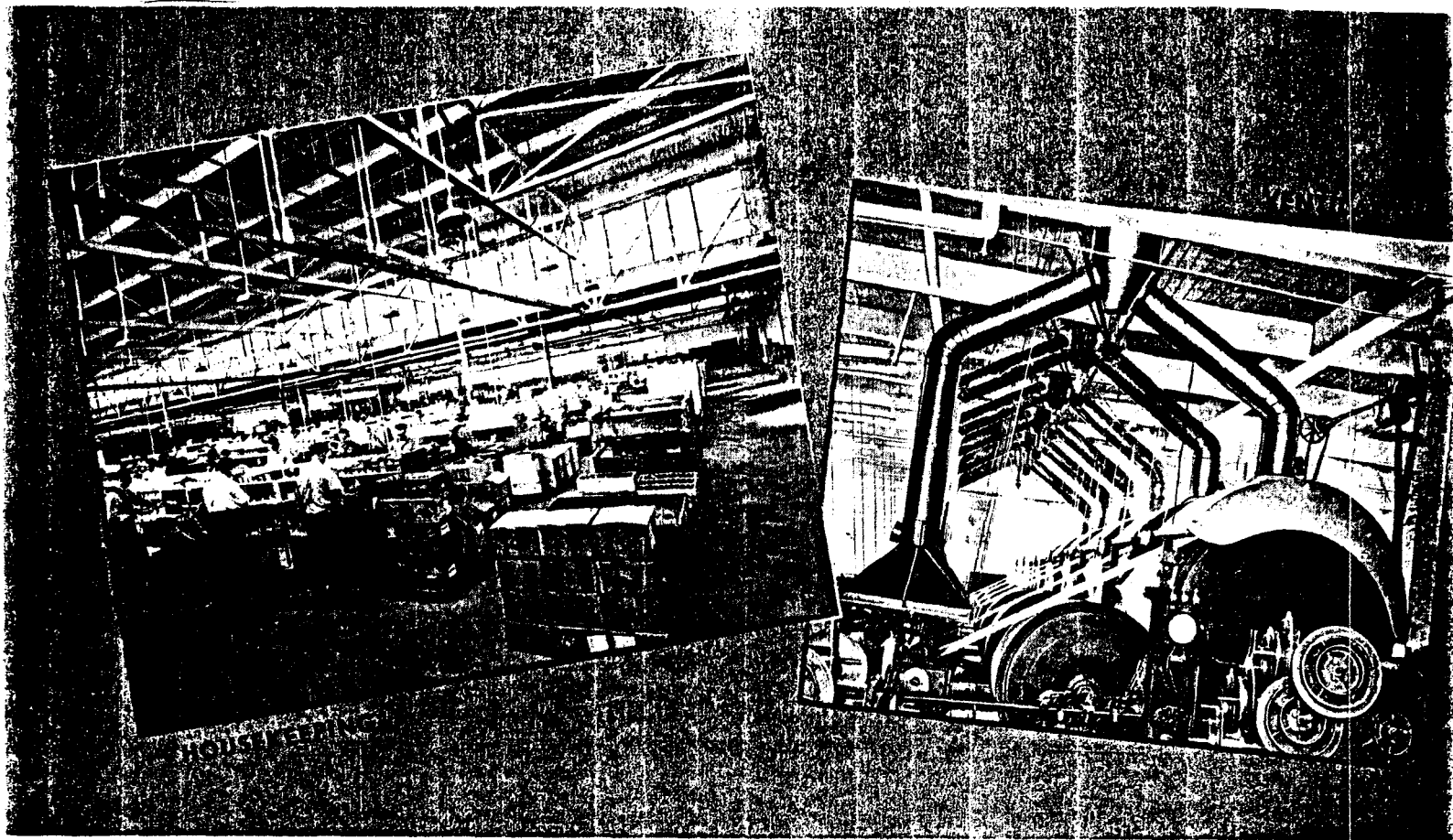


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The Working Environment

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A SAFE and healthful place for work should be the aim of every industrial establishment. Such an environment can be achieved only through a study of every condition of industrial life, followed by an adjustment of these conditions to the health requirements of the worker. Those factors which have a bearing on morale and efficiency, as well as on health, should also be considered.

Employees should not be exposed to the inhalation of atmospheric contaminants in sufficient concentrations to endanger health, nor even to cause any marked discomfort. Employees who are satisfied with the working environment are happier and more efficient, as well as healthier. Many individuals imagine all sorts of ill effects from even trivial industrial exposures. They may even worry themselves into actual illness which was caused by mental attitude rather than environment.

Atmospheric contaminants in industrial plants may consist of solid dispersoids, liquid dispersoids, or

gases or vapors. Solid dispersoids may be divided into dusts, fumes and smokes. Liquid dispersoids may be grouped into mists and fogs.

Dusts

Industrial dusts are mechanically generated by many processes. Typical examples are drilling, blasting, and crushing in mining and quarrying; polishing, buffing and grinding in metal finishing, and stone-cutting, polishing and abrasive blasting in the granite and monument industry. In these examples the dust is of the inorganic or mineral variety. Animal and vegetable dusts, known as organic dusts, are generated by such operations as cotton processing, wood-working, and polishing skins.

From the health standpoint, industrial dusts above ten microns in size are of no importance because they are too large to be inhaled into the lungs. Dusts below ten microns in size are not visible to the naked eye but can be seen with a microscope down to about two-tenths of a micron. Dusts containing sufficient percentages of

free silica and asbestos may cause silicosis and asbestosis if inhaled in sizes below ten microns in sufficient concentrations over a long enough period of time.

Other dusts, with the exception of metallic dusts, do not result in diseases, but many of them do produce certain changes in the lungs which evidently are not of great importance. Nevertheless, workers should not be allowed to inhale high concentrations of any kind of dust.

Permissible limits for these dusts have been established by various organizations, but as yet there has been no complete agreement for dust concentrations in workroom atmospheres. The American Standard Safety Code for the Protection of Heads, Eyes and Respiratory Organs recommends "that no worker be continuously subjected without a protector to any atmosphere containing any form of mineral dust in quantity exceeding 50,000,000 particles per cubic foot of a size less than five microns."

The National Silicosis Conference in 1937 suggested that the maximum

permissible concentration should be found by multiplying the percentage of free silica by the total dust count. If the result is over five million, the concentration may be considered too high.

California, Connecticut and some other states allow no more than five million particles of dust running high in free silica. New York State, in the Industrial Code adopted September 1, 1941, for the control of silica dust in the stone cutting and stone finishing industry, allows five million particles if the dust contains more than 70 per cent free silica, 10 million particles if it contains from 10 to 70 per cent, and 100 million particles if it contains less than 10 per cent free silica. California has established a permissible limit of five million particles per cubic foot of air for asbestos dust.

Metallic dusts may also be generated mechanically in such operations as weighing and mixing red lead and litharge in the manufacture of paints and storage batteries. Permissible limits for such toxic dusts are the same as for the fumes of these metals.

Fumes and Smokes

Inhalation of the freshly formed fume of any metal in sufficient concentration may cause the condition known as "metal fume fever," also known as zinc chills or shakes. Although this condition causes a great deal of discomfort and may be alarming to those who are not familiar with it, it is actually not a disease and has no permanent effect on the individual. Inhalation of dust or fumes of the toxic metals in sufficient quantities can also cause systemic poisoning.

AIDS TO A HEALTHFUL INDUSTRIAL ENVIRONMENT

1. Necessary changes in operations or processes, materials, techniques, or equipment.
2. Enclosing or isolating hazardous exposures.
3. Good housekeeping and exhaust ventilation.
4. Personal protective equipment.
5. Sanitation and related facilities.
6. Control of temperature and humidity.
7. Satisfactory illumination.
8. Noise control.
9. Adequate medical care.
10. Good wages and satisfactory working hours.
11. An efficient personnel department.
12. Employee training.

As yet, no definite standards have been established for most of the toxic metals. The American Standards Association's Sectional Committee on Allowable Concentrations of Toxic Dusts and Gases is developing standards for cadmium, chromium, lead and mercury. They also propose to develop standards for antimony, arsenic, manganese and zinc. All of these standards will undoubtedly be available in the near future.

The Journal of Industrial Hygiene and Toxicology (June, 1940) published a Code for Safe Concentrations of Certain Common Toxic Substances Used in Industry. This code contained a list of suggested permissible limits to be used as a guide until the ASA had completed its standards. Maximum allowable concentrations for certain of the toxic metals, expressed in milligrams per cubic meter were: Cadmium, 0.1; chromium, 0.1;

lead, 0.15; mercury, 0.1; zinc, 15.0.

Very little work has been done on concentrations of smoke which can be tolerated without impairing efficiency or causing marked discomfort, and no limits have yet been established.

Mists and Fogs

Mists are formed by the mechanical disintegration of a liquid by such processes as spray coating of paints or vitreous enamels. They usually range in size from 50 to 100 microns.

Fogs are formed by the condensation of vapors. They vary in size from 5 to 50 microns. Wherever hot alkaline cleaning or pickling vats are operated in a rather cool workroom, the water vapor is apt to condense in the form of a fog in the same manner that ordinary fog is formed outdoors.

A mist which may be inhaled in spray coating operations may be rather complex in nature. In the case of spraying paints, it usually consists of a mixture of organic solvents of varying toxicity together with solid matter in solution or in suspension. These fine droplets in the form of mist may hold in suspension lead oxide as a pigment or other particles of a toxic nature.

In the spray coating of vitreous enamels a water vehicle is used but the particulate matter in suspension may contain toxic metals in the form of oxide, such as cadmium, lead and manganese. In addition, they sometimes contain finely divided particles of free silica in the form of quartz or flint.

The maximum allowable concentration in inspired air containing mist is the same as that for vapors, fumes

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