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Why Industrial Hygiene in a Rubber Company?

By WILLIAM E. McCORMICK

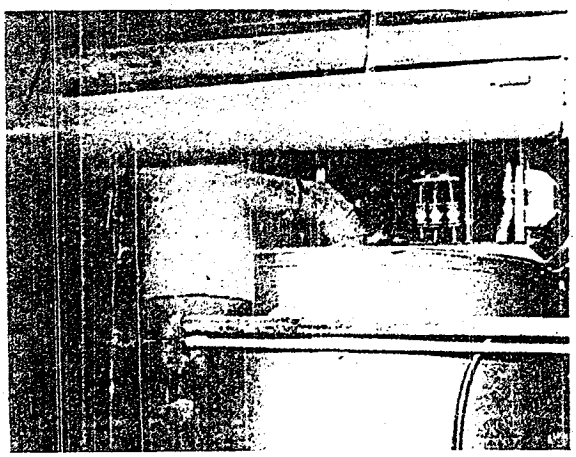
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THE science of industrial hygiene has come of age. Its growth, although slow, has been continuous since its American inception just prior to the first World War. It remained, however, for the events of the last decade—notably the passage of the Social Security Act in 1936, and World War II—to provide it with its needed stature. In assessing the value to be derived from a well organized industrial hygiene program in a large industrial company, certain tangible benefits can be expected. These benefits are not applicable to any one industry, but are common to all.

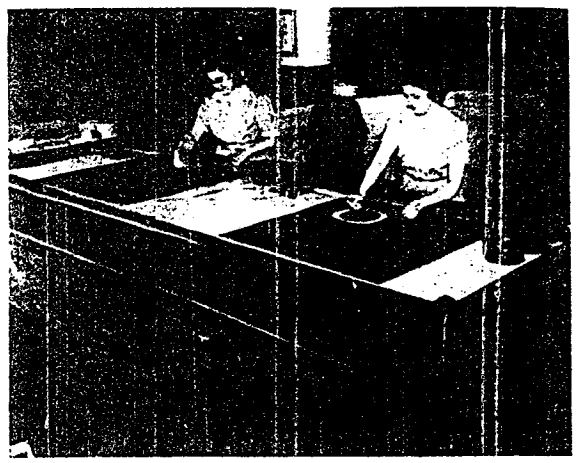
Value of Industrial Hygiene

First, there should be tangible benefits resulting in the form of *lower compensation costs*. While it is true that the number of occupational disease claims is small as compared to those due to industrial accidents, the severity of the former is usually much greater than the latter. Any reduction in claims, either in frequency or severity, will be directly reflected in lower compensation costs. Furthermore, certain factors such as poor ventilation, poor illumination, obnoxious dusts and odors, and excessive noise, although not necessarily directly causing occupational disease, may contribute to the production of industrial accidents.

A second benefit might be termed *more efficient production*. The improvement of environmental working conditions generally has been found to increase workers' efficiency and morale. Numerous instances can be cited where, during the past few years, strikes and work stoppages have been prevented by the timely correction of unhealthful conditions, or by satisfactorily acquainting employees with factual evidence of the non-existence of alleged health hazards.



Controlling acrylonitrile vapors in the manufacture of Hycar rubber. Note the exhaust ventilation at the large extractor.



Control of solvent vapors by local exhaust ventilation (slot at edge of table top) at a fabric cementing operation.

Lower *absenteeism* should also result. This is somewhat a corollary of the preceeding paragraph. It is a known fact that absenteeism, from whatever cause, results in tremendous costs to both employer and employee. The vice-president of one of the country's large companies has estimated the employer cost as approximating $70 per year for each employee carried on the payroll of the company. There, of course, is an irreducible minimum for absenteeism, but it is not difficult to see that any substantial reduction caused by improved employee health, better plant working conditions, or better employee morale, will pay dividends.

Finally, an *improvement in the quality of marketable* product should result. An improved worker efficiency may, of course, be reflected in this, but frequently the proper control of contaminants resulting from the manufacturing operation may result in improved marketable qualities. This is particularly true of those operations wherein very small quantities of impurities derivable from atmospheric contamination may adversely affect the consumer product.

Program at Goodrich

Since 1942 the B. F. Goodrich Company has been actively interested in industrial hygiene. A laboratory was maintained for this purpose, functioning as a part of the Works Laboratory. Recently the need for further expanding these activities, and more closely coordinating them with the medical activities of the company, was realized. This has resulted in the ver,

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Solution to the Problem of Uniform Abrasion

RESISTANCE to abrasion is an important factor in the serviceability of many organic and inorganic products, such as textiles, rubber, plastics, leather, linoleum, ceramics, mastic tiles, concrete, stone, wood, and metal. The National Bureau of Standards is at present engaged in research on the measurement of resistance to abrasion as a part of the broad program on abrasion conducted by the Office of the Quartermaster General.

One of the major problems in this work has been the design and development of an abrasion machine that will abrade a plane area of a specimen uniformly over the entire surface and from every direction in its plane. A complete mathematical solution to this problem has been worked out by Herbert F. Schiefer, and a machine based upon the solution has been constructed at the Bureau.

In an attempt to approximate the conditions that produce uniform abrasion, numerous abrasion machines have been developed, several with highly complicated mechanisms. However, in most cases the relative motion between the specimen and abradant is not the same for the whole area of the specimen to be abraded, and in no case is it the same from every direction in the plane of the abraded surface.

In the mathematical solution that was obtained, the abrasion at any instant is constant in magnitude and direction over the whole abraded area. From instant to instant the amount of abrasion remains constant, but the direction changes continuously through 360° in each cycle. This general solution requires the plane areas of the abradant and of the specimen, which are in contact under pressure, rotate in the same direction and with the same angular velocity. The specimen must at all times be completely in contact with the abradant, and the specimen and abradant must not be coaxial. The specimen may revolve about the center of the abradant with any angular velocity in the same direction as its rotation or in the opposite direction.

The simplest solution from mechanical considerations is the special solution in which both abradant and specimen rotate in the same direction and with the same angular velocity while the specimen does not revolve. A machine based upon this special solution has been constructed and found to operate satisfactorily for a wide variety of textile products.

A new feature of this machine is the abradant. It consists of a disk 4½ inches in diameter, in one face of which are inserted a series of parallel strips of clock spring, 0.025 inch thick and spaced ⅛ inch apart. The edges of these springs, ground and lapped to a plane surface, constitute the abradant for textile materials. Although tests indicate that the abrasive effect of this device remains constant, the abradant is, obviously, not uniform over its entire area. Any effect on the result of a test due to non-uniformity in the abradant is eliminated by rotating the abradant once more than the specimen in every 240 rotations.

Abrasion machines based upon the mathematical solution which has been derived have many advantages. The resistance to abrasion of many products, such as textiles, varies greatly with the direction of the abrasion because of structural differences due to the type of weave and the kinds of yarns and fibers used in the warp and in the filling. Since such machines can abrade plane areas of a specimen equally from every direction, the effect of fabric construction or "form factor" on the resistance to abrasion can be evaluated directly.

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recent establishment of a Department of Industrial Hygiene, functioning as a part of the Medical Division of the company and directly responsible to the Medical Director, with laboratory and office space in the central Dispensary of the main plant.

Successful industrial hygiene requires the combined efforts of the medical, engineering, chemical, and nursing professions and it is believed the present arrangement enables this to be secured. A constant interchange of information, pertaining to occupational disease cases and the nature of the various manufacturing operations, occurs between the industrial hygiene department and the medical staff. Likewise a close liaison is maintained between the safety department and the workman's compensation department.

The industrial hygiene laboratory, when completed, will be adequately equipped to handle all of the various analytical determinations necessary for the field control work. Of course every needed facility of the present research and control laboratories will be utilized. It is not anticipated to duplicate such specialized equipment as x-ray diffraction units, spectrographs, ultraviolet spectrophotometers, etc. It is the hope of the company to provide all of its plants with the best industrial hygiene service possible. This in its United States and Canadian plants alone means an industrial population of approximately 45,000.

The B. F. Goodrich Company is not only a rubber manufacturing company but a chemical and plastics manufacturer as well. Consequently, the potential health hazards cover a very wide range. Many solvents, covering the entire gamut of the toxicologist's textbook are used. Many compounds of both toxic and dermatologic significance are employed. Of these, a few are of singular importance to the rubber industry, and of especial industrial hygiene interest. Styrene, acrylonitrile, and butadiene are typical examples.

Fortunately, for the most part, industrial hygiene and industrial toxicological research has progressed sufficiently to supply us with the necessary knowledge for controlling most industrial health hazards. However, in the newer, expanding industries, where today's laboratory curiosities may be tomorrow's production line or tank car products, constant toxicological research is necessary to supply the answers to proper employee health and consumer protection. The industrial hygiene department of the company is charged with the latter, as well as the former, responsibility, and for both of these reasons constant toxicological research is being carried on by Goodrich.