not afford the protection desired to the upper part of the leg when this occurs. However, in wearing knee type leggings, it is important that the trousers are bloused over the top of the legging, so that molten metal cannot enter through the top and run down inside between the plants and the legging.

Before I continue discussing personal safety equipment, let's see if, in your estimation, this wearing of safety equipment pays. I have positive proof that it does pay, because I can use the foundry I work in as an example of the results that can be obtained. The Harvester Company purchased and took over operation of the Waukesha Foundry in February 1946. We had no planned safety program and not many safety rules, such as those we have now requiring the wearing of safety equipment. We had 28 lost-time accidents among our foundry workers in 1946 including one fatality. In June of that year we had a safety program functioning and a goggle and legging wearing rule that worked. Our record thereafter showed how it worked. Of the 28 lost-time accidents in 1946, twenty-five happened during the first six months. We had three lost-time accidents the last six months of that year.

During 1947 we did not have a lost-time accident, and we did not have a lost-time accident again until August 1948, which was the only one of its type that year. So we worked two years with one lost-time accident. During these two years, 1947 and 1948, we worked over 2,159,000 hours with one lost-time accident in a 100 per cent foundry operation. Incidentally, the one accident we did have during 1947 and 1948 amounted to only three days lost time. In 1949 we had three lost-time accidents. These amounted to a total of 48 days lost time, and so far in 1950 we have had two lost-time accidents, one of which amounted to four days, and the other to one day of lost time. I think this record speaks for itself, and if you could see some of the damaged personal safety equipment turned in for replacement and repair, you too would be enthusiastic about equipping your employees with some type of goggles and other types of safety equipment.

In Wisconsin, as probably many of you know, under our Industrial Commission rules, any safety equipment that an employee is required to wear as a condition of employment must be furnished gratis by the employer. So we do not require that our employees wear safety shoes in order to hold their jobs, but we do our best to sell employees on the idea of wearing safety shoes. We sell two types of shoes, lace and what is commonly called molders shoes, which are the slip-on type with elastic sides. We sell lace shoes in both high and oxford styles. We discourage wearing oxfords except in our cleaning, inspection, core and finishing departments, as hot sand and molten metal in other departments may get in low shoes very easily. These safety shoes have saved many employees from serious injury. I wish I could show you a couple of shoes that have withstood the heavy impact of a casting that accidentally dropped or fell, so you could see how the blow was deflected or how the toe of the shoe was crushed without causing injury to the foot.

We also encourage the wearing of gloves by our grinders and employees who handle castings because an accident such as a cut or burn may take place. Many times a grinder's hand slips and touches the wheel. The glove is cut but the hand is saved from injury. Sharp edges on castings can cause nasty cuts, which can be prevented by the wearing of gloves. Likewise a shifter may accidently burn his hand on molten metal or on a mold or weight. The gloves used are of the gauntlet and knitted-wrist type with a leather palm. Gloves are sold to employees at cost.

I think I have mentioned the hazards most common in our foundries which are burns, eye, foot and hand injuries, and the measures we have taken to prevent them. Of course, what is done to prevent such injuries is up to you, but we have prevented a lot of these injuries in our plant. Safety education is a never-ending process, and you must put all your efforts into it to keep it alive. A safety program must go on day-after-day so that there will be no letdown.

During the many years that I have been connected with safety, I have sold myself on it. If you are sold it is that much easier to sell the other fellow, and if you do sell the other fellow on wearing personal safety equipment your safety program is bound to succeed.

The Problem of Industrial Hygiene in the Foundry

By HERBERT J. WEBER
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Potential hazards to health in the foundry industry are becoming more numerous today because of advances in metallurgical research. Formerly the foundry was identified with silicosis, but recent studies have shown that the incidence of silicosis in the industry is low. However new alloying materials are now being used to obtain special metallurgical properties. Thus today we find lead, zinc, tellurium, beryllium, manganese, phosphorus, radioactive cobalt—to name a few materials—being used routinely in founding. These have given rise to new hazards and to new problems of prevention. The solution is not the same for all yet, fortunately, there are some common principles of approach that are applicable in a generic way.

Sometimes I think preventive measures are becoming so complicated that only a trained hygienist is capable of applying them intelligently. On the other hand, there are certain common sense procedures that should seem obvious even to the uninitiated.

In the light of our present knowledge, you cannot deal with beryllium for example, in the same way as you would with silica or with radioactive materials, and respirators are not a solution. As I have said elsewhere: "Respirators are a stop gap—a dubious remedy. In the first place their use lulls one into a sense of false security. Suppose management issues respirators to all exposed employees instead of controlling the dust and fume; and thereby in its mind disposes of the hazard, has it solved the problem? If the solution of industrial hygiene problems were that simple, you need no industrial hygiene program other than a respirator service, and you need no industrial hygienists. But actually, men will not wear respirators continuously because they are forced to breathe against a resistance: and for work requiring exertion or where there is exposure to heat, a respirator is a cruel remedy. Furthermore, unless the respirator fits tightly, it is worthless. In my experience, this device may[4] be defined as a muzzle type ornament loosely pendent from the neck and used in dirty industries to distinguish the laborers from the office employees.

"If a respirator must be worn, except for unusual cases and for intermittent or casual jobs, it is an indictment of the working environment and an admission of unhygienic conditions. It should be a last resort when all other solutions have failed or are impractical."

This is not to condemn respirators *per se*. They have their use and there is a real need for them in the situations mentioned but they have been readily seized upon as a panacea for all ills due to exposure to foundry dusts and fumes. Properly and appropriately worn, they are effective.

As I said before, the problem of prevention is a complicated one. Some foundries are mechanized, some are production shops, others jobbing shops. One makes beryllium bronze castings, another tellurium iron, and yet another manganese steel. Correct and safe procedures will be different in each instance and the limitations of this paper prevent a detailed analysis of these specific problems.

However, there are some control factors common to all and within the reach of the poorest plant. Oddly enough they are, in my opinion, the most powerful weapons in the fight against occupational disease. They are:

1. *A willingness on the part of top management to correct bad conditions.* Lip service is futile and is readily sensed by the line supervision. The annual pep talk at the safety dinner is not enough. Supervisors must be made to account for departmental hygiene as well as for production. In my experience, unless you have the support of top management, the most expensive exhaust systems will not bring about good working environment.

2. *Good Housekeeping.* It costs little but pays the biggest dividends. A cluttered and dirty area in a foundry causes accidents and occupational disease.

I will venture to say that the greatest reduction in the incidence of occupational disease and of accidents in the foundry will be brought about by good housekeeping. It is almost a complete answer to the question: "What can I do about industrial hygiene?" and yet it is often so ignored. If a plant manager walked into the treasurer's office and found twenty-dollar bills lying on the floor, in the waste basket, on the window ledges, he'd be scandalized. Yet, in his own plant, equipment and material—all of which represent dollars—are strewn about in the same careless manner.

A certain foundry decided to put a new concrete floor in the core room. When the contractor arrived to set the forms, he found a perfectly good concrete floor about a foot below the dirt. That is a true story!

It has been shown by Hatch that occupational disease is directly proportional to crowding.

A study of 43 foundries in New York State revealed the following startling relationships between housekeeping and the incidence of silicosis.

Housekeeping	Number of Plants	Silicosis Incidence (Percent) Median	Maximum	Minimum
Fair	5	1.9	2.8	1.0
Poor	18	4.4	15.4	1.0
Bad	22	5.4	13.8	0.8

Note that no foundries were classified as having good housekeeping; only 5 were fair, 18 poor, but most of them bad. Note also the sharp reduction in the incidence of silicosis between plants with bad housekeeping and those with fair. What would the difference be if the comparison were made between plants having bad and very good housekeeping?

In one of our own brass foundries we had approximately 14 cases of lead poisoning a month. With little change in the ventilating system but by reason of an excellent regimen of good housekeeping alone, we have not had a single case in over five years.

I know of a foundry that removed 60 tons of dust from the superstructures. Such material finally exceeds the angle of repose, and dust from the superstructures is constantly set air-borne by building vibration. Particles of physiologically significant size will remain suspended in *still* air for very long periods thus contaminating the atmosphere long after the dust-producing operation has ceased. A spherical particle having the same density as quartz will fall 0.016 foot per minute or 1 foot per hour in still air. This important fact has not been fully appreciated by the foundry industry.

I have found high dust concentrations in foundries with very good ventilating systems because the floors and rafters were seldom if ever cleaned. For this reason, I have been strongly in favor of central built-in vacuum cleaning systems capable of maintaining a vacuum of 12 inches of mercury at six outlets simultaneously. Such systems are not expensive. In fact, I believe a built-in vacuum cleaning system is as important as a good ventilating installation if we are to have good industrial hygiene in the foundry.

3. The third important control factor is education. I have found unsafe conditions in the foundry because the supervision was ignorant of the toxic effects of the materials they used or of the hazards involved in a given process.

For example, one foundry was blissfully engaged in the production of beryllium copper, totally unaware of the reported extreme toxicity of beryllium; and the material was handled and processed with the same indifference as phosphor-copper.

Another plant making copper castings was surprised when the workmen contracted lead poisoning because the copper contained less than 2 per cent lead. They forgot about the vapor pressure of lead at the melting temperature of copper and, as a result, there was a high concentration of lead-in-air around the unexhausted furnaces.

A third plant did not know that fumes from welding and burning steel and gray iron castings is principally iron oxide. In the concentrations produced by those operations, iron oxide will cause a lung condition known as siderosis. Siderosis consists of a pigmentation of the lungs due to deposits of iron throughout the lung fields. It is nondisabling and is harmless much as a tatoo mark on the skin is harmless though undesirable. However, the iron deposits are radio-opaque and their shadows seen on a roentgenogram are very similar in appearance to those caused by fibrosis due to free silica. As a result, a diagnosis of silicosis is frequently made and compensation for a non-existent disability results.

Now foundrymen are not toxicologists or industrial hygienists and, therefore, cannot be expected to know the hazards involved in founding. But the United States Department of Health, branches of which are set up in each state, is at their service at no charge. This is a fact-finding organization without coercive or police powers; and, therefore, no plant should fear to call on them for assistance if the plant really wants technical advice.

The foregoing three factors then: (1) Conviction on the part of top management that good industrial hygiene is good business; (2) Good housekeeping; and (3) Education, are prerequisites in any foundry hygiene program. Without them, it is foolish to discuss safe practices or to install expensive ventilating systems.

Presentation of Awards

By GROVER C. BROWN
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The metals industry was one of the first to be recognized as a separate and distinct section of the National Safety Council. Metals, together with nine other industries was organized as a separate section in 1915. The first safety contest for this section was held 14 years later in 1929. Today we are celebrating its 22nd consecutive safety contest.

Only 34 units were entered in that first contest, all under one general classification but divided into groups A and B according to size. Through the years this section has grown until it now encompasses nine separate classifications, each divided into three groups, A, B, and C according to size. As you know, these nine classifications are: steel mills, iron and steel rolling mills, non-ferrous metals and products, foundries, machine shops with foundries, heavy fabricating, light fabricating, heavy machinery and light machinery. Included within these nine classifications are 2,315 separate operating units scattered geographically from Canada to the Gulf of Mexico and from the Atlantic to the Pacific coast. All are eligible to compete in this Metals Section's Safety Contest.

A "Unit" may be a single plant or department or a group of plants or departments, a part or the whole of a company. These 2,315 operating units have combined payrolls of more than a million employees, all potential players on the many scores of safety teams eligible to compete in this contest.

This year 706 units have satisfied all requirements and completed the contest. This is equivalent approximately to one out of every three units eligible to compete. (A few additional units participated through part or all of the contest period but for some reason have failed to fulfill all requirements to the end and are not now included in this total.) To build up this total of 706 competing units, the heavy fabricating and light fabricating divisions each supplied 128. Light machinery supplied 103 units, foundries—96, and heavy machinery—90. Sixty-nine units came from steel mills and 32 from non-ferrous metals and products. Iron and steel rolling mills and machine shops with foundries contributed the remainder with 30 each. One hundred and sixty-six of these units are in Group A, 239 in Group B, and 301 in Group C.

Ninety-six of these units have emerged from this contest as 1st place winners. This is equivalent to an average of approximately one for every seven units which satisfactorily completed the contest. (A winner is a unit with a perfect score or with the lowest score in its respective group.) Group A, of largest units, is credited with 9 winners; Group B, of medium sized units, has 13 winners; and Group C, of smallest units has come through with 74 winners. The ratios of number of 1st place winners to number of contestants is therefore—

For Group A—1 for every 18.4 units
For Group B—1 for every 18.4 units
For Group C—1 for every 4.1 units