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A Medical and Industrial Hygiene Control Program In Widely Scattered Plants

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MEDICAL and Industrial Hygiene programs today have reached a stage of high efficiency in many large industries. In this paper we do not propose to discuss a stereotyped program but rather to touch on some of the high lights in our own experience over the past six years.

The American Brake Shoe Company originated a complete Medical and Hygiene Program in 1941 to service its 60 plants in 23 states and Canada. The number of employees in these plants varies from 60 in some to 1,000 in the largest—with an average of 250 to 300. There are 10 separate divisions, each of which is engaged in the manufacture of a different product. Six of the divisions, which include some 44 plants, conduct foundry operations producing grey iron, nickel and chrome alloys, manganese steel and brass castings. The other plants manufacture such products as upset and drop forgings, railway switches, frogs and crossings, special alloys, automobile brake linings, paint sprayers and compressors.

The Medical Department had its inception in 1941 through the efforts of the late Donald E. Cummings, then Professor of Industrial Hygiene at the University of Colorado. From a modest start with a staff consisting of a Medical Director, Industrial Hygiene Engineer and X-Ray Technician the department has grown to its present complement of ten and the company has recently approved a complete new building to take care of our expanding needs.

All health hygiene activities originate from the department in Chicago. These consist of pre-placement and periodic health examinations which include chest x-rays, blood tests and urinalyses. Examination forms, x-rays, etc., from all plants are checked and filed here as well as results of industrial hygiene surveys. Periodic plant health surveys, are directed by the department and we have our own field x-ray equipment. Recently we have added a new mobile photoroentgen x-ray unit similar to that used by the public health and tuberculosis associations. We also have a comprehensive industrial hygiene program with a well-equipped laboratory for carrying out field surveys which are correlated with medical findings.

In addition we have an industrial nursing service which began with one full-time

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nurse in 1942 and now employs 25. In a few locations a single nurse takes care of two plants while in one area a very satisfactory arrangement allows a nurse to service two plants in other industries in close proximity.

The type of program matters little as long as it is effective and demonstrates the points of attack. Adequate records are essential but there is danger of going overboard on details in our enthusiasm to do a complete job. At one of our locations recently a personnel manager devised a very detailed form for prospective employees which contained a great many questions concerning background, previous experience and personal attributes. One question asked was "What hobbies do you have?" An applicant for work answered—"Chawin' tobacco." Perhaps he was serious and possibly the question was in order but the reply illustrates the point that if cooperation is desired in obtaining authentic information some thought must be given to the matter of intelligent questions. Not long ago a pilot told me of a similar form which all employees of his airline were required to complete. Many of the questions were so absurd that the routine reply to most of them consisted of a single word "Wheaties!" So let us keep the records straight. We have revised ours at least four times in the past six years in favor of simplicity without sacrificing necessary details.

Management Support

ONE of the first essentials in the success of any health hygiene program is cooperation and support from top management. Plant supervisors must be made to understand that the recommendations of the Medical Department have to be given serious consideration. Most progressive superintendents "catch on" quickly but always there are some who refuse to see the light. They resent fancied interference or what they feel is being told how to run their plants. The approach should be one of "selling" industrial hygiene and medical care rather than anything savoring of a dictatorial effort, otherwise one need not expect permanent results. A superintendent who carries out industrial hygiene recommendations because he has to cannot be expected to cooperate and he can find numerous apparently valid excuses for procrastination. Occasionally such an attitude can only be changed by pressure from top management but a threat to shut down a plant until corrective measures have been carried out, while it may be effective, is not productive of future industrial hygiene happiness.

Perhaps the biggest single factor in successful operation of an industrial hygiene plan is the need for thoroughly convincing the plant operating head of the obvious advantages of good hygiene and demonstrating how these can effectively result in better production, satisfied workers, less absenteeism, fewer occupational disease claims and lowered production costs. The superintendent is a key man who can make or break your program. Once he is convinced, the major part of your difficulties are over.

Sometimes the man from whom you least expect cooperation turns out to be your most ardent disciple. A pat on the back in the way of bringing his good showing to the attention of top management not only pleases his ego—a very human reaction—but makes him more determined than ever to surpass his already excellent record. Such an individual permits no slovenliness in his shop, tolerates no shortcutting or bypassing of established hygienic practices and insures appreciable results, which incidentally reflect credit on the Medical and Hygiene Department.

Many Aspects to Industrial Physician's Part in Program

THE part played by the doctor in industrial health and hygiene is an important one. Aside from his responsibility in directing the program he should never be unmindful of the necessity for cooperation with management and plant personnel. He must be familiar with the various plant operations and should display an intelligent interest in local procedures and

methods. Superintendents greatly appreciate a visit from the doctor and too many industrial physicians fail to realize the necessity of periodic tours of the plants they service. How can they evaluate a man's ability to perform a specific job unless they know exactly what it entails? Employees, too, notice the doctor's visits. This interest in them and their work inspires confidence and discourages fraudulent claims. It also increases management's respect for its medical service. In this way the doctor not only adds to his practical knowledge of industrial operations but finds a new interest which can become most fascinating. The importance of this familiarity with industry cannot be overestimated in the proper evaluation of occupational disease and industrial hazards.

A most important aspect of the doctor's work in industry is frequently the one which is most often neglected. I refer to the psychological side of industrial medicine. One of my most important duties is to give advice on problem cases, both to personnel directors and to the employee himself. The busy physician either cannot or does not take time to talk to an injured employee to tell him about his condition and explain why it is taking longer than anticipated for him to get well. He treats the ailment repeatedly and asks the man to come back again and again for dressings. Soon the employee becomes discouraged and wants to see another doctor. His dissatisfaction is reflected in the plant management which is greatly concerned about the health of its employees and very jealous of its safety and lost time record.

I have been impressed with the results of a half hour's or an hour's talk, if necessary, with numerous workers in our plants who have been dissatisfied with such treatment. I have seen them return to their jobs with a different outlook on life and renewed confidence in the doctor all because of a sympathetic hearing and explanation of their difficulties. Some of our operative heads feel that this is one of the best services our Medical Department renders. The industrial physician can and should include these practices as part of his medical service. His reward will be satisfied plant workers, the high regard of management and an inner feeling of compensation which cannot be evaluated in dollars and cents. If he does these things and makes an honest effort to keep abreast of the latest developments in industrial medicine he will not make himself ridiculous by doing such things as diagnosing a case of lead intoxication on a single stipple cell count or calling a man totally disabled from a mild, uncomplicated degree of occupational fibrosis simply because he has worked in a plant where there is some degree of dust in the atmosphere.

Fig. 1.
Industrial hygiene laboratory

Employee Participation

WE IN American Brake Shoe like to stress the human side of industry and often go far afield in this respect. Sometimes there is danger in going to extremes in such policies and results are neither appreciated or desirable. One of our plants recently invested a very considerable sum of money in a new shower and lunch room for its employees. It filled a long felt need and was modern in every respect. While the management was not looking for any great amount of credit for providing such adequate facilities, it did anticipate some favorable reaction on the part of the em-

ployees. Imagine its surprise when the only response was a grievance to the effect that instead of putting all that money into a building it should have been handed out to the men themselves.

Another plant, in order to improve conditions, installed a new Bradley fountain in its shower room. Shortly thereafter the superintendent informed me that it was a mistake and that they could not use it any more. On further inquiry it turned out that the employees insisted on using an ordinary bucket of water which they placed in the fountain and instead of soap, they preferred to use small cores from the foundry with which to scrub their skins. Naturally, the accumulation of sand in the fountain soon stopped up the drain and put an end to its usefulness. One might say that this was management's fault but remember this was in the war years when the labor turnover was at its worst and strikes were often called for very trivial reasons.

Perhaps the psychological approach to new ideas is wrong. Workmen resent paternalistic attitudes and a "mother knows best" pose. Providing the new shower and locker room without taking into consideration the fact that perhaps the men would like to be consulted on what they might want in the way of such accommodations, possibly produced the unfavorable reaction.

The same objection should be considered when making recommendations for improving hygiene or exhausting machines. Too often plant managers, engineers, yes and industrial hygienists get their heads together and say "Now this is what has to be done on Joe Smith's job." Great care and thought are employed in designing the exhaust equipment and frequent conferences are held right on the job while the machine is in operation. Joe listens but no one asks him any questions or what he might think of the idea. He is paid to turn out his quota of parts and is not supposed to know what is best for him. Of course Joe has only operated this particular machine for a matter of twenty-five years or so and if anyone should know its peculiarities he should. Joe says nothing but he has his own ideas which not uncommonly are more practical than those of the expert. So what happens! Joe's machine is fitted with some new device. He is told to use it, but he does not like it. All these years he has done the job his way and it worked. Now they are going to embarass him with some new fangled contraption which he has resented from the start. He deliberately tries to circumvent the whole thing and usually manages to do a good job of it unless he is under pretty rigid supervision.

Now suppose the experts had come to Joe and said "Our hygiene survey shows that there is too much dust on this job and we want to clean it up for you. Here's what we have in mind, what do you think of it or how do you think it will work? Have you any ideas about it yourself, you have been operating this equipment all these years!" Joe's attitude is entirely different. He feels that he is of some importance and that consideration is being given to his years of experience of which he is naturally jealous. Instead of being a rank outsider he is now part of the team. He probably comes up with a notion that has real merit and possibly on a point the experts have overlooked. He sees it included and, from here on in, Joe is the most cooperative employee in the shop. He does his utmost to make it work because an idea o his is in it and he wants to demonstrate its worth. Moreover he is constantly on the lookout for more and more ways of improving things and management has made another convert to industrial health and hygiene. Perhaps the illustration is a bit overdrawn—I do not think so! It will not always apply but in general the psychology is so obviously right. Let us not forget to do a bit more of taking the man on the job into our confidence.

Periodic Industrial Hygiene Surveys

HEALTH hygiene programs in widely scattered small plants are sometimes difficult to institute. A well-planned pro-

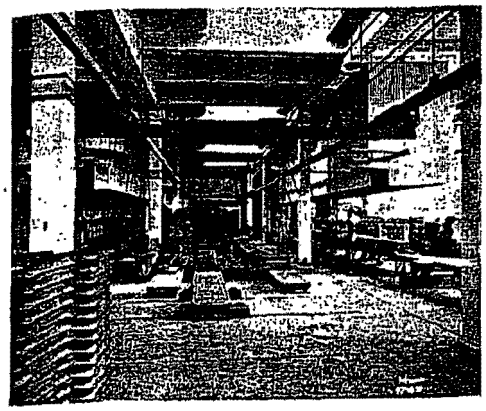

Fig. 2.
Interior of brass foundry. Note pouring being done under hood

cedure, directed from a central department, can be worked out but it must always be tailored to fit individual locations.

An industrial hygiene program for an organization comprised of 60 widely scattered plants presents problems which do not exist in an organization having one large plant. Furthermore, our company is composed of ten distinct divisions, each having different processes. Thus we are confronted with the following typical hazards:

Lead oxide	Iron oxides
Lead formate	Iron, steel, and brass welding
Silica	Chromium
Phosphorus	Acrolein
Manganese	Various solvents
Tellurium	Carbon monoxide
Asbestos	

To operate an industrial hygiene program under a variety of conditions—namely, dissimilarity of individual state health and labor codes, diversification of processes, kind and number of hazards—postulates first and foremost that the industrial hygiene department be given wide latitude in function, operating practically autonomously and responsible only to top management. While the department must remain an ancillary and advisory one, to be effective it must have the whole hearted backing of top management.

Our company operates throughout on the principle of bottom-up management. That is, each plant superintendent has full authority and full responsibility in operating his plant. This means that the industrial hygienist, while he can bring pressure to bear from above, finds his job to be one principally of selling the plant manager on control measures. This is as it should be and one finds that once you have convinced him, you have control of your hazards in absentia.

In our circumstances, and because of constantly changing plant processes, it becomes obviously important that all plants be thoroughly surveyed at least once a year and that those where the hazards are greater, at least twice a year. In fact, those plants in which we believe no hazard exists also should be surveyed annually because of changing conditions.

An interesting example of this occurred in one of our brake-lining plants. Lead formate, which is used in the manufacturing process, was received in the plant in 18 lb. packages—the exact weight required for a batch of lining. The only dust produced was during the actual emptying of the bags. This was done in an exhausted booth and hence no hazard was involved. During the war, the plant could get this material only in large drums so that it was necessary to weigh out each batch. The ventilation was not designed for this change of method, nor was the industrial hygiene department notified. On a routine survey the hazard was uncovered and corrected the next day. This condition could have gone on until real harm was done.

Besides locating unsuspected hazards, the regular routine survey has other advantages. To give an example: Asbestos is the principal ingredient in brake lining. A certain company carrying life insurance on the employees through their union classified all occupations in the plant as hazardous because of asbestos being used. The agent applying the rate did not investigate whether the asbestos hazard is controlled;

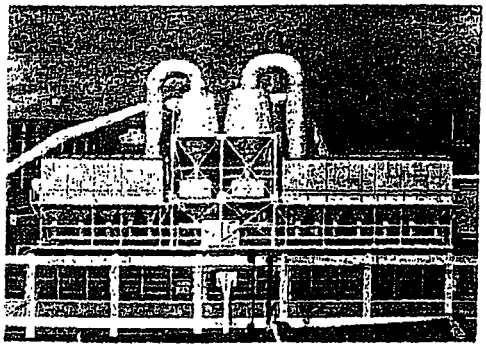

Fig. 3.
Cloth filter dust arresters with cyclone precleaner for asbestos dust at brake lining plant

took no cognizance of the fact that every individual machine has its own exhaust unit; disregarded the fact that the plant is a model of excellent housekeeping. He consulted his handbook under B for brake lining, found asbestos listed and made an unwarranted classification of hazard with a consequent increase in premium. The union approached management with their grievance. A photostatic copy of the report of the routine survey, showing dust counts of the order of one million particles per cubic foot and less, was sent to the insurance company and the rates were promptly revised. This had a three-fold effect. It showed the union we were there to help; it sold the industrial hygiene program to the management of the plant; and it impressed us with the importance of having quantitative records of hygienic conditions as derived from the routine survey.

We also encounter humorous things in our surveys. We have a plant in the south that makes only brake shoes—a grey iron casting. Our surveys indicated no hazard. However, during the war, we had a [illegible] woman working in the core room. Whatever her motive, innocence, spite, or patriotism, she wrote to the President of the United States and informed him that the American Brake Shoe Company was making poison gases. Imagine the superintendent's surprise when he was shortly after confronted by a Colonel from the Chemical Warfare Service. Actually we did have some acrolein fume as a result of the decompositio nof core oil but it was below the allowable limit; and oddly enough, acrolein is a war gas! However, we do not make it; it just occurs and we are glad to get rid of it as soon as possible.

It cannot be stressed too much, that

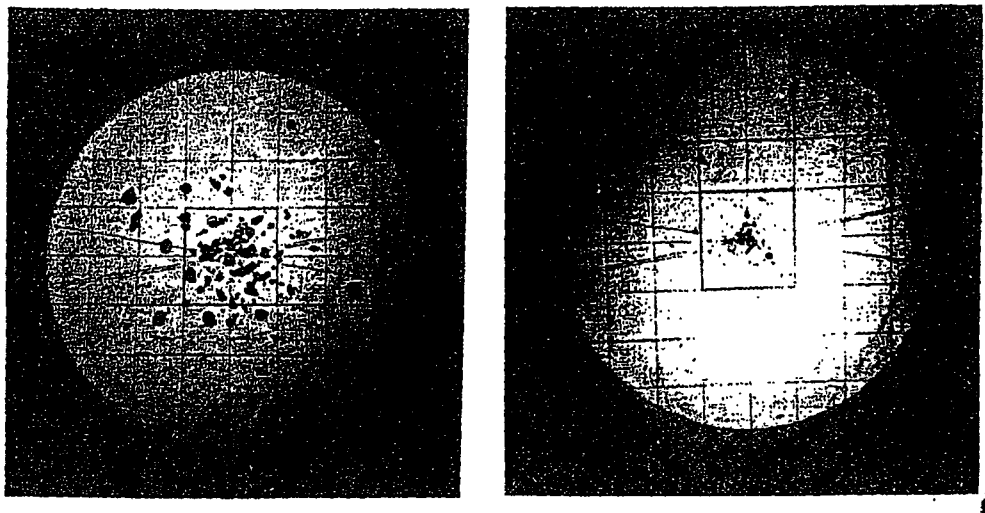

Fig. 4.
Konimeter samples of foundry dust
(a) Dust collected near shakeout. Note large size particles
(b) Dust from grinding operation in cleaning room. Note large number of very fine particles

plants must be surveyed at least annually. In this way we have found in so-thought safe plants: a potential beryllium hazard; a lead hazard in a plant melding "pure" copper ingot: explosive hazards in machine shops. We have even found lead in air in some of our offices in the brass foundries, although in safe concentrations.

Since we operate in 23 states and Canada, one can see the need for cooperation with other health and hygiene agencies. However, if they wish to survey our plants, we prefer to be present. This decision was arrived at after several experiences.

In one of our plants, these hygienists made quite an ado about a manual shakeout. To the eye, it would appear that the condition is extremely hazardous. Our repeated analyses proved that the contaminants were principally smoke, steam, and dust particles too large to be inhaled. However, these same men failed to take cognizance of a really hazardous operation because it did not appear to be dirty. Here we were concerned with high concentrations of fine pure silica. Their report to management was misleading, making it difficult for the company hygienist to rectify faulty reporting.

Again, we have a bearing plant in the northwest which formerly was hazardous. Air concentrations of lead were as high as 30 milligrams per 10 cubic meters and we found some as high as 300 milligrams per 10 cubic meters. We had about 14 cases of lead poisoning a month. By good exhaust and excellent housekeeping we have reduced lead in air to safe concentrations and we have not had a case of lead poisoning here in three years. We are proud of the plant and its accomplishments.

Co-ordination with Other Industrial Hygiene Agencies

RECENTLY an outside agency surveyed this same plant and wrote a report that we felt was unfair. Their report, of course, was based on air samples. Whether these were collected in a representative manner or whether their analyses were correct, we do not know. We do know that our urinalyses, our air samples, and especially our lack of cases of lead poisoning show good hygienic conditions.

In another plant, one inspector took samples of foundry sand to analyze for lead content and then proceeded to take a two-minute impinger sample of a cyclic operation, timing it with a wrist watch. We failed to see what information could be gained by either procedure and awaited interpretation of results with apprehension. If the field technique was such, what of the analysis and interpretation of results?

When one realizes that in some areas the recommendations of these inspectors have the force of law, it can readily be seen why we like to be present for plant inspections.

This is not to be construed as a condemnation of other industrial hygiene agencies. We have had some good surveys done by them which checked very well with our own. Our recommendations to management have greater weight when supplemented by a correct and representative survey by these departments; but we feel that we know our own plants better than outsiders because of the many investigations we have made in them, just as the family physician knows the idiosyncrasies of his own patients better than the casual specialist.

In many instances our maximal allowable concentrations are set lower than those of the organizations in question. Furthermore, we do x-ray diffraction and particle size separation in addition to the gross dust counts. One should not, therefore, be condemned on a single dust count alone, or be told a lead hazard exists because there is lead dust in the molding sand.

Analysis of Urine for Lead in Evaluation of Exposure

BECAUSE lead is our principal hazard those plants where it is processed are surveyed twice a year. But our best control is urinalyses. With plants widely scattered, the 24-hour sample or the eight hour sample becomes impractical. We therefore resort to the use of spot samples. However, there is a wide diurnal fluctuation in urinary excretion rates so that a single spot sample has little meaning; one

operation in cleaning of very fine particles