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IPAI HEALTH PROTECTION SEMINAR

Industrial Hygiene Programs in Multiplant Operations

Previous speakers have made brief references to industrial hygienists and industrial hygiene surveys. It is my purpose in the time allotted to me to define industrial hygiene and to describe the scope and objectives of the industrial hygienist's work and the manner in which he operates - specifically within a corporate organization involving multi-plant operations. Later this morning, Mr. Cole will expand upon the subject and describe the manner in which the industrial hygienist, operating within a single plant, discharges his responsibilities.

Very broadly, industrial hygiene can be described as the science of protecting employee health by means of controlling his working environment. In more detail, the American Industrial Hygiene Association has described it as:

" . . . that science and art devoted to the recognition, evaluation and control of those environmental factors or stresses, arising in or from the work place, which may cause sickness, impaired health and well-being, or significant discomfort and inefficiency among workers or among the citizens of the community."

What, then, is an industrial hygienist?

"An Industrial Hygienist is a person having a college or university degree or degrees in engineering, chemistry, physics, medicine, or related physical and biological sciences

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who, by virtue of special studies and training, has acquired competence in Industrial Hygiene. Such special studies and training must have been sufficient in all of the above cognate sciences to provide the abilities (1) to recognize the environmental factors and to understand their effect on man and his well-being; (2) to evaluate, on the basis of experience and with the aid of quantitative measurement techniques, the magnitude of these stresses in terms of ability to impair man's health and well-being; and (3) to prescribe methods to eliminate, control or reduce such stresses when necessary to alleviate their effects."

These definitions published by the American Industrial Hygiene Association (AIHA) provide a better picture of the total scope of industrial hygiene. As you will note, AIHA considers air pollution within the scope of industrial hygiene. However, because this opinion is not universally accepted and the subject of air pollution could justify a seminar of its own, I will exclude it from today's discussion. For the purposes of this seminar, industrial hygiene will mean that facet of environmental health that deals with occupational exposures that can result in health problems to the employee.

The objective of a corporate industrial hygiene program is to attain and preserve a healthy workplace. If it is to meet its objectives, the program must contain three essential elements: (1) recognition, (2) evaluation, and (3) control of health hazards.

It is essential that we be able to recognize those processes and materials that can cause occupational disease. Both chemical and physical agents within the working environment must be considered. Our attention cannot be restricted to the basic materials used in a chemical process because by-products, or even impurities, are capable of producing occupational exposures of concern. Similarly, physical energy applied to a process or created by it, provides the source of a wide variety of potentially harmful exposures. Noise, ionizing and non-ionizing radiation, vibration and heat are some of the more common examples of physical hazards.

Once something in the environment is recognized as potentially harmful, it must then be evaluated to determine if it is, in fact, harmful. Evaluation, the second element of an industrial hygiene program, may require judgment, knowledge, experience, quantitative measurement, or a combination of all of these. To evaluate the hazard potential, both the short-range and long-range consequences to the exposed employees must be considered.

The third element of an industrial hygiene program is control. Once a condition has been evaluated and found to be hazardous, it becomes necessary to institute appropriate controls in order to reduce exposures to safe levels. Although one usually thinks of control in terms of engineering solutions, there are a number of other valid options that by themselves or in appropriate combinations can be exercised. These include such things as substitution of materials, change of process, use of good housekeeping, use of personal protection, and educating the worker in good work practices.

If a corporate industrial hygiene program is to be effective, it must have the sincere commitment of management at all levels, starting from the top. A manager's saying he is dedicated to preserving the health of his employees is not enough. He must be committed to the extent he is willing to provide the funds necessary to eliminate health hazards. The manager must also know that his supervisor is, likewise, fully supportive. Without such commitment, an industrial hygiene program is merely corporate "window dressing", a fact that will be plainly evident to the employee if environmental improvements do not take place.

Another essential requirement for an effective industrial hygiene program is a highly visible industrial hygiene unit. It must be involved, informed, and consulted at all levels of management. Without this involvement, the hygienist cannot have early input into decisions that could determine whether or not an environmental problem is created. Lack of early involvement can be costly and generally results in a program that is largely reactive rather than preventive. A highly visible industrial hygiene unit carries with it the implication that it has authority; that is, the authority to bring about the changes necessary to prevent or eliminate occupational health hazards. Without providing the industrial hygienist the authority that enables him to carry out his responsibilities a program will exist in name only.

An industrial hygiene organization within a multi-plant corporation requires a number of resources in order that it may operate effectively. A well-trained professional industrial hygienist is needed to direct the corporate activities. Many companies have

assigned engineers and scientists that were already in their employ to direct their industrial hygiene activities. Through dedication to their jobs, attendance at short courses and technical meetings, on-the-job training, and self-improvement, many of these people have, over the years, developed into respected and truly professional industrial hygienists. Providing the corporation has the necessary talent on hand and can afford to wait until it has developed a professional, there is nothing wrong with this approach. Unfortunately, in this day, the luxury of available time is rare. Management is under increasing pressure, generated by themselves, by their employees, and by governmental agencies, to rapidly improve environmental conditions in the workplace. At the same time, the training needs of the industrial hygienist continue to increase. Therefore, if it is necessary to expeditiously develop an effective program, it is prudent to hire the fully trained individual rather than try to develop one from within the corporation.

The university-trained industrial hygienists usually have advanced degrees, either Masters or Doctorates. Their undergraduate work is generally in the physical or biological sciences or engineering. Although the new graduate's academic training may be excellent, he is no different than most other graduates in being oblivious to industry or in knowing how best to apply his newly learned skills. Therefore, the tempering effect of experience is an essential ingredient in the make-up of anyone who would direct a corporate industrial hygiene program.

Of all the potentially harmful exposures in the workplace, exposure to toxic chemicals is one of the most frequently encountered. To evaluate the potential hazards that they represent, the air in the working environment in which they are dispersed must be sampled. Following collection, the samples are analyzed in order to determine if the airborne concentrations are within safe limits. From this, it can be inferred that an effective industrial hygiene program cannot operate without laboratory support.

Although sample analysis is an important function of an industrial hygiene laboratory, sample analysis is only one of its functions. Methods development is another important function. Frequently, the industrial hygienist finds that no adequate analytical or sampling methods are available to him for evaluating exposures to certain materials of interest to him. Because industrial hygiene sampling and analysis are inextricable, the laboratory must also be fully conversant with air sampling methods. Therefore, the laboratory's involvement in development of sampling methods is just as important as its involvement in analytical methods development.

The industrial hygiene laboratory is a calibration laboratory as well. Pumps and other air moving devices and air sampling systems must be calibrated in order that accurate measurements are obtained. It is also necessary to calibrate a wide variety of direct reading instruments. To perform these calibrations requires that the industrial hygiene laboratory have the capability to generate known concentrations of the contaminants to be measured.

Because of the wide variety of tasks it performs, one of the prime requisites of the industrial hygiene laboratory and its personnel, is versatility.

Although the necessary laboratory support can be purchased from other divisions of the corporation, the optimum arrangement is to have the industrial hygiene laboratory under the industrial hygienist's control. If supervision of a purchased laboratory service has different and competing priorities, the industrial hygienist may not always have his work done in a timely fashion. Problems of this nature can be minimized only if there is mutual understanding and cooperation between the laboratory supervisor and the industrial hygienist. Conflicting priorities and inhibition of the development of environmental laboratory specialists are better avoided by placing the administration of the industrial hygiene laboratory under the industrial hygienist.

An industrial hygiene program also requires engineering support. When problem areas have been identified, they frequently require some type of engineering control, ventilation being the most commonly encountered. The engineering expertise needed for design of control systems can either be part of the industrial hygiene or engineering divisions. If the former, the industrial hygiene engineer can provide control design concepts or details to the corporate or plant engineers responsible for the control installation. If, on the other hand, it is decided that all engineering control expertise should be part of the engineering division, the function of the industrial hygiene unit will be predominantly recognition and evaluation of potential health hazards. In this case, once the industrial hygienist has identified a problem area in need of

engineering control, he provides the control engineer with facts and figures that are necessary for designing effective controls.

Industrial hygiene requires toxicology support. New materials are constantly finding their way into the workplace. Not infrequently, some are materials for which no safe limits for man have yet been established. At best, there may be the results of animal testing - by which the effects on man might be inferred. Although all industrial hygienists eventually develop a practical knowledge of toxicology, this superficial knowledge is insufficient when materials of little known toxic properties are involved. To be able to recommend safe practices for these materials, the industrial hygienists need the help of an industrial toxicologist. Fortunate is the corporation whose industrial hygienist or physician, by his training, is also a toxicologist. On the other hand, if this expertise is not available within the corporation, it must be purchased or otherwise obtained from without. If a primary aluminum company is also heavily involved in the manufacture of chemical products, there is a likelihood that a full-time toxicologist can be justified to satisfy its own and its customers' needs.

Where should the industrial hygiene unit most appropriately be placed within the corporate organization? Obviously, there is no single answer to this question since corporate organizations and management philosophies differ widely. If there is a sincere corporate commitment at all levels of management to its industrial hygiene program, its placement within the organization is inconsequential.

But, because corporations are managed by humans who are sometimes- forgetful or preoccupied with their principal responsibilities, the managers frequently have to be reminded of this commitment. An effective means of reminding them is to place the organization in a position where it is readily visible; i.e. at a relatively high level in the organizational hierarchy.

In attempting to determine in which department industrial hygiene should report, the person making this determination should understand how industrial hygiene interrelates with other corporate units. The industrial hygiene objectives and activities must be compatible with those of the department to which it will report. Regardless of reporting relationship, it is essential that industrial hygiene have access to high levels of management because its activities impinge and cross over most divisions of a corporation. Later, I will describe in detail with whom and how they become involved with other corporate entities.

Where corporate activities in safety, health and environment are important to the company and involve a number of experts employed full-time in their specialties, a single department reporting to or headed by a corporate officer is warranted. There are a number of activities for which this department could be responsible, such as industrial hygiene, medical, safety, air and water pollution, and solid wastes.

The goals of industrial hygiene and medicine are quite similar.

Industrial hygiene might well report to the medical organization, but only if the medical director is broadly trained in occupational health and good management principles. Without these requisites, it will be difficult for the corporation to retain a high grade of industrial hygiene talent.

The industrial hygiene evaluations of some production operations will not always be to the production managers' liking, because they may require costly corrective measures. Therefore, if industrial hygiene reports to a production department, care must be taken to assure that the hygienist is not intimidated. Without this assurance, one has all of the elements of having the fox looking after the chickens. Although the hygienist must provide a sound basis for his evaluations and recommendations, he must, by the same token, feel free to evaluate conditions as he sees them.

The personnel department often provides a home for industrial hygiene. However, unless the department head has an understanding of the program's objectives and the technical support required by industrial hygiene, the hygienist may have difficulty in obtaining sufficient support for his activities to attain an effective program.

At least in the eyes of the employees, the labor relations unit is a poor home for industrial hygiene. Labor relations is an adversary process. Industrial hygiene is based on scientific facts which are not negotiable. Having industrial hygiene report to labor relations can be interpreted as, "The right hand giveth while the left hand taketh away."

Industrial hygiene reporting to the legal department has some of the same disadvantages of reporting to labor relations and to personnel. In addition, there will be the connotation of the industrial hygiene activities being purely for protecting the corporate interests rather than the employee's. With such a reporting arrangement, there is also a tendency for the hygienist to place a disproportionate emphasis on the legal requirements of his work.

Research is another department where one might consider placing industrial hygiene. This department can only provide the hygienist with technical depth. Industrial hygiene, although it must be innovative, can by no means be considered as research. Its concerns are with real problems existing in today's production areas.

Engineering is another department where industrial hygiene might logically be placed. But one must observe the same caveats as with reporting to production. Whatever the hygienist determines is in need of correction, the engineers must correct. Therefore, it is essential to keep the hygienist free of intimidation. In addition, although industrial hygiene control is engineering work, recognition and evaluation is not. Therefore, the engineering manager who supervises the hygienist must be broadly based so as to be fully supportive of the total industrial hygiene program.

As promised earlier, I will now reveal how the corporate industrial hygienist relates with other members of the corporate management team and, in so doing, give you a better idea of his

total function. Some of the more frequent contacts the industrial hygienist has are with medical, safety, and air pollution specialists. Because of the close relationship of responsibilities within the three groups, they frequently are combined to form a single corporate unit.

The physician and the industrial hygienist rely on one another to protect the health of the employee. For example, the hygienist advises the physician of potential physical and chemical stresses placed on the employees. The physician thus alerted is then able to look for early signs of excessive exposures. He is also able to screen out those employees who have physical conditions that are incompatible with exposures to certain materials identified by the hygienist. The physician, on the other hand, may describe to the hygienist certain symptoms he sees in the employees, and seeks the assistance of the hygienist in determining if the cause might be occupational. Jointly they are involved in training programs designed to inform employees of health hazards on the job and how the employees can and should avoid them.

The safety director and the industrial hygienist communicate regularly. Their familiarity with all types of hazards in the workplace permits them to support each other's efforts to protect the employee. They have a number of areas of common interest and some with overlap. Personal protection is usually administered by safety personnel. However, in many cases the industrial hygienist, with his technical and health-oriented background, is in a better position to select appropriate protective devices and to monitor their effectiveness. I refer specifically to such items as

respirators, ear protectors, and gloves used to prevent chemical dermatitis. Normally the hygienist, alone, is concerned about employee exposures to toxic materials. However, where there is the possibility of large spills of these materials, both the hygienist and the safety director are concerned and involved. In such instances communication between the two is essential, both to prevent duplication of effort and to assure that proper procedures are developed and observed. Similarly, both are involved where potential explosive hazards exist; but the hygienist, with his array of instruments and sampling devices, is usually better equipped to evaluate a potential explosion hazard. Safety and industrial hygiene as well as operating and engineering personnel should be involved in developing appropriate explosion prevention measures.

The hygienist also has need to communicate with corporate personnel responsible for controlling air pollutants. Air pollutants discharged from the plant are the same materials that create problems for the hygienist inside the plant. What is done to control in-plant pollution problems may affect out-of-plant problems and vice versa. For these reasons the specialists in each area should keep one another informed of their interests, concerns, and activities. They have much to learn from one another.

One of the key contacts of the industrial hygienist is with production personnel since it is within their facilities that the bulk of industrial hygiene problems exist. From production the

hygienist learns the nature of process materials and, from these, the problem potentials. Where real problems are found, the hygienist works with production to determine if other less hazardous materials can be substituted, or if work practices can be modified so as to minimize exposures. If these approaches are impractical, the hygienist will then work with the engineer who must install appropriate controls. The hygienist provides the engineer with data relative to the measured concentrations of the contaminant in the workplace and the reduction that is required. In some instances, the hygienist must collect additional sampling data specifically to aid the engineer in selecting a suitable design.

The hygienist must keep in close touch with the research organization. In doing so he is in a position to protect research personnel who are always working with new materials and processes. More important, potential health problems detected in the research phase permit appropriate controls to be designed and built into a process before it is taken into plant production where the potentially exposed employees are more numerous and the consequence of retrofit controls much more costly.

Occasionally, political or environmental conditions in the workplace stimulate employee grievances and, in some cases, application for workers compensation payments for physical conditions alleged to have been caused by occupational exposures. Such activities bring the industrial hygienist into direct contact with industrial relations and legal personnel. It is the hygienist's responsibility to gather the facts about the magnitude of employee exposures so as to determine if the allegations are real or contrived.

For the sales department, the industrial hygienist provides safety data sheets for the products they sell. These sheets describe the physical, chemical, and toxicological properties of the product, precautions for handling, recommended personal protective devices (where applicable), and the permissible limit for exposures. Such information enables the customer to use our products with safety. In addition, all customer inquiries relative to the toxicity of the company's products are handled by industrial hygiene personnel.

Although there are a number of other corporate units with which the hygienist has contact, the above illustrations are sufficient to show that when the talents of the industrial hygienist are fully utilized, he interrelates with a very large part of the corporation. He also has some important contacts outside of his corporation. He meets regularly with personnel from those governmental agencies that have responsibility for writing and enforcing health standards. He provides counsel and data to the standards makers in the areas where he has special knowledge. This is done with the goal of developing reasonable, yet effective, standards. The hygienist's relationship with his counterparts in governmental agencies who are charged with enforcing health standards is one of mutual respect. Although occasional differences of opinion may arise amongst them, they normally are settled amicably. This relationship can help to assure that the corporation receives fair treatment in the enforcement of regulations.

As in any other profession, the hygienist becomes involved in the work of various technical and professional organizations.

This is to advance himself and the profession, to work with his peers on problems of mutual concern, to communicate, to learn, and to teach. Attendance at technical meetings involving industrial hygienists from government, universities, industry and consulting organizations is also important. It is at these meetings he gains rapport with his counterparts and is kept current on developments within the profession that are of interest and concern to himself and to his employer.

In conclusion, I would like to say a few words about the organization of a corporate industrial hygiene program. To meet its charge to prevent occurrence of occupational disease, the corporate industrial hygiene unit can be organized in one of two fundamental means; centralized or decentralized. Where the authority is centralized, all of the industrial hygiene expertise is located at the corporate headquarters. Little or no expertise is in residence at the plant locations. Obviously, the total responsibility placed on this unit requires that its personnel possess a high degree of expertise. Under this system one of the more important responsibilities of the corporate industrial hygiene unit is to conduct all health hazard surveys at all plant locations. If there are a large number of plants within the corporation, the centralized organization will require a rather large number of specialists because the central unit will be required to conduct special studies as well as the planned periodic surveys at each plant.

The main advantage to having centralized organization is that all evaluations are conducted by individuals with a high degree of expertise. However, this system does have some disadvantages. It is costly because it requires a rather large staff of experts committed to a considerable amount of travel. Also, at any given plant, surveillance can be accomplished only during a limited number of days each year. This places a distinct handicap on the survey teams in being able to recognize all hazards. They will have a limited knowledge of each plant because of the limited time they have to understand its operation. One must also realize that with a number of plants to take care of, the corporate survey teams may not always be available when needed, especially when special problems arise. Finally, a centralized organization removes almost all of the plant's responsibility to take care of its own industrial hygiene problems.

A decentralized organization employs a small group of experts at the headquarters location that directs the overall corporate industrial hygiene program, audits plant performance, and provides the plants with consultation, training, and hands-on assistance to enable them to operate effectively. Each plant has the necessary expertise to do the bulk of its required evaluations. With proper selection and training of plant personnel, adequate surveillance can be accomplished largely by skilled technicians. Professional industrial hygienists might be required only at the larger or environmentally more complex plants. To gain the maximum benefit of these professionals, they can also provide assistance to smaller plants nearby. The decentralized approach requires that full responsibility for maintaining a healthy workplace rests on each plant.

To those of you who are not well acquainted with industrial hygiene, much of what I have said may sound complex and expensive. I think I would have to agree. But we live in a complex world, and as our plants take advantage of technological advances, they become increasingly complex, and equally complex environmental problems are frequently a by-product. Identifying and solving these problems can be costly, but we must solve them. To not solve them would be even more costly.

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