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Abstract

The operation of an energy system often requires that its personnel engage in manual and technical activities that involve exposure to health and safety hazards. A typical electric utility is used as a model for studying the operation of safety and health programs for energy systems. Specific criteria regarding standards and management are presented and discussed. These criteria are general enough so that they may be applied in the management of future energy systems.

1. INTRODUCTION

Annually, in American industries, more than 14,000 employees are killed and approximately 2,500,000 suffer disabling injuries. The National Safety Council estimates that the total cost to industry is 14 billion dollars, and some believe that the cost is even higher. (1)

This problem is dealt with herein with regard to the efforts that have been expended by the electrical utility industry to reduce this annual loss of human resources. In particular the impact of the Occupational Safety and Health Act of 1970 (OSHA) and its relationship to the present safety and health posture of the energy industry as well as future energy systems is examined.

Systems that generate and deliver energy usually have a working environment that exposes employees to many safety and health hazards. This has been true of the many operating utilities in the United States since their inception; however, several of them, such as the gas and electric utilities, have recognized the situation and have instigated safety and health programs which have made their places of employment relatively safe and healthful. This can be demonstrated by comparing the current data from various industries for the frequency of accidents (Table I).

The injury frequency rates shown in Table I are the number of disabling injuries per million man-hours of work. A tabulation of the severity rates would show that the electric utilities rank well below the industrial average. The severity rate is the time charges per million man-hours worked. This is due to the nature of the injuries sustained by electrical utility workers.

TABLE I

COMPARATIVE FIGURES FOR INJURY FREQUENCY RATES FOR 1973*

Industry	Frequency Rate
Communications	5.00
Electric Utilities	6.93
Gas	8.17
All Industry	10.55
Water	28.60
Sewer Systems	45.41
Streets & Highways	49.87
Refuse Disposal	71.86
Refuse Collection	104.53

*Courtesy National Safety Council and American Water Works Association

Because of their interest and past experience in the establishment of safety and health programs, the gas and electric utilities responded well and were very instrumental in formulating the standards for OSHA. The principal effort in this respect was expended by the investor-owned utilities, although the Rural Electric Cooperatives and some governmental agencies participated.

The enactment of OSHA was an event of some note for American industry. The Act states that "Each employer - (1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees; (2) shall comply with occupational safety and health standards promulgated under this Act." In other words, by law, the Act requires the employer to provide a safe and healthful workplace for his employees and to comply with certain standards. (2)

The first of these requirements, as stated previously, has been practiced by most of the electric utilities for many years as shown by the following discussion of a typical utility's approach to the establishment of a safety and health program.

2. A TYPICAL SYSTEM

The Union Electric Company, which has its general offices in St. Louis, Missouri, is a medium-sized utility, which serves the urban and industrial center of St. Louis and parts of the rural areas in Missouri, Iowa, and Illinois. Because of the diversity of its operations, this company is considered to be a good example of an energy system.

2.1 ELEMENTS OF THE SAFETY PROGRAM

The basic elements of the Union Electric's Safety Program are: (1) management responsibility, (2) assignment of responsibility, (3) maintenance of safe working conditions, (4) an accident record system, (5) a medical and first aid system, (6) training, and (7) employee responsibility.

Management's responsibility is assumed and demonstrated by written policy which is promulgated by the top management. The president of the company has delegated the proper authority throughout all management levels to provide for safe operation.

Personnel, such as the staff safety personnel, are assigned to the program and provided with authority to perform their duties. Adequate financing is budgeted to carry out the program. The safety organization is recognized and established as a decentralized operation with adequate

safety personnel from the staff who are appointed to administer policy, to provide technical information and program materials, and to assist in the training programs. The heads for the different functions interpret and support safety policies. Managers and superintendents carry out the program. Foremen, who are the key persons in the program, inspect for compliance with safety rules and standards, train their workers in safety procedures, supervise the safe operations of their crews, maintain a safe work environment, and carry out the details of the safety program with respect to first aid, accident reporting, and accident investigation. The staff safety personnel carry out their assignments by advising, assisting, evaluating, and promoting the safety program within all of the departments of the company.

Safe working conditions are maintained by proper planning and control. Planning is accomplished by including or providing for safety in the design of new systems and in normal operations. Safety rules, standards, and work procedures are established and followed. The company has a safety suggestion system. Control is maintained by means of regular safety inspections, accident investigations, and accident analysis.

The accident record system is well established and is utilized by the company to provide a basis for identifying safety problems and causes of accidents as well as for evaluating the program.

The medical and first aid system provides information for the proper placement of newly hired personnel. It assures adequate care and rehabilitation of the occupationally injured. It also protects employees against health hazards in the work environment. This last provision is accomplished by a staff industrial hygienist whose duties are to recognize and evaluate the environmental factors of the work place.

Staff safety personnel direct the safety training and provide a central source for information and support. The basis for all training is the foreman who trains his workers. He is assisted in informal training by the safety supervisors who coordinate such activities.

The last element of the program is the responsibility of the employee. This is set forth very well in the Occupational Safety and Health Act under "Duties", Section 5(b) "Each employee shall comply with occupational safety and health standards and all rules, regulations and orders issued pursuant to this Act which are applicable to his own actions and conduct." This has been interpreted to mean that the employee follows his employer's rules as well as the OSHA standards. (3) This is especially appropriate for the utility worker, because in many instances there are no applicable OSHA standards, and the worker must follow the rules of the company in order to work safely. This may be even more true in energy systems of the future when relatively new processes and procedures will be involved. Where no specific OSHA standard applies, the administrators of the OSHA law have relied on the above general duty clause for enforcement of the Act. If a compliance officer observes an employee working in an unsafe manner, his employer is held responsible and is subject to possible citation and fines. This has been a very controversial part of the OSHA law for some, but it merely follows the practices of good management.

2.2 STANDARDS

The second requirement of the Act, for both the employer and the employee, requires that certain standards be followed. This has caused considerable confusion especially when the OSHA standards are involved.

There are more than 22,000 OSHA standards. These cannot be expected to cover all possible hazards in all industries. This has been found to be true in the utility industry, which always has been exempted from provisions of the National Electric Code for construction activities and has used the National Electric Safety Code instead. There are two OSHA standards that apply to utilities: the General Industrial Standards (1910) and the Construction Standards (1926). The numbers refer to that portion of the Federal Register where the standards are found, and these numbers are used by industry to indicate the specific standards. Because a large percentage of the work done by utilities is construction, the 1926 Standards are usually applied. If a specific standard cannot be found in the 1926 Standards or they do not apply, the 1910 Standards are tried. If this fails, then the utility finds another standard or devises its own standards or rules.

The 1910 Industrial Standards do not specify specific electrical standards, instead Subpart S of that standard adopts as a national concensus standard the National Electric Code, NFPA 70-1971. This standard specifically exempts two industries: communications and electric utilities. (4) There are some exceptions in the electric utility industries where the 1910 Standards must be used for facilities in offices, warehouses, garages, and shops. Those facilities directly used for transmission and distribution of electrical energy are excluded. Standards for transmission and distribution are found in the 1926 Construction Standards under Subpart V. (5) These standards create a unique situation for the electric utilities by setting up a separate set of vertical standards for the transmission and distribution of electric energy. Vertical standards are those which apply specifically to one industry as opposed to horizontal standards which might apply to any industry; however, the standards that are found in Subpart V do not apply to the generation of power. The operation of generating stations is governed by the 1910 Standards for General Industry unless there is a period of construction when the 1926 Standards apply.

Thus, it can be seen that the application of standards for the operations within an electric utility are quite complex; however, they do provide a legal basis for the safe operation of such an energy system and in this respect can be extended to energy systems in the future.

3. CONCLUSION

It has been shown that safety and health problems do exist for energy systems, and an examination of an electric utility illustrates how one company copes with these problems by using a well-organized and structured program. The following are some general rules which may be used to establish a safety and health program for energy systems:

(1) Cultivate a positive attitude.
(2) Procure and maintain a good reference library.
(3) Put policies, rules and regulations in writing.
(4) Ensure top management's responsibility.
(5) Determine the objectives of the program.

(6) Establish priorities for accomplishment.

(7) Integrate into line management.

(8) Provide a staff organization.

(9) Set up a training program.

(10) Establish a means for evaluation and control.

The above rules could be called "the ten positive rules for a safe and healthful energy system". If properly applied, they will do much to help conserve America's most valuable resource for now and in the future.

4. BIBLIOGRAPHY

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5. BIOGRAPHIES

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