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Loss Control

Ergonomics

Introduction

Ergonomics is the study of people and their workplace.

The terms “ergonomics” and “human factors engineering” have been used interchangeably in discussing the general topics of product design and workplace design. In spite of some attempts to define the two terms differently, those who work under the outward appearance of human factors engineers and those who call themselves ergonomists actually use the same basic information and perform the same kinds of work with respect to product and workplace design. The expertise and objectives of these people for all intents and purposes are the same.

In the United States, the term “human factors engineering” has been used more widely; while in other countries, the term “ergonomics” has been more predominant. As the term “ergonomics” becomes more familiar in this country, it is being used to refer to both ergonomics and human factors.

The term “ergonomics” comes from the Greek word *ergon* (work) and *nomos* (law). It is a multidisciplinary activity which assembles information to permit the proper design of jobs, products, workplaces and equipment. It deals with the variety of ways in which people interact with their work environment, including the design and function of controls, displays, safety devices, lighting, temperature, workplace layout, tools and work organization. The basic goal of ergonomics is *to adapt the job to fit the person, rather than to force the person to fit the job.*

In the United States, the military and aerospace industries have generally accepted ergonomics principles, but most other industries have been less quick to understand the benefits. The benefits of well-designed jobs, equipment and workplaces are improved productivity, safety, health, and increased job satisfaction for the employees.

As concerns about productivity, employee job satisfaction, and health and safety in the workplace have increased, interest in ergonomics has also increased. Many schools with an industrial engineering or a psychology department now include a course in ergonomics. Industrial hygienists are expected to know ergonomics principles for certification. Medical professionals are recognizing the value of ergonomic analyses of jobs to assist them in the rehabilitation of people returning to work after illness or injury. In addition, with increasing industrialization of developing countries, there is more demand for designing manufacturing systems that maximize the capabilities of people.

Accident / Loss Trends

Several factors influence our concern about materials handling exposures:

- More than 25% of all workers' compensation losses involve the manual handling of materials.
- The lower back is involved in 75% of these injuries.
- Each year, seven million new back injuries occur, of which two million results in permanent disability.
- 93 million lost workdays annually result from back problems. The average disabling injury costs the employer $17,600 in direct and indirect costs.

Accident / Injury Types

Materials handling related injuries include:

- Muscle sprain/strain, especially to the lower back.
- Dislocation or herniated disc.
- Dislocated vertebrae.
- Inflammation of joint.
- Pinched nerve.

All involve localized, often severe, pain and restriction of movement. Other injuries caused by materials handling accidents include cuts and abrasion, fractures, etc.

Loss data concerning cumulative trauma disorders (CTD) is not readily available. In the past, many affected employees, not realizing their injuries were work related, have just submitted claims to their medical insurance carrier, rather than as a workers' compensation claim. More recently, however, medical and safety studies have shown that many of these symptoms have arisen because of repetitive occupational motion.

Cumulative trauma injuries include:

Carpal tunnel syndrome associated with a bent or twisted wrist, especially under force. The symptoms include numbness, tingling and burning sensations, and pain, often on only one side of the hand. The injury results when the nerve which runs through a channel of the wrists, called the carpal tunnel, is damaged by excessive repetitive pressure on the nerve.

Tendinitis associated with repetitive motions. The symptoms include pain, swelling, tenderness and redness of the hand, wrist and forearm, often resulting in a reduction of the use of the hands and fingers. The damage to the tendons result from overuse, and will depend on the type of movement. Related disorders include DeQuervain's Disease, tennis elbow, trigger finger and bursitis.

Raynaud's Phenomenon associated with vibrating tools. The symptoms include a loss of feeling and control in the fingers and hands, clumsiness, and a reduced sensitivity to heat, cold, and pain. The injury results from damage to the blood vessels of the hand, resulting in a lack of oxygen flow to the skin and muscle tissues.

History

Past efforts in the area of materials handling loss control have focused on assessing a person's ability to perform physical labor. In other words, if the job to be performed is known to require the lifting and moving of materials which could stress the body, special consideration was given to the health and functional ability of the person's back, based on x-rays, physical examination and medical history.

Other approaches have stressed the teaching of "proper lifting" through the bent-knee/straight-back approach. Neither has been totally satisfactory, however. The former requires assessment of every individual for each job. Neither compensates for changes in the task environment or changes in employees.

The application of ergonomics to cumulative trauma disorders began with military applications in the 1950's. It was not until the 1970's, however, that industrial applications became prevalent, beginning with display and control design, and more recently with hand tool and workplace design.

Current Directions

Ongoing research into materials handling and cumulative trauma disorders focuses on two areas; medical approaches and task redesign.

Medical approaches continue to stress the proper selection of employees through medical histories, although other indicators of loss potential are available. Lifting strength ratio studies by Don Chaffin and lordosimetry studies by Erwin Tichauer have made progress toward defining the physiology of the worker most likely to have injury from a material handling accident. Similarly, many medical studies have defined many hand and arm ailments as being work-related, which previously were thought to be unrelated to the specific tasks performed.

Task redesign, in which the components of a given job are designed to minimize the stress on the worker, has been shown to be a very effective control method for both materials handling and cumulative trauma exposures. Stover Snook has pioneered in application of research to the redesign of manual handling tasks to increase the percentage of the population that can perform the given task. Tom Armstrong and E. Grandjean have done similar work in the cumulative trauma disease (CTD) areas, developing design criteria for tasks such as assembly operation, to avoid CTD