DEVELOPING SAFE WORKING CONDITIONS AND PRACTICES

Human Factors in Machines, Equipment, and the Environment

Human engineering is defined as “the application of the principles laws, and quantitative relationships which govern man’s response to external stress to the analysis and design of machines and other engineering structures, so that the operator of such equipment will not be stressed beyond his proper limit or the machine forced to operate at less than its full capacity in order for the operator to stay within acceptable limits of human capabilities.

A high percentage of accidents result from a combination of unsafe acts and unsafe conditions, seldom solely from an unsafe act or an unsafe condition.

Evidence exists indicating that many so-called operator errors leading to accidents have been touched off by faulty design or construction, poor housekeeping, operating practices that created hazards, or lack of standardization and identification that so confuses the operator that he is literally trapped into making mistakes.

Thus potential accidents have been built into machines and equipment by failure to human engineer the work place.

Man-Machine Relationships

A principal objective of the supervisor and safety engineer in the development of safe working conditions is the elimination of bottlenecks, stresses and strains, and psychological “booby traps” (i.e. A trap set to catch a careless person) that interfere with the free flow of work. It is an accepted concept that the less an operator has to fear from his job or his machine, the more attention he can give to his work.

In the development of safe working conditions attention is given to many things, including machine design and machine guarding, personal protective equipment, plant layout, manufacturing methods, lighting, heating, ventilation, removal of air contaminants, and the reduction of noise.

Adequate consideration of each of these areas will lead to a proper climate for accident prevention, increased productivity, and worker satisfaction.

If this point of view is carried out in practice, fewer accidents should result, training costs should be reduced, and extensive redesign of equipment after it is put into use should be eliminated.

With the decrease in manual labor has come specialization, increased machine speeds, and monotonous repetition of a single task, which create work relationships involving several physiological and psychological stresses and strains.

Application of Ergonomics, principles

To achieve more effective integration of humans and machines.

The application of Ergonomics principles in the design of things is not an exact science. Rather, it is a philosophy or approach to problems of designing and constructing things which people are expected to use, so that the user will be more efficient and less likely to make mistakes in the use of article. In addition, it is an effort to make such articles more convenient, more comfortable, less confusing and in the end, less fatiguing to the user (These are important accident-prevention considerations).

Ergonomics' principle concern is people. How they see, hear, react, think, respond; how big or small they are, how far they can reach or bend; and how strong they are.

The human factors analysis and evaluation of human engineering systems should be done by highly trained specialists; this does not preclude the safety engineer and the supervisor.

The analysis should consider all possible faults in the equipment, the work area and in the works including a survey of the nature of the task, the work surroundings, the location of controls and instruments, and the way the operator performs his or her duties.

The questions of importance in the analysis of machine, equipment, process, plant layout, and the worker will vary with the type and purpose of the operation, but usually will include the followings:

- What sense organs are used by the operator to receive information? Does he move into action at the sound of buzzer, blink of a light, reading of a dial, verbal order? Does the sound of a starting motor act as a cue?
- What sort of discrimination is called for? Does the operator have to distinguish between light of two different colors, tones of two different pitches, or compare two dial readings.
- What physical response is he/she required to make?
- What overall physical movements are required in the physical response? Do such movements interfere with his/her ability to continue receiving information through his/her sense organs?
- What are the speed and accuracy requirements of the machine?
- What physiological and environmental conditions are likely to be encountered during normal operation of the machine?

Pertaining to the machine, equipment, and the surrounding area, these key questions should be asked:

- Can the hazard be eliminated or isolated by a guard, ventilating equipment or other device?
- Should the hazard be identified by the use of color, warning signs, blinking lights, or alarms?
- Should interlocks are used to protect worker when he forgets or makes the wrong move?
- It is necessary to design the machine, the electrical circuit, or the pressure circuit so it will always fail safe.

- Is there need for standardization?
- Is there need for emergency controls, and are controls easily identified and accessible?
- What unsafe conditions would be created if the proper operating sequence were not followed?