

## **Product Design**

- Ergonomics is playing an ever-increasing role in the design of products worldwide.
- Consultants in ergonomics are used to analyze new designs and to solve particularly involved problems and as expert witness in litigation.
- The more complex the product use pattern, the more rigorous must be the ergonomics investigation.
- Data covering “Anthropometrics” and “Biomechanics” are a particularly important foundation for product design.

**Anthropometrics** is simply the physical measurements of humans.

**Biomechanics** is the study of the human body’s capabilities.

**Note:** Currently available data in these disciplines are at times non-realistic, inappropriate, or just difficult to find.

- Product design quality depends upon an understanding of the user-product interface in terms of the user’s characteristics. These are not readily redesigned or modified.
- **Ergonomic principles:** when properly applied result in safer products, more easily understood and effectively employed by the user.

**1- Design for Safety:** Analysis of use patterns to discover possible or likely misuse is important. Misuse, which can be reasonably foreseen and avoided through design or warnings, provides fertile ground for future litigation, if it is not addressed during the product development cycle.

- Behavioral modification to control unsafe acts is not a widely understood or applied discipline in the home or workplace. Therefore, product design for safety remains the best approach to accident reduction.
- A sound methodology to ensure attention to safety in design includes a safety committee charged with reviewing the product on at least two milestone dates. The first date is the completion of the design on paper and the second is the assembly of pilot lot units. A standard safety checklist should be used for evaluation. It is important for the design team and safety committee to identify and agree upon potential mechanical, electrical and task hazards. Since real-time observation of accident experiments with human subjects is not possible, the analysis of accident reports compiled by attorneys can be a valuable exercise.
- So-called fail-safe design should be considered for those products, which are inherently hazardous, such as power saws etc.
- Finally, safe design, to be effective, must not impair the use of the product for its intended purpose.

**2- Design for Reliability:** Should be an on-going process of design and testing using prototype units. Clearly, there is a close relationship between product reliability, durability and safety.

Products reliability in use may be tested in the laboratory and in the field. Generally, data that are more meaningful come from field-testing with intended users.

To reliability to perform its function, a product should supply the user with visual and auditory feedback. Without feedback, human

beings cannot modify actions taken and forces applied during a use cycle.

Adjustments and controls should be understandable, consistent with, and appropriate to a product's use envelope. In addition, they must be repeatable and positive.

**3- Design for Durability:** Under conditions of normally expected use and reasonably foreseen misuse should be another area of focus. The lack of adequate durability may have safety implications. Constant product failure can be aggravating to a home user but disastrous for a professional user.

Testing for durability may be performed in laboratory simulations and field trials.

**4- Design for Usability:** Is closely dependent upon a solid understanding of a product's intended purpose and use environment.

New product designs with new applications require careful analysis of the use sequence and potential patterns of misuse.

Successful product designs must not only work right but be perceived as being right by the user.

**5- Design for Comfort:** Most people will decide intuitively upon the rightness or wrongness of a product's feel.

**6- Product Manuals:** Are important elements in the safe and satisfactory utilization of products. General safety information, specific product safety data, applications, operating instructions, cleaning and maintenance guidelines, service locations, approved accessories,

warranty statement and assembly instructions, if any, are all mandatory items for a good manual.

## **Fundamentals of Industrial Hygiene**

**Industrial Hygienist**: Is a specialist concerned with solving industrial health problems and trained to recognize, evaluate, and control health hazards in the industrial environment.

Every industrial hygienist has special proficiency in at least one essential basic discipline such as engineering, chemistry, physics, medicine, toxicology or biological science and has broad knowledge concerning the recognition, evaluation and control of stress in the work environment likely to impair health.

**Within his or her sphere of responsibility, the 'Industrial Hygienist' will:**

- 1) Study work operations and processes and obtain full details of the nature of the work, materials and equipment used, and product and by-products.
- 2) Make appropriate measurements to determine the magnitude of exposures to workers and the public.
- 3) Interpret results of the examination of the environment in terms of ability to impair health, nature of health impairment, worker efficiency and community nuisance or damage; and present specific conclusions to appropriate interested parties such as management, etc.
- 4) Make specific decisions as to the need for, or effectiveness of control measures and, when necessary, advises as to the producers that will be suitable and effective for both the environment and the environs.

- 5) Prepare appropriate text for labels and precautionary information for materials and products to be used by workers and the public.
- 6) Conduct programs for the education of workers and the public in the prevention of occupational disease.
- 7) Conduct epidemiologic studies among workers and industries to discover possibilities of the presence of occupational disease and establish or improve **'threshold'** limit values or standards as guides for the maintenance of health and efficiency.
- 8) Conduct research to advance knowledge concerning the effects of occupation on health and means of preventing occupational health impairment, community air pollution, noise, nuisance and related problems.

**THRESHOLD-LIMIT VALUES:**

Refer to air borne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect.