

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

SAFETY AND RISK

- Safety was defined as the risk that is known and judged as acceptable.
- But, risk is a potential that something unwanted and harmful may occur.
 - It is the result of an unsafe situation, sometimes unanticipated, during its use.
- $\text{Probability of safety} = 1 - \text{Probability of risk}$
- $\text{Risk} = \text{Probability of occurrence} \times \text{Consequence in magnitude}$

SAFETY AND RISK....

- Different methods are available to determine the risk (testing for safety)
- Testing on the functions of the safety-system components.
 - 1) Destructive testing: In this approach, testing is done till the component fails. It is too expensive, but very realistic and useful.
 - 2) Prototype testing: In this approach, the testing is done on a proportional scale model with all vital components fixed in the system. Dimensional analysis could be used to project the results at the actual conditions.

. 3) Simulation testing: With the help of computer, the simulations are done. The safe boundary may be obtained. The effects of some controlled input variables on the outcomes can be predicted in a better way.

SAFETY AND RISK....

- Safety must be an integral part of any engineering design.
- In other words of William W. Lawrence, "A thing is safe if its risks are justified to be acceptable".
- So a design or thing is said to be safe, if for the person who judges, the perceived risk is high. In short, safety means an acceptable risk.
- But, the drawbacks of the definition of Lawrence are
 - Under estimation of risks
 - Over estimation of risks
 - No estimation of risks

SAFETY AND RISK....

- A modified version of Lawrence definition is
- “A thing is safe if, were its risks fully known, those risks would be judged acceptable in light of settled principles. More fully, a thing is safe (to a certain degree) with respect to a given person or group at a given time if, were they fully aware of its risks and expressing their most settled values, they would judge those risks to be acceptable (to that certain degree)”
- The difficulties in Lawrence definition are overcome by
- Knowledge and Settled value principles – helps to rule out the irrelevant judgments
- Safety is frequently thought in terms of degrees and comparisons.
- The degree to which a person or group, judging on the basis of their settled values, would decide that the risks of something are more or less acceptable in comparison with the risks of some other thing.
- We interpret “things” to include products as well as services, institutional processes, and disaster protection.

RISK

- When a thing or product is proved to be dangerous or hazardous then it is unsafe.
- A risk is a potential that something unwanted and harmful may occur". A risk the possibility of suffering harm or loss.
- Risk is defined as the probability of a specified level of hazardous consequence being realized. Risk (R) is thus a product of probability (P) and consequence (C) which is given by the equation $R = P \times C$.
- On the basis of technology, risk includes the dangers of bodily harms or economic laws or environmental degradation.
- Good engineering practice has always been concerned with safety. Whenever the society is more influenced by technology there is more possibility of facing risks not only by the users but also by the producers. It causes ecological imbalance. So safety demand will be higher in degree

RISK.....

- A risk may fall into one of the following categories
- Low consequence, Low probability (can be ignored)
- High consequence, High probability
- Low consequence, High probability
- High consequence, Low probability
- Obviously we need to concentrate on the third and fourth categories of risk. The third category of events, the so-called “learning incidents” is precursor to high consequence of major events. The fourth category comes under the major hazards control and requires special attention. The risk analysis is mandatory for this category of “major events”.
- A disaster = A serious continued event; A state of unpreparedness.

Acceptability of risk

- William D. Rowe says “A risk is acceptable when those affected are generally no longer (or not) apprehensive about it. Doubtfulness depends mainly on how the people take the risk or how people perceive it. This perception of risk is mostly influenced by the following factors.

I. **Voluntarism and control**

- Though people know that their actions are unsafe, their involvement of risk is called voluntary risk. They take up these kinds of risky actions for thrill, amusement and fun

Acceptability of risk.....

- ii) Effect of information on risk assessments
- The ways in which the information necessary for taking a decision has a great influence on how risks are perceived. Many experiments have proved that the manner in which information about a danger is presented can lead to reverse preferences about how to deal with that danger.
- iii) Job - Related risks / Job – Related Pressures
- It depends upon the nature of the job. In most of the cases of employees in high risk jobs, don't have any options but to undertake them merely because of compulsion. They rarely use the available safety equipments.
- Ex: working in a steel plant or chemical plant.
- So, while designing and equalling the work stations, the engineers must consider the above said nonchalant attitude of the employers towards safety, particularly when their pay is on a piecework basis.

Acceptability of risk.....

- iv) Magnitude and proximity
- Our reaction to risk may be affected by the magnification or the personal identification or relationship of victims. Misperceptions of numbers can easily make us overlook losses that are far greater than the numbers reveal by themselves.
- Lessons for the engineers

Regarding the public conceptions for safety, engineers have to face two problems. First one is the optimistic attitude.i.e the things or actions are familiar to them, they never hurt them, and these actions can be controlled by them and present no real risk. Second one is pessimistic attitude. This attitude comes when the public feel that an accident kills many people, affects their inmates, they consider those risks as high ones.

- The risk communication and the risk management efforts must be structured as a two way process. □ Lay people ↔ Experts

Assessment of safety and risk

- It is very difficult to attain hundred percent absolute safety. In an engineering product, if there is any improvement in safety, it often goes with an increase in the cost of the product. On the other side, the products which are not safe always increase the secondary costs to the producer such as warranty expenses, loss of customer's good will and down time in the production process etc.
- An engineer must know the safety measures before assessing a risk of any product. The factors may be like:
 - Does the engineer have the right data?
 - Is he satisfied with the present design?
 - How does he test the safety of a product? And
 - How does he measure and weigh the risks with benefits for a product?
 - A stress on high safety and low risks leads to high primary costs and low secondary cost and vice versa.

Knowledge of risks

- It is the data in designing a product. Though past experience and historical data give better information about the safety of products designing, it is still inadequate.
- The reasons for the inadequacies are:
- The information is not freely shared among industries and
- There are also new applications of old technologies that provide available data which are less useful.

Uncertainties in design

□ Risk in a product arises due to so many uncertainties faced by all kinds of engineers such as the design engineer, the manufacturing engineer and also the sales and application engineer. This is also the knowledge required to assess the risk of a product. So, in order to minimize the risk involved in any product an engineer has to investigate the following criteria:

□ i) Purpose of designing

The purpose of designing a product has lot of uncertainties in its design itself.

□ ii) Application of the product

Uncertainties may also be based on the type of loading on that design and the uses of that design. In history, there is a best example to prove this. When Napoleon's army crossed a wooden bridge by marching in step, the bridge had collapsed. The design of that bridge could not bear that heavy load.

□ iii) Materials and the skill used for producing the product

There are also uncertainties regarding the materials and the level of skills used in designing and producing the product. For example, changing economic conditions, types of materials and also unfamiliar environmental conditions can affect the design of a product.

TESTING FOR SAFETY

- Once a product is designed, both the prototypes and finished product must be thoroughly checked and tested. This testing is to determine whether the product meets out the specifications and also to see whether the products are safe. The importance of proper testing can be explained by the disaster of a Russian submarine named “Kursk”. It sank in August 2000 and everyone in the ship was killed. The sinking had been caused by an explosion in the “torpedo room” which made a large hole in the body of the submarine. Many of the crew members survived the initial explosion, but died because they were unable to escape from the submarine and no efforts at the rescue by other ships were successful.

The Russian naval Engineers told the “Krusk” was equipped with a rescue capsule that was designed to allow the crew members to float safely to the surface in an emergency. But due to some reasons, this safety system was never tested. So, it is essential that in any engineering design, all the safety systems should be tested properly to ensure that they work as intended.

SAFETY AND RISK ANALYSIS

- Recent occurrences of large scale accidents in which many lives were lost or in which great damage was caused to the environment has lead to more attention being paid to safety within industrial plants or installations.
- As a result of this attention, risk analysis techniques have come to play an ever-increasing role.
- Risk reduction can take place at different levels viz by implementing the inherent safety provisions during the designing stage, applying safety measures, preventing or limiting damage, providing safety zones around industrial plants and by emergency planning.
- Each of these applications demands a specific approach for the risk analysis.

RISK ANALYSIS ANALYSIS

- Risk analysis is used for the assessment of the hazards associated with an industrial or commercial activity and can be summarized by 3 questions given below:
- What can go wrong? – Hazard Identification
- What are the effects and consequences?- consequence Analysis
- How often it will happen? - Probability estimation

Analytical Methods

- Several analytical methods are adopted in testing for safety of a product/project.
- 1. Scenario Analysis : This is the most common method of analysis. Starting from an event, different consequences are studied. This is more a qualitative method.
- 2. Failure mode and effect analysis : In this method various parts and components of the system and their modes of failure are studied.

SAFE EXIT

□ In the study of safety, the 'safe exit' principles are recommended. The conditions referred to as 'safe exit' are:

- 1 The product, when it fails, should fail safely
- 2 The product, when it fails, can be abandoned safely (it does not harm others by explosion or radiation)
- 3 The user can safely escape the product (e.g., ships need sufficient number of life boats for all passengers and crew; multi-storied buildings need usable fire escapes)

RISK-BENEFIT ANALYSIS

- Risk- benefit analysis is a method that helps the engineers to analyze the risk in a project and to determine whether a project should be implemented or not. It is very much closer to cost-benefit analysis.
- Risk – benefit analysis is being conducted for finding out answers for the following questions:
 - I. Is the product worth applying the risk-benefit analysis?
 - II. What are the benefits?
 - III. Do they over weigh the risks?
- The major reasons for the analysis of the risk benefit are:
 1. To know risks and benefits and weigh them each
 2. To decide on designs, advisability of product/project
 3. To suggest and modify the design so that the risks are eliminated or Reduced

Respect for Authority

- Decisions can be taken by a few people, but putting into action requires larger participation from different groups of people, such as operation, purchase, sales, accounts, maintenance, finance etc.
- In effectively-and efficiently-transferring decisions to actions, the authority comes into play a great role. Otherwise the individual discretions may ruin the activities.
- Further the authority fixes the personal responsibility and accountability uniquely on each person. This is necessary to ensure progress in action.

Institutional Authority

- It is the right given to the employees to exercise power, to complete the task and force them to achieve their goals.
- Duties such as resource allocation, policy dissemination, recommendation, supervision, issue orders (empower) or directions on subordinates are vested to institutional authority, e.g., Line Managers and Project Managers have the institutional duty to make sure that the products/projects are completed successfully.
- The characteristics features of institutional authority are that they allocate money and other resources and have liberty in execution.

Expert Authority

Authority

- On the other hand, the Expert Authority is
 - (a) the possession of special knowledge, skills and competence to perform a job thoroughly (expertise),
 - (b) the advice on jobs, and
 - (c) is a staff function.
- It is also known as 'authority of leadership'.
- These experts direct others in effective manner, e.g., advisers, experts, and consultants are engaged in an organization for a specific term.

COLLECTIVE BARGAINING

- It is the bargain by the trade union for improving the economic interests of the worker members.
- The process includes negotiation, threatening verbally, and declaration of 'strike'.
- It is impossible to endorse fully the collective bargaining of unions or to condemn.
- There exist always conflicting views between the professionalism and unionism.

CONFIDENTIALITY

- Confidentiality means keeping the information of the employer and clients, as secrets. It is one of the important aspects of team work.

Justification for Confidentiality

- Confidentiality can be justified by various ethical theories. According to Rights-based theory, rights of the stakeholders, right to the intellectual property of the company are protected by this practice. Based on Duty theory, employees and employers have duty to keep up mutual trust. The Utilitarian theory holds good, only when confidentiality produce most good to most people. Act utilitarian theory focuses on each situation, when the employer decides on some matters as confidential.
- Further, the following moral principles also justify the concept of 'confidentiality':

CONFIDENTIALITY.....

1. Respect for Autonomy

- It means respecting the freedom and self-determination of individuals and organizations to identify their legitimate control over the personal information of themselves. In the absence of this, they cannot keep their privacy and protect their self-interest.

2. Respect for Promises

3. Trustworthiness

4. Respect for Public welfare.

- Types of confidential information 1. Privileged information 2. Proprietary information

Conflict of Interests

A conflict of interest (COI) is a situation in which a person or organization is involved in multiple interests, financial or otherwise, one of which could possibly corrupt the motivation or decision-making of that individual or organization.

OCCUPATIONAL CRIME

- An occupational crime may be committed by
 - (1) wrong actions of a person through one's lawful employment or
 - (2) crime by an employee to promote ones own or employer's interest or
 - (3) theft or
 - (4) Pilferage of employee or
 - (5) Damage to properties or an employees own organization
- Tease are also called white collared crimes
- Occupational Health and Safety Assessment Series, OHAS-18001 Certification has been adopted in many Indian Industries. As per the Annual report of RIL10, an initiative called Project CASH, Change Agent for Safety and Health, had been formed to bring about a positive change and continual improvement in occupational health practices at the work place, besides attitudinal and behavior changes.
- This is claimed to have prevented work-related diseases, injuries, reduced absenteeism, and ultimately increased the productivity level.

HUMAN RIGHTS

- Human rights are defined as moral entitlements that place obligations on other people to treat one with dignity and respect.
- Organizations and engineers are to be familiar with the minimum provisions under the human rights, so that the engineers and organizations for a firm base for understanding and productivity.

Provisions under 'human rights' are as follows:

1. Right to pursue legitimate personal interest
2. Right to make a living
3. Right to privacy
4. Right to property
5. Right of non-discrimination
6. No Sexual harassment

Professional Rights

- Under professional rights, the following provisions are protected:
 - 1. Right to form and express professional judgment:
 - 2. Right to refuse to participate in unethical activities:
 - 3. Right to fair recognition and to receive remuneration for professional services:
 - 4. Right to Due Process from Employer
 - 5. Right to Equal Opportunity—Non-discrimination
 - 6. Right to Equal Opportunity—Sexual Harassment in the Workplace
 - 7. Right to Equal Opportunity—Affirmative Action or Preferential Treatment

Intellectual property rights (IPRs)

- ❑ Intellectual property rights (IPRs) are the protections granted to the creators of IP, and include trademarks, copyright, patents, industrial design rights, and in some jurisdictions trade secrets.
- ❑ IP permits people to have fully independent ownership for their innovation and creativity, like that of own physical property.
- ❑ This encourages the IP owners towards innovation and benefit to the society. It is an asset that can be bought or sold, licensed, and exchanged. It is intangible i.e., it cannot be identified by specific parameters.
- ❑ The agreements with World Trade Organisation (WTO) and Trade-Related aspects of Intellectual Property System (TRIPS) have been adopted effective from January 2005.
- ❑ The global IPR system strengthens protection, increases the incentives for innovation, and raises returns on international technology transfer.
- ❑ However it could raise the costs of acquiring new technology and products

Need for Protection of IP

□ IP plays an essential role to stabilize and develop the economy of a nation. This protection actually stimulates creativity, research, and innovation by ensuring freedom to individuals and organizations to benefit from their creative intellectual investments. The IP serves many purposes, namely

- (a) it prevents others using it,
- (b) prevent using it for financial gain,
- (c) prevent plagiarism
- (d) fulfill obligation to funding agency. ICICI Bank has advanced loan against IP as security to Shopper's Stoppe, New Delhi, and
- (e) provides a strategy to generate steady income.

□ Some of the challenges in the acquisition of IP are:

- (a) Shortage of manpower in the industry. Educational institutions can play a vital role in providing the same.
- (b) High cost of patenting and lengthy procedure. This was being considered by the Government and a simpler and faster procedure is expected, and
- (c) Lack of strong enforcement mechanism.

Types and Norms

1. Patents

- Patent is a contract between the individual (inventor) and the society (all others). Patents protect legally the specific products from being manufactured or sold by others, without permission of the patent holder. Patent holder has the legally-protected monopoly power as one's own property. The validity is 20 years from the date filing the application for the patent. It is a territorial right and needs registration. The Patent (Amendment) Act 2002 guarantees such provisions.

Types and Norms.....

2. Copyright

The copyright is a specific and exclusive right, describing rights given to creators for their literary and artistic works.

- This protects literary material, aesthetic material, music, film, sound recording, broadcasting, software, multimedia, paintings, sculptures, and drawings including maps, diagrams, engravings or photographs.
- There is no need for registration and no need to seek lawyer's help for settlement. The life of the copyright protection is the life of the inventor or author plus 50 years. Copyright gives protection to particular expression and not for the idea.
- Copyright is effective in (a) preventing others from copying or reproducing or storing the work, (b) publishing and selling the copies, (c) performing the work in public, commercially (d) to make film (e) to make translation of the Work and to make any adaptation of the work. Copying the idea is called 'plagiarism' and it is dealt with separately.

Types and Norms.....

3. Trademark

- Trademark is a wide identity of specific good and services, permitting differences to be made among different trades. It is a territorial right, which needs registration. Registration is valid initially for 10 years, and renewable. The trademark or service mark may be registered in the form of a device, a heading, a label, a ticket, a letter, a word or words, a numeral or any combination of these, logos, designs, sounds, and symbols. Trademark should not be mistaken for a design, e.g., the shape of a bottle in which a product is marketed, can not be registered as a trademark. Trademarks Act 1999 made in compliance with TRIPS agreement, provides further details. There are three functions of trademark:

1. Just as we are identified by our names, good are identified by their trademarks. For example, the customer goes to the shop and asks for Lux soap. The word 'Lux' is a trade mark. In other words it shows the origin or source of the goods.

2. The trade mark carries with it an inherent indication or impression on the quality of goods, which indirectly demonstrates that it receives the customer's satisfaction.

3. The trademark serves as silent sales promoter. Without a trademark, there can be no advertisement

Types and Norms.....

4. Trade secret

A trade secret is a formula, practice, process, design, instrument, pattern, commercial method, or compilation of information not generally known or reasonably ascertainable by others by which a business can obtain an economic advantage over competitors or customers.

Discrimination

- ❑ Discrimination means morally unjustified treatment of people on arbitrary or irrelevant grounds.
- ❑ Discrimination because of caste, sex, religion, creed, and language are regressive actions.
- ❑ Discrimination which means a morally unjust treatment of people in the workplace is damaging to the human dignity.