

INTRODUCTION

In the early 1900 industrial accidents were common in most of the countries. For example, in 1907 over 3200 people were killed in mining activity in United States (US). During this period legislation president and public opinion all favored management. There was only little protection for workers safety. Then the people began national safety council in 1913 in Chicago, a board based organization with thousands of members from business industry, agriculture, education, labor and government. The development of safety movement in US has paralleled that of national safety council (NSC).

Working conditions for the industrial employees today have improved significantly. The chance of a worker being killed in an industrial accident is less than what it was in the earlier days. Improvements in safety until now have been the result of pressure for legislation to promote safety and health, steadily increasing cost associated with accidents and injuries and the professionalization of safety as an occupational.

HISTORY OF OSHA

During industrial revolution, child labor in factories was common. The working hour were long, the hard work and the conditions often unhealthy and unsafe following an outbreak of fever among children working in cotton mills, the people of 'Manchester', England began demanding better working condition in the factories. Public pressure eventually forced a government response and in 1802 "the health and morals of apprentices act" was passed this was a mile stone piece of legislation. It marked the beginning of government involvement in work place safety.

Factory inspection was introduced in Massachusetter in 1867, In 1869 Pennsylvania legislation act passed on mine safety. The bureau of labor statistics (BLS) was established in 1869 to study industrial accident and report relative to inform about those accidents. In 1877 the first legislation requiring the use of guards for hazardous machinery was passed.

DEVELOPMENT OF SAFETY PROGRAMS

The first recorded safety program began in response to 'Joliet plant' of Illinois steel company in 1892. A committee of plant executives was formed to evaluate the problem and their first action was to inspect and test all fly wheels in the plant. Gradually other high injury industries took similar action but, it was not until workman compensation laws became general that accident prevention programs received serious attention the national safety council (NSC, 1912) promotes safety through compilation and dissemination of safety information and promotion of safety consciousness.

As industry became more aware of safety, methods to prevent accident were developed and engineer efforts to train and educate workers were undertaken and safety rules were established and enforced. Safety programs were built upon the principles of the "3 E's of safety"- Engineering, Education and Enforcement. The success of these traditional safeties depends on how we build upon.

Recommendation for changes safety programs intended to continue and improve upon the success, fall into 2 categories:

- 1) Federal legislation such as “occupation safety and health act”.
- 2) Improve safety methodology.

NATIONAL SAFETY POLICY

The National Policy on Safety, Health and Environment at Work Place was declared by the Ministry of Labor and Employment, Government of India in February 2009 after consultations with partners. The Action Programme to implement the Policy is part of the document.

The National Policy, referring to the Constitution of India, sets out a set of goals with the view to building and maintaining a national preventative safety and health culture and improving the safety, health and environment at workplace. The Policy also expresses a set of the national objectives.

The outline for Action Programme identifies eight specific working areas, including enforcement, national standards, compliance, awareness, research and development, occupational safety and health skills development and data collection.

After an initial review to ascertain the status on safety, health and environment at workplace, the Policy is envisaged to be reviewed at least every five years.

BENEFITS

The Policy is not limited to large and organized sector, but extends even to Medium scale and unorganized sectors.

The Policy Provides for

- General guidance to all the stakeholders to discharge their responsibilities in an appropriate manner.
- Helps to create a positive safety and health culture.
- Enables development of research activities, skill development of employees, employers, enforcement authorities, and society at large.
- Participation and cooperation of employers and employees promoting employee participation for effective management.
- Ensures better compliance and implementation through a mechanism of accrediting competent professionals and institutions.
- The implementation of the policy would enable timely collection, compilation, and analysis of work related injuries, diseases, sicknesses etc. for qualitative decision making at the national level.
- It provides for OSH systems approach to be followed by the management including use of computer aided risk assessment tools for dealing with safety, health and environment at workplace problems.

OCCUPATION SAFETY AND HEALTH ACT

This act was passed on December 29th 1970, and became effective in 1971. Earlier laws were in general, designed to provide compensation for occupational injuries and illness, the focus of OSH act was prevention.

The major goal of the act was to ensure, “so far as possible every working man and woman in the nation is safe and healthful working conditions and to preserve our human resource”.

Everyone involved with safety must be familiar with the impacts of OSH act and compliance procedures.

A number of ideas were proposed in the OSH act to achieve in its fundamental aim, the following have proved to be the most important.

- 1) Mandatory occupational safety and health standards.
- 2) Effective enforcement.
- 3) Uniform record keeping and reporting procedures.
- 4) Separate but dependent responsibilities and rights of employees with respect to achieve safe and healthful worker conditions.
- 5) The establishment of occupational safety and health administration (OSHA) and national institute OSH (NIOSH).

OSH – Administration

1. OSH administration standards

The responsibility of employees to provide safe and healthful workplace is based primarily on the standards established by OSH administration, a responsibility given by OSH act. OSH administration standards have been categorized in several ways. The most distinction is between, “Safety standards” which are intended to protect against traumatic injury and “Health standards” which deals with toxic substance and long term health effects. Another distinction is based upon the scope of standards.

- i) “Horizontal standards” applied to a wide variety of operations in virtually all industries.
- ii) “Vertical standards” are developed for a specific type of employment such as construction or telecommunication.

Many OSH administration standards are “consensus standards which have been adopted from nationally recognized organization notably from “American national standard institute” (ANSI), the “National Fire Protection Association” (NFPA) and the “American Society of Mechanical Engineers” (ASME). Others have been issued through specific rule making procedures, the major steps of which are as follows:

1. OSH administration proceeds on the basis of its own information, petitions from interested parties and recommendation from other government agencies, recommendation from (NIOSH) form an important basis for OSH administration standards.
2. OSHA may establish an advisory committee to make recommendation for the development of standards; requirements are laid down for the composition of advisory committee and for the time periods within which it must act.
3. If OSHA decides that a standard should be issued, it must publish a proposed standard and give the public at least 30 days to comment in writing. If objection to the proposals are filed and public hearing is requested, then such a hearing must be held.
4. On the basis of entire record OSHA must either, promulgate the standard or determine that no standard is needed and must publish a statement outlining its action.
5. Certain prescribed time frames for most stages of rule making must be followed.

There are many types of standard, all of which involve in control. The goal of good standards should be to co-ordinate work on the same problems in order to generate routine solution which can guide those who face similar problems in the future. There are particular characteristics which apply to good standards.

- 1) It must suggest something which can be attained.
- 2) It should be economically feasible.
- 3) It should be meaning full and applicable to the situations in which it is to be used.
- 4) It should be understood by its users.
- 5) It should be consistent in its interpretation.
- 6) It should be both stable and maintainable.

2. OSHA ENFORCEMENT

The act enforced OSHA standards by allowing surprise work place inspections and if violations are found, situations could be issued and civil penalties proposed. These aspects of enforcement have been upheld by the courts.

LAWS GOVERNING OSHA

The Factories Act, 1948, the Mines Act, 1952, The Dock Workers (Safety, Health & Welfare) Act, 1986 are some of the laws, which contain provisions regulating the health of workers in an establishment. Whereas the Employees State Insurance Act, 1948 and the Workmen's Compensation Act, 1923 are compensatory in nature.

1. Health Provisions under the Factories Act, 1948

The Factories Act, 1948 was enacted with the object of protecting workers from subjecting to unduly long hours of bodily strain or manual labor. It lays down that employees should work in

healthy and sanitary conditions so far as the manufacturing will allow and that precautions should be taken for their safety and for the prevention of accidents.

The Act defines a 'worker' as any person employed directly or through any agency (including a contractor), whether for remuneration or not in any manufacturing process or in any work incidental to or connected with the manufacturing process. It is required that work performed should be connected with the product which is produced in the manufacturing process.

Section 10 of the Act lays down that a State Government may appoint qualified medical practitioners as 'certifying surgeons' to discharge the following duties:

- a) Examination and certification of young persons and examination of persons engaged in 'hazardous occupation'.
- b) Exercising medical supervision where the substances used or new manufacturing processes adopted may result in a likelihood of injury to the workers.
- c) Exercising medical supervision in case of young persons to be employed in work likely to cause injury.

Chapter IX of the Act lays down in detail the provisions relating to the health, safety and welfare measures, namely, cleanliness, level of ventilation, diversion of dust and fumes, provision of artificial humidification, sanitation, fencing of machinery, among others. There are also provisions that prohibit women and children from working in certain occupations.

27 processes and operations have been identified as dangerous in The Maharashtra Factories Rules, 1963. These Rules lay down detailed instructions regarding preventive measures, protective devices, cautionary notices as well as medical examination of workers. The State Governments have adopted these rules depending on their local needs. The Act lists 29 occupational diseases and obliges the manager of a factory and medical practitioners to notify the Chief Inspector of Factories if any worker contracts any of the diseases. The Rules are very comprehensive in laying down special provisions with respect to health, safety and welfare of workers including medical examinations, setting up of Occupational Health Centers, etc. The only lapse has been its ineffective implementation since most of the discretionary powers lie in the hands of the Inspectors and occupiers. Although very few cases of occupational diseases are reported in factories, the working conditions in most of the factories handling hazardous chemicals have higher risk potential.

2. The Employees' State Insurance (ESI) Act, 1948

It is a social security legislation enacted with the object of ameliorating various risks and contingencies sustained by workers while serving in a factory or establishment.

It is designed to provide cash benefit in the case of sickness, maternity and employment injury, payment in the form of pension to the dependents of workers who died of employment injury and medical benefit to workers. It recognizes the contributory principle against such contingencies, provides protection against sickness, replaces lumpsum payments by pension in the case of dependents benefit and places the liability for claims on a statutory organization.

The Act does not cover 'seasonal employments'. It defines 'employment injury' as personal injury to employees, caused by accident or occupational diseases, in an insurable employment.

The Act lays down provisions to set up an ESI Corporation, to promote measures to improve health and welfare of insured persons and a Medical Benefit Council to advise the Corporation on medical benefits, certification, etc. The Medical Boards have to ascertain the percentage of disability of injured workers before submitting their report to the Corporation in order to grant compensation to the workers. An injured worker has to wait for months before the Medical Board calls him for a check-up.

The main source of revenue for the ESI Fund is the Contribution paid by the employers and the employees. The purposes for which the Fund is to be used are numerous. It includes payment of benefits, provision of medical treatment to insured families, meet charges in connection with medical treatment, maintenance of hospitals, dispensaries, etc. In existing conditions there is gross misuse of these funds.

The discretionary powers with respect to using the Fund amount lie solely with the Corporation along with the State Governments. According to the Occupational Health and Safety Center, Mumbai, the Corporation has only 4 occupational disease centers for workers.

Section 39 of the Act makes the employer primarily liable for the payment of contribution on behalf of himself and his employees towards the ESI Fund.

In case of misuse of the contribution by employer, the employee can sue the employer in the Employees' State Insurance Court set up by the respective State Government.

Where an employee makes a claim on the grounds of sickness, disablement or maternity, it has to be made against the ESI Corporation and not against the employer. The process involved to obtain the compensation, is tedious. Such a lapse renders the very object of the Act to provide for quick claims as unreal.

Under the Workmen's Compensation Act, 1923, there exists a legal obligation on the employer to pay compensation to workmen involved in accidents arising during the course of their employment. The prerequisites for payment of compensation to such workmen are as follows:

- Personal injury must be caused.
- There must be temporary, total or partial disablement due to an accident, which also includes occupational diseases.

The State Government is to appoint a Commissioner to decide the liability of an employer to pay compensation, the amount and duration of compensation, among other issues. An appeal may lie to the High Court in case the applicant is grieved with the Commissioner's orders.

Compensation is decided on the nature of injury caused. Where the injury from an accident results in the death of the workman, the minimum compensation payable is around Rs 50, 000 and the maximum may extend to Rs 3, 00,000. In case of permanent total disablement and permanent partial disablement, compensation may extend to Rs 60, 0000, depending on its nature. Further the amount of compensation is calculated on the wage-group to which the workman belongs and the time-period for which he has worked.

There is no comprehensive law on occupational health, though the Central Government has in its various policies stressed the need to effectively implement the existing laws.

3. Workman's Compensation Act,1923

This law has done more to promote safety than all other measures, because employees found it more cost effective to concentrate on safety than to compensate employees for injury or loss of life. However many employees look up insurance to cover compensation claims. Over the years, insurance companies have been a driving force in establishing and maintaining effective safety programs, supporting research in safety and employing specialists.

THE RIGHT TO KNOW LAWS AND SARA III

Legislation or regulation that requires an employer or producer to disclose information on hazardous material disposed, emitted, produced, stored or used in a work environment or community is known as right to know laws. The great deal of time and money has been spent complying with hazard communication laws, better known as right to know laws. The oldest and the best known law is OSHA hazard communication standard enacted in 1983. This standard requires all companies and employers handling any hazardous substance in any form to assess the hazards associated with the substance in the work area, to inform workers of those hazards and to train them in safe handling procedures. The environmental protection agency (EPA) has also involved with right to know laws as a result of the “superfund amendments and reauthorization act” (1986, of SARA III) of 1986 which requires companies to provide authorities with information concerning toxic chemical releases and other potential chemical hazards to the community. SARA III also encourages emergency planning efforts in response to emergencies arising from chemical incidence.

All the right to know laws have 3 primary objectives

- 1) The dangerous properties of materials used or produced in the work place are determined.
- 2) Employees are to be trained in the recognition of and safe handling of these materials.
- 3) The laws force companies to disclose the presence of hazardous substances, thereby making employees and others aware of the possible dangers.

It is known that, the task of compliance is expensive, sometimes confusing and endless, steps should be taken to meet the requirements and do it on a cost effective basis by using the following as building blocks.

- 1) Hazard determination- The material safety data sheet (MSDS).
 - 2) The written program.
 - 3) Training.
- 1) MSDS- It is a key to communication and compliance to the right to know laws. Each MSDS must identify the particular materials or mixture, its physical and chemical characteristics, any health hazards and other identifying criteria. Every company should develop an internal

review process for MSDS from received with orders to ensure that it contains the following minimum information.

- 1) The chemical and common name of the hazardous substance and for a mixture, the proportion of each chemical and its hazardous ingredients.
 - 2) The hazards posed by the substance, including potential for fire explosion and reactivity.
 - 3) Health hazards including symptoms of exposure and medical conditions aggravated by exposure.
 - 4) Precautions for safe handling and use including procedures for the cleaning up of spillages and leaks.
- 2) **WRITTENS PROGRAMS**- All employers using hazardous substances, regardless of size most comply with the written program requirements of OSHA hazard communication standard. The program itself must describe the presence and location of hazardous substance in the work place as well as identify the location and availability of written program and where to find and how to use the MSDS. Labeling procedures and all other matters related to hazardous substances.
- 3) **TRAINING**- It is required by OSHA hazard communication standard, other OSHA standard and generally by other right to know laws. It is left to the individual companies to decide what training program to introduce. The net result of this policy has been to yield excellent, well taught out expensive training and re-training programs which have been developed internally by individual companies. The minimum training program should alert employees to the hazardous materials that they may come into contact with, emphasis the written program, thoroughly explain the information given on an MSDS and then describe the procedures for safe handling.

CAUSE OF ACCIDENT

An accident can be defined as any unplanned and uncontrolled event caused by human situational or environmental factors or any combinations of these factors which interrupts the work process, which may or may not result in injury, illness, death, property damage or other undesired events but which has the potential to do so.

In every sphere of human activity, there is a possibility of an accident and work is no exception. Industrial accidents are the end product of unsafe acts and unsafe conditions of work however, accidents are preventable they don't just happen they usually occurs as a result of the combination of as number of factors of which 3 main factors are technical equipment's, the working environment and the worker. The working environment may be so noisy that it is impossible to hear safety signals. Also the works themselves may be a contributory factor in that they may not have received adequate training or may have little experience of the task.

Accidents repeats with those people who have a deficiency, either permanent or short life, such deficiency may be:

- 1) Lack of aptitude for the work.
- 2) Lack of certain skills and co-ordination.
- 3) A possible literacy problem.
- 4) An attitude or personality problem.
- 5) Alcohol or drug problems.
- 6) Personal life stresses.

There is unlimited number of hazards that can be found in almost any work place such as unguarded machinery, slippery floors or in adequate fire precautions. The hazards can be categorized as follows:

- 1) Chemical hazards, arising from liquids, solids, dust, fumes vapor and gases.
- 2) Physical hazards such as noise, vibration, unsatisfactory lighting, radiation and extreme temperature.
- 3) Biological hazards such as bacteria, virus, infections waste and infestations.
- 4) Physiological hazards resulting from stress and strain.
- 5) Hazards associated with non-application of ergonomics principles like badly designed machinery, mechanical devices and tools used by workers, improper seating and work station design or poorly designed work practices.

Workers do not create hazards in many causes the hazards are built into the work place .This means that the solution is to remove the hazards, not to try to get workers to adopt to unsafe conditions. The most effective accident and disease prevention begins work process are still in the design stage.

All the work place hazards can be controlled by variety of methods. The goal of controlling hazards is to prevent workers from being exposed to occupational hazards. Hazard control program includes the following components:

- 1) Hazard identification.
- 2) Ranking hazards by risk.
- 3) Establishing preventive and control measure.
- 4) Monitoring.
- 5) Evaluation program effectiveness and feedback.

THEORIES OF ACCIDENT CAUSATION

1. The Domino Theory of Accident Causation

An early pioneer of accident prevent and industrial safety was Herbert W Heinrich, an official with the travelers insurance company in the late 1920's after studying the reports of 75000 industrial accidents , he concluded that,

- 1) 88% of industrial accidents are caused by unsafe acts committed by workers.

- 2) 10% are caused by unsafe conditions.
- 3) 2% are unavoidable.

Heinrich's study laid the foundation for his axioms of industrial safety and his theory of accident causation which came to be known as the Domino Theory.

Heinrich's axioms of industrial safety

- 1) Injuries result from a completed series of factors, one of which is the accident itself.
- 2) An accident can occur only as a result of an unsafe act by a person and a physical or mechanical hazard.
- 3) Most accident is the result of unsafe behavior by the people.
- 4) An unsafe act by a person or an unsafe condition does not always immediately result in an accident or injury.
- 5) The reason why people commit unsafe acts can serve as helpful guides in selecting corrective actions.
- 6) The severity of accidents is largely by chance and the accidents that caused is preventable.
- 7) The best accident prevention techniques are analogous with best quality and productivity techniques.
- 8) Management should assume responsibility for safety, since it is in the best position to get results.
- 9) The supervisor is the key person in the prevention of industrial accidents.
- 10) In addition to direct cost of an accident (i.e compensation, liability, claims, medical cost, and hospital expenses) there are also hidden and indirect costs.

HEINRICHE'S DOMINO THEORY

According to Heinrich's there are 5 factors in the sequence of events leading up to an accident. Factors are as follows:

- 1) Ancestry and social environment = Negative character traits, that might lead people could behave in an unsafe manners can be inherited (ancestry) or acquired as a result of social environment.
- 2) Fault of person = Negative character traits, whether inherited or acquired or why people behave in an unsafe manners and why hazardous conditions exist.
- 3) Unsafe act/mechanical or physical hazard - They are the direct causes of accidents
- 4) Typically accidents that result in injury are caused by falling or being hit by moving objects.
- 5) Injury – Typical injuries resulting from accidents includes fractures and laceration.

Heinrich's theory has 2 central points

- 1) Injuries are caused by the action of preceding factors.

- 2) Removal of central factor (unsafe act or mechanical or physical hazard) negates the action of preceding factors and in doing so prevents accidents and injuries.

2. HUMAN ERROR MODEL OR HUMAN FACTOR THEORY

I OVER LOAD

LOAD	CAPACITY	STATE
1. Task <ul style="list-style-type: none"> • Physical • Information processing 	<ul style="list-style-type: none"> • Physical Condition • State of Mind • Training • Drugs or Pollutants • Pressure • Stresses that impair ability to respond 	<ul style="list-style-type: none"> • Motivational level
2. Environmental <ul style="list-style-type: none"> • Light • Noise • Distraction 		
3. Internal <ul style="list-style-type: none"> • Worry • Emotional stress • Personal Problem • Situational Factor 		
4. Situational <ul style="list-style-type: none"> • Ambiguity of goals or criteria • Danger 		

II INCOMPATIBILITY

- Stimulus response
 - Controlled display
- Stimulus stimulus
 - Inconsistent display type
- Response Response
 - Inconsistent controlled types or locations

III IMPROPER ACTIVITIES

- Don't know
- Deliberately (tools) risk
 - Low perceived probability of accidents
 - Low perceived cost of accident

The above Process (I Overload, II Incompatibility, and III Improper Activities) explains the human error underlining initiation of accidents. Ferrell considers that accidents are the results of

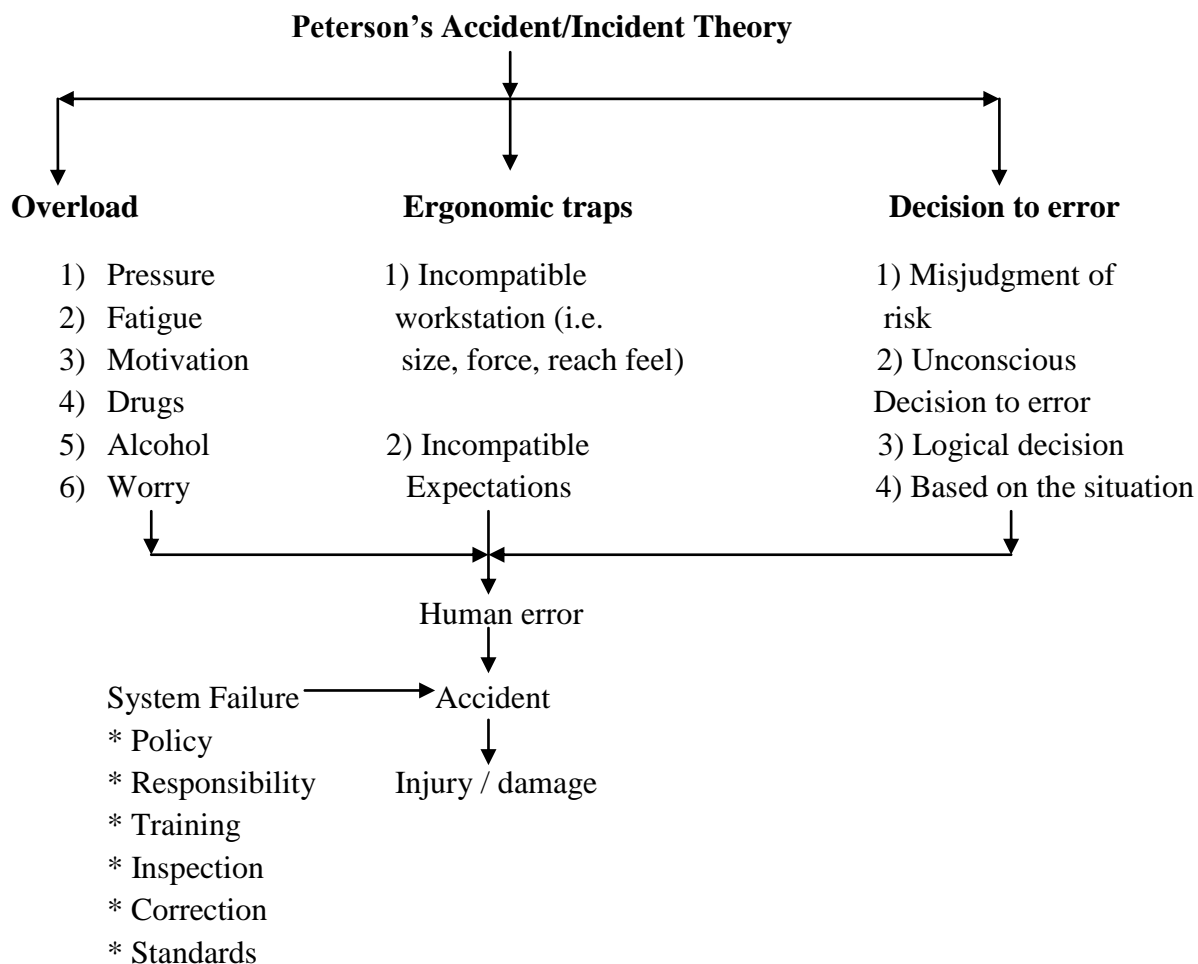
the casual chain of initiative incidents and that human error underlies all initiating incidents. The 3 situations for human error proposed by Ferrell are:

1. Overload: - The mismatch between the load and the capacity of the person at the time of action.
2. Incorrect response by the person to a situation and improper activity.

3. THE ACCIDENT / INCIDENT THEORY OF ACCIDENT CAUTION OR PETERSON'S CAUTION

It is an extension of human factor theory. It was developed by "Dan Petersen" and is sometimes refers to as Accident/Incident theory. He introduced new elements like ergonomic traps, the decision to error and system failures, while retaining much of human's factor theory.

In this model, overload ergonomics traps and decision to "err" leads to human error. The decision to err may be conscious and based on logic and it may be unconscious. A variety of pressures such as deadlines, peer pressure and budget factors can make a person decide to behave in an unsafe manner. Another factor that can influence such a decision is the "It won't happens to be syndrome".



The system failure component is an important contribution of Peterson's theory,

- 1) It showed potential for a casual relationship between management decision or behavior or safety.
- 2) It established management's role in accidents prevention as well as the broader concepts of safety and health at workplace.

Following are some of the different ways that systems can fail; management does not establish the comprehensive safety policy. Responsibility and authority with regard to safety are not clearly defined, safety procedure such as measurement inspection, correction and investigation are ignored or given insufficient attention. Employees are not given sufficient safety training.

4. THE EPIDEMIOLOGICAL THEORY OF ACCIDENT CAUSATION

Epidemiology is the study of casual relationship between environmental factors and diseases. The epidemiological theory holds that the models used for study and determining these relationships can also be used to study relationship between environmental factors and accidents or diseases.

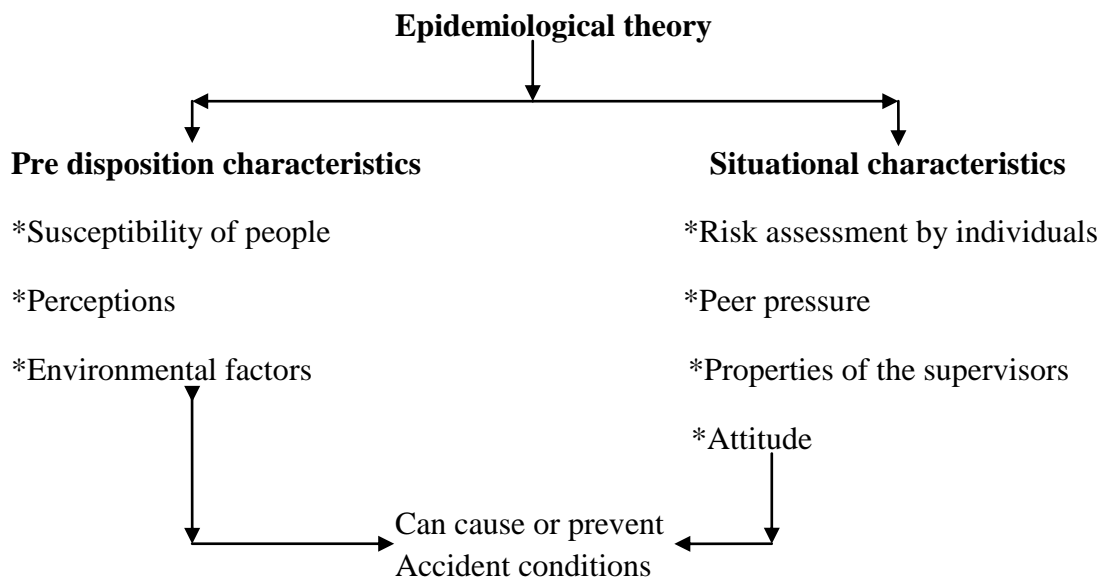


Figure illustrates epidemiological theory of accident causation where the key components are pre-disposition characteristics and situation characteristics, these characteristics taken together can either results in or prevents conditions that might result in an accident. Eg: If an employee who is particularly susceptible to peer pressure is pressured by his co-workers to speed up his operation, the result will be an increased probability of an accident.

ACCIDENT INVESTIGATION

One of the biggest challenges facing the investigators is to determine what is relevant to what happened, how it happened, and especially why it happened. This involves conducting a systems approach incident investigation that focuses on the root causes of the incident to really help prevent them from happening again.

The four-step approach supported by the incident investigation form and tools. This approach will assist employers through the incident investigation and help to ensure the implementation of corrective measures based on the findings.

The steps are:

1. Preserve/Document the Scene.
2. Collect Information.
3. Determine the Root Causes or Methods of acquiring accident facts.
4. Completing report and Implement Corrective Actions.

1. Preserve/Document the Scene

Preserve the scene to prevent material evidence from being removed or altered; investigators can use cones, tape, and/or guards.

Document the incident facts such as the date of investigation and who is investigating. Essential to documenting the scene in capturing the injured employee's name, injury description, whether they are temporary or permanent, and the date and location of the incident. Investigators can also document the scene by video recording, photographing and sketching.

2. Collect Information

Incident information is collected through interviews, document reviews and other means. Use checklist to ensure all information pertinent to the incident is collected. The type of information that should be collected during the investigation process includes:

- Worker characteristics (age, gender, department, job title, experience level, tenure in company and job, training records, and whether they are full-time, part-time, seasonal, temporary or contract).
- Injury characteristics (describe the injury or illness, part(s) of body affected and degree of severity).
- Narrative description and sequencing of events (location of incident; complete sequence of events leading up to the injury or near miss; objects or substances involved in event; conditions such as temperature, light, noise, weather; how injury occurred; whether preventive measure had been in place; what happened after injury or near miss occurred).
- Characteristics of equipment associated with incident (type, brand, size, distinguishing features, condition, specific part involved).

- Characteristics of the task being performed when incident occurred (general task, specific activity, posture and location of injured worker, working alone or with others).
- Time factors (time of day, hour in injured worker's shift, type of shift, phase of worker's day such as performing work, break time, mealtime, overtime, or entering/leaving facility).
- Supervision information (at time of incident whether injured worker was being supervised directly, indirectly, or not at all and whether supervision was feasible).
- Causal factors (specific events and conditions contributing to the incident).
- Corrective actions (immediate measures taken, interim or long-term actions necessary).

3. Determination of Root Cause / Methods of acquiring accident facts

The purpose of all this fact-finding is to determine all the contributing factors to why the incident occurred. Statements such as “worker was careless” or “employee did not follow safety procedures” don't get at the root cause of the incident. To avoid these incomplete and misleading conclusions in your investigative process, continue to ask “Why?” as in “Why did the employee not follow safety procedures?” Contributing factors may involve equipment, environment, people and management. Questions that help reveal these may include:

- Was a hazardous condition a contributing factor? (Defects in equipment/tools/materials, condition recognized equipment inspections, correct equipment used or available, substitute equipment used, design or quality of equipment).
- Was the location of equipment/materials/worker(s) a contributing factor? (Employee supposed to be there, sufficient workspace, environmental conditions).
- Was the job procedure a contributing factor? (Written or known procedures, ability to perform the job, difficult tasks within the job, anything encouraging deviation from job procedures such as incentives or speed of completion).
- Was lack of personal protective equipment or emergency equipment a contributing factor? (PPE specified for job/task, adequacy of PPE, whether PPE used at all or correctly, emergency equipment specified, available, properly used, function as intended).
- Was a management system defect a contributing factor? (Failure of supervisor to detect or report hazardous condition or deviation from job procedure, supervisor accountability understood, supervisor or worker adequately trained, failure to initiate corrective action).

4. Completing report and Implement Corrective Actions.

At this point, once you have gathered information and interviewed the involved worker and any witnesses, you can prepare the investigation report itself and formulate corrective actions. Your company should have determined who the report is sent to, within what time

frame and what information gets communicated to workers, management, or gets filed or posted. Each corrective action listed should have a person assigned ultimate responsibility for the action, a completion date set and a place to mark completion of the item.

Specific corrective actions address root causes directly; however, some corrective actions can be general, across-the-board improvements to the workplace safety environment. Some of the corrective actions to consider are:

- Strengthening/developing a written comprehensive safety and health management program.
- Revising safety policies to clearly establish responsibility and accountability.
- Revising purchasing and/or contracting policies to include line employees along with management representatives.

SUPERVISORY ROLE IN ACCIDENT INVESTIGATION

The supervisor in the area where it happened investigates the accident/incident and completes the investigation report within 24 hours of the accident/incident or hazardous situation. Fax the completed Accident/Incident Investigation Report. In the case of personal injury the supervisor ensures that the injured employee(s) receive immediate and appropriate first aid and/or health care. Report those injuries that result in critical injury to Occupational Health & Safety (OHS) immediately. During non-business hours the supervisor should call Campus Community Police Services. In conducting the accident/incident investigation and completing the Accident/Incident Investigation Report, the supervisor must ensure the following has been completed:

- Assessment of the Scene i) Inspection of the site, equipment, material that were involved in the accident/incident ii) Site must be secured especially in the case of a critical injury iii) Use of photographs, sketches, drawings of the accident/incident scene indicating sizes, distances, and weights of objects as appropriate.
- Interviewing i) Interview employee(s) involved ii) Interview any eye witnesses iii) Interview outside experts if applicable i.e. suppliers, equipment designers iv) Interviews must be documented v) Interviews should be conducted as soon as possible vi) Interviews should be conducted one-on-one in a quiet place.
- Identifying the contributing factors i) Factors to consider are people, equipment, material, environment, process.
- Write the report i) Record all findings of the accident/incident investigation on the standard investigation reporting form ensuring that all requirements of the written investigation procedure are captured ii) Copies of the completed Accident/Incident Investigation form are distributed as per the distribution list on the form.
- Make recommendations for corrective action i) Responsibilities must be assigned (investigators, management, technical personnel) for completion of the Action Plan ii) Record on Accident/Incident Investigation Report form under Action Plan iii)

Recommendations should focus on the corrective action(s) to all the contributing factors identified iv) Recommendations should specify What, Why and How the corrective actions will be completed.

- Ensure recommendations are acted upon i) Assign responsibility for the follow-up of the corrective action(s) ii) Record on Action Plan section of the Accident/Incident Investigation Report form iii) Detail what has been done, who has completed the actions and when the actions were completed.
- Ensure the recommendations are communicated to employees. Please note that when a department fails to report the accident/incident within the required time, any fines levied will be charged to that department.

QUESTION BANK

1. Outline the history and development of OSHA.
2. Write a brief note on national safety policy.
3. Write a brief note on right-to-know laws as a result of SARA-III.
4. List out the laws governing OSHA. Discuss any 2 in brief.
5. Outline and explain the causation/causes of accidents in industry.
6. Explain the Domino theory of accident causation.
7. What are the three factors that lead to human error in human factor theory explain?
8. With an aid of a flow diagram illustrate epidemiological theory of accident causation.
9. Briefly discuss with a neat diagram the Peterson's accident/incident theory.
10. Outline the process of accident investigation at a work place.
11. Explain the supervisory role in accident investigation.