
UNIT 16 PREVENTION OF ACCIDENTS

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16.1 INTRODUCTION

Accidents do happen. But, at the same time they can be prevented. Most of the accidents, whether small or large can be prevented. Even if they are not preventable, much can be done to reduce the level of accident consequences by taking the safety measures and preventive actions. Seriousness of the major accident can be reduced to a large scale by informing the potential victims, taking proactive measures and providing the safety equipment's. Serious consequences from major accidents can only be controlled by strictly implementing the safeguards and safety standards, and installing industrial units away from the densely populated areas.

All-inclusive management of on-site programs for prevention of an industrial accident and attentiveness of the involved people depends upon two primary keys:

1. The organized and efficient coordination of technical, administrative, legal and infrastructure considerations and,
2. To realize that the efficient public communication is an effective key to the preparation for the prevention of any occupational accident

Objectives

After studying this unit, you should be able to

- describe the need for prevention of accidents,
- discuss the humanitarian factors associated in accidents and its prevention,
- relate the prerequisites for a major hazard control system,
- analyze the hazard and risk
- carry out effective workplace inspections for accident prevention
- discuss the common practices to be followed to prevent accidents in the workplace.

16.2 NEED FOR ACCIDENT PREVENTION

Accident prevention is highly essential in any company or organization. Accident in an industry leads to various losses and adverse effects to the organization apart from direct effects of injury to the employee. Some of the industrial accidents in the past even lead to the complete closure of the plant and legal actions against them. Figure 16.1 shows the different reasons for accident prevention.



Figure 16.1: Reasons for Accident Prevention

Accident prevention is highly essential in an industry for the following reasons:

- i) Prevent economic losses: prevention of accident leads to reduction in various costs which otherwise would have to be paid by the company in terms of different direct and indirect costs.
- ii) Improve social values: An organization effectively involved in safety measures and accident preventions at workplace is always regarded as the good organization and thus built the social status of the company.
- iii) Avoid legal actions: In most of the countries it has now become mandatory to adhere to the safety standards in order to prevent the accidents. Not meeting the safety measures may lead to legal actions against the company.
- iv) Avoid loss of productivity: Accident in an industry leads to huge losses to the organization in terms of loss of productivity. Any accident be small or large, always accounts for downtime loss, loss of labour and various other costs which results in reduction in productivity.
- v) Humanitarian ground: Above all, prevention of accident in any industry is a true humanitarian concern. It leads to have good relations between employer and the employee and also boosts the morale of the employees and builds the mutual trust between the employer and the employee.

16.3 PRINCIPLES OF ACCIDENT PREVENTION

The core of accident prevention principle consists of foreseeing the unsafe conditions and of rectifying them before accident occurs. Investigation of an accident, even if it has not resulted in injury, aids in pinpointing the deficiencies in the set-up and helps in preventing recurrence of accidents.

- i) Accident prevention is an essential part of good management and of good workmanship.
- ii) Management and workers must co-operate whole heartedly in securing freedom from accidents.
- iii) Top management must take the lead in organizing safety in the works.
- iv) There must be a definite and known safety policy in each work place.
- v) The organization and resources necessarily must exist to carry out the policy.
- vi) The best available knowledge and methods must be applied

16.4 HUMAN FACTORS INVOLVED IN OCCUPATIONAL ACCIDENT AND ITS PREVENTION

Human factors play an important role in the accidents as well as in the prevention of accidents as follows:

- i) The model describing causation of accident should take into account relative timing as well as the relation between the elements.
- ii) The factors which leads to an accident varies with respect to their contribution in the accident. The chronological sequence of these factors also plays a key role in deciding the importance of any particular factor responsible for the accident. These two dimensions can vary independently. For example, some factors are important because of their occurrence in a very close time proximity of an accident and thus it can indicate the approximate time of an accident. Moreover, these factors may also be primarily responsible for the accident, or both. The complete analysis of both the chronological as well as causal importance of factors involved in the accident, the true reasons of the occurrence of an accident can be predicted instead of just describing how it occurred.
- iii) The industrial accidents are generally caused by the simultaneous activation of various factors instead of just one or two. In some cases, the poor or faulty interaction between the human, technical and environmental components can be critical and may be the root cause of an accident. However, the established frameworks for the analysis of an accident are restricted by the range of predefined categories. This flaw in the framework leads to the limited amount of information and in turn also restricts the range of options which are predominantly visible for the preventive action. In case of in-depth analysis for the cause of an accident, the large number of factors are explored and consequently, the model has to take an extensive range of factors into consideration. In this wide range, the interaction among the engagement of a human factor with other human and non-human factors are taken into consideration. Similarly, the pattern of occurrences, co-occurrences and inter-relationship of various different elements within the causal network of an accident are analyzed. These information provides a clear understanding of the root cause of an accident.
- iv) The interaction of two considerations such as the nature of an event and nature of its contribution in the accident. The accidents are not always solely occurred by any particular cause. In fact, there may be multiple causes responsible for an accident. However, the role played by these causes in the occurrence of an accident are not equivalent. Thus, understanding of the role played by each factor in the accident becomes critically important to analyze the actual reason for its occurrence and consequently, to prevent the future accidents. For example, the change in the environmental conditions during the accident which should not have occurred in the environmental conditions at the time of establishing the standard procedure. Thus, the prevention would be much more effective if it is targeted towards the hidden underlying causes instead of the immediate cause of an accident. This study of actual causal network can only be done if all type of factors are given considerable weightage in the

study, examination of their relative timing is conducted and their relative importance is predicted.

- v) There can be infinite potential ways in which the human factor could have been directly engaged in the occurrence of an accident. However, out of these infinite possibilities, there are relatively few patterns which accounts for majority of the accidents. In a study conducted by Feyer and Williamson (1991) over 3 years, it was reported that around two-third of occupational accidents in Australia are caused by only four pattern of predominant factors. Interestingly, in almost all of these patterns human factors are involved at some point of accident.

16.5 PREREQUISITES FOR HAZARD CONTROL SYSTEM

Many operations in the plants are hazardous. Therefore, a well-established safety mechanism and various facilities are pre requisite for operations of such plants.

In general, the working of a major hazard control system essentially requires the manpower, advanced equipment's and last but importantly the information source. These essential requirements are discussed in detail as follows:

16.5.1 Manpower Requirements

Any organization going to construct or working on any major hazard related installations should ensure availability of adequate number of workers with sufficient expertise in the field. Prolonged hours of working may also lead to the risk of accident even by the experts. Thus, the design of jobs and systems of working hours should be systematically arranged thus reducing the pressure of work and the risk of accidents.

The competent and responsible authorities frames the rules and regulations for the fully operational major occupational hazard control system. These regulations provides the mandatory guidelines for the engagement of following specialized and skilled manpower:

- a) Government officials (inspectors, commissioners etc.) with special powers;
- b) Hazard and risk assessment professionals;
- c) Qualified personnel for conducting examinations and testing's on pressure vessels;
- d) Skilled professional to handle the emergency situations and its management;
- e) Land-use planning experts;
- f) Emergency services such as fire fighters, police authorities, medical professionals etc.

Government officials

The competent authorities are responsible for providing the suitable staff including the qualified professionals for testing and inspection of the hazard control system. Moreover, it also provide specialized training to the officials and conduct frequent mock drills to evaluate the performance of the people involved in hazard control system.

Group of Experts

The group of experts involves engineers and scientists from different fields who work together with an objective to minimize the chances of an occupational accident. However, it is the responsibility of the competent authorities to establish a group of experts in the country and to also provide them with specialized resources for their efficient functioning.

Advisory committee

Advisory committee is framed by the competent authorities to obtain valuable suggestions for the efficient working of the hazard control system. This committee comprises of people from all the involved organizations and also the representatives which are experienced in handling the major hazards such as:

- a) Regulating authorities;
- b) Works managements and employers' organizations;
- c) Employee or trade unions representatives;
- d) Local governing authorities;
- e) Scientific labs and institutions.

The advisory committee is framed with following key objectives:

- a) To discuss the priorities of the major occupational hazard control system with any national requirements.
- b) To raise the technical difficulties in the implementation and efficient working of hazard control system.
- c) To suggest necessary recommendations and instructions on all safety features of hazard control system.

16.5.2 Technical and Safety Equipment

Competent authorities takes the decision of making the data base of national and state inventories of major hazard control systems. This element enables the quick support system from other facilities in case of an accident and the safety equipment's can be made available at the site as early as possible.

The works management and local authorities are responsible for making the availability of technical and safety equipment's in case of an emergency situation. However, this availability of resources varies with the needs of emergency plans. These equipment's includes:

- a) First-aid medications and rescue equipment's;
- b) Fire-fighting equipment's.
- c) Spill control equipment's;
- d) Personal safety devices for rescue staffs;
- e) Measuring devices for various toxic substances;
- f) Antidotes for curing of persons affected by toxic substances.

16.5.3 Sources of Information

The regulating authorities should identify their information requirements for the establishing and efficient working of the major hazard control system.

These requirements may include:

- a) Latest technological developments and advances in the process industries;
- b) Recent progresses made in the major hazard control systems;
- c) Practice codes for the health and safety related technical problems;
- d) Reports of the accidents, its complete evaluation study and remarks;
- e) Critical information's and reports provided by experts and professionals on major hazard control.

The regulating authorities can obtain these information's from various sources such as:

- a) Industry professionals and scientists;
- b) Industry and trade groups;
- c) Organizations which sets the national and international standards;
- d) Employee union;
- e) Scientific institutes and research labs;
- f) International codes of practice and guiding principles;
- g) National codes and guidelines;
- h) Previous accident reports;
- i) Research articles about major hazard valuations;
- j) Conference proceedings;
- k) National and international seminars

16.6 HAZARDS AND RISKS ANALYSIS

Primarily, works management is responsible for various hazard analysis. However, the same analysis methodology can also be adopted by the competent authorities for the assessment of the safety system.

A hazard analysis should cover the wide areas for the analysis of the safety of a major hazard and its prospective hazards. These wide areas includes:

- a) Identification of hazardous toxic, reactive, explosive and flammable materials in the installation;
- b) Identification of possible failure and errors which may lead to the abnormal conditions and contribute in the major accident;
- c) Identification of the consequences for the workers, people living or working outside the installation etc. in case of major accident;
- d) Prevention system and measures for major and minor accidents;
- e) Mitigation of the accident's consequences.

A formalized method is normally followed for the risk and hazard analysis. This method ensures the consideration of broad areas and its comparability for the efficient working of the prevention system.

16.6.1 Preliminary Hazard Analysis (PHA)

- i) PHA is the initial step for any hazard analysis.
- ii) PHA identifies the potential causes which can lead to an accident in the installation. This includes release of toxic fluids, explosive or flammable substances in the installation. The PHA also ensures the basic elements of safety in the system.
- iii) The PHA maintains the documentation of each and every accident, the involvement of components such as (pressure vessels, storage vessels etc.) in the accident, the events or activities which are responsible for the initiation of an accident, and lastly the corresponding safety devices such as safety valves, pressure gauges etc.
- iv) The findings of PHA should comprise the critical information about the units in the installation which requires additional attention and detailed examination. Similarly, the units which are less significant from a major hazard point of view should be also be identified.

16.6.2 Hazard and Operability Study (Hazop)

- i) A HAZOP is designed to determine the nonconformities from the normal working conditions in the installation. The HAZOP study also identifies the operational malfunction which may result in the uncontrolled conditions and consequently major accident.

- ii) The HAZOP study is very much needed during the design stage of the new unit's installation. Similarly, HAZOP study is also essentially required if some modifications (due to operational or legal reasons) are to be made in the existing installation.
- iii) The HAZOP study documents the systematic questionnaire regarding every critical part of the design, the motivation or intention of design, its deviation from the intention and potential hazardous conditions.
- iv) A HAZOP study should be necessarily performed by an expert group of people from multidisciplinary backgrounds. Moreover, it should always include the workers or staff who are familiar with the installation.
- v) The HAZOP study group should be headed by an experienced specialist from works management and should have undergone special training from the registered consultant.
- vi) The HAZOP study group should be headed by an experienced specialist from works management or an official specially trained by the professional consultant.

16.6.3 Accident Consequence Analysis

The last stage of hazard analysis consists of the investigation on the consequences of an accident. This analysis predicts the consequences of a major accident in the installation on workers, neighborhood and environment.

- i) An accident consequence examination should consist of:
 - a) Details of the accident such as tank rupture, safety valve failure etc.;
 - b) Estimated quantity of toxic and flammable material released due to accident;
 - c) Approximate calculation of dispersion of released material (gas or evaporating liquid);
 - d) Assessment of the dangerous effects such as toxic gases, heat radiation etc.
- ii) The accident consequence analysis methodology should include prototypes for dispersion of pollutant in the atmosphere, thermal radiation etc. The type of physical models varies from the installation to installation depending upon the hazardous substances present in the installation.
- iii) The findings of consequence analysis should be used to determine the protective measures needed in the installation. This may include fire-fighting system, alarms, pressure relief systems etc.

16.7 EFFECTIVE WORKPLACE INSPECTIONS FOR ACCIDENT PREVENTION

Workplace inspections help prevent incidents, injuries and illnesses. Through a critical examination of the workplace, inspections help to identify and record hazards for corrective action. Health and safety committees can help plan, conduct, report and monitor inspections. Regular workplace inspections are an important part of the overall occupational health and safety program and management system, if present.

Inspections are important as they allow you to:

- listen to the concerns of workers and supervisors
- gain further understanding of jobs and tasks
- identify existing and potential hazards
- determine underlying causes of hazards
- recommend corrective action
- monitor steps taken to eliminate hazards or control the risk (e.g., engineering controls, administrative controls, policies, procedures, personal protective equipment)

Planning is essential for an effective inspection.

What to Examine

The inspection should be focused on who, what, where, when and how. During inspection, an additional attention is given to the items that are potential source for the unsafe and unhealthy conditions owing to the stress, wear, impact, vibration etc. Inspection should also include the areas where work is not done on the regular basis such as parking lots, rest areas and locker rooms.

Workplace related elements

The workplace elements comprises of the people, environment, equipment's and the process.

The environment indicates the hazards through noise, vibration, lighting and temperature. Equipment includes the involved raw materials, tools, jigs and fixtures, for the manufacturing of a product. The way of interaction between the workers and other elements in a series of operations comes under the process element.

What types of hazards do we look for in a workplace?

Various types of workplace related hazards are:

- Safety hazards includes the threats triggered by the poor machine guards, risky workplace circumstances and unsafe work practices.

- The hazards caused by the micro-organisms such as bacteria, viruses etc. comes under the category of biological hazards.
- The threats associated with solid, liquid, gases, dust etc. belongs to the chemical hazards.
- Physiological and psychological pressure on the workers due to various activities such as repetitive and forced movements, incompatible work postures, improper designed workplace etc. leads to the ergonomic hazards.
- The condition of the work atmosphere such as noise, vibration, heat, radiation etc. comes under the category of physical hazards.
- The various other mental conditions of the worker due to overwork, stress, bullying etc. are associated with the psychological hazards.

Information required for the inspection report includes the following:

Area diagram

The plant layout and floor plans assist in the planning of an efficient inspection in the installation. The entire installation can be sub-divided into various zones based on the processes. The activities in these sub-divided zones are then analyzed visually. Moreover, an additional attention is invested on the location of machinery, equipment and raw as well as finished materials in the zone. Material and work flow in the installation is critically analyzed with a special attention to air ducts, aisles, stairways and fire exits. Opinion of workers and supervisors are also given due consideration as they are more familiar to the work place.

Equipment Inventory

Information on the inventory i.e. machinery, equipment, raw materials, finished goods etc. also contribute significantly in planning of an efficient inspection methodology. Besides inventory information, the technical data sheets and manufacturer safety manuals should also be given due consideration during inspection. Work area records provides the critical information related to the hazards associated with the equipment and thus it should also be given significant weightage during the inspection.

Hazardous Product or Chemical Inventory

The products engaged in the production should be listed along with its data sheets availability information. A check should be made on the exposure sources. The training and information on how to use, store and handle the products is to be necessarily imparted to the workers. The hazardous products should be properly labelled as per the Workplace Hazardous Materials Information System (WHMIS) guidelines.

Checklists

The checklist assists in the inspection responsibilities, controlling the inspection activities, and lastly documentation and preparation of inspection reports. Checklist also help in taking the on-spot readings and comments. However, while maintaining the checklist, there are chances of missing some other hazardous conditions which should be avoided. Thus, the checklists should only be used as a basic tool. A customized checklist as shown in Figure 16.2 is often more appropriate than the consolidated one.

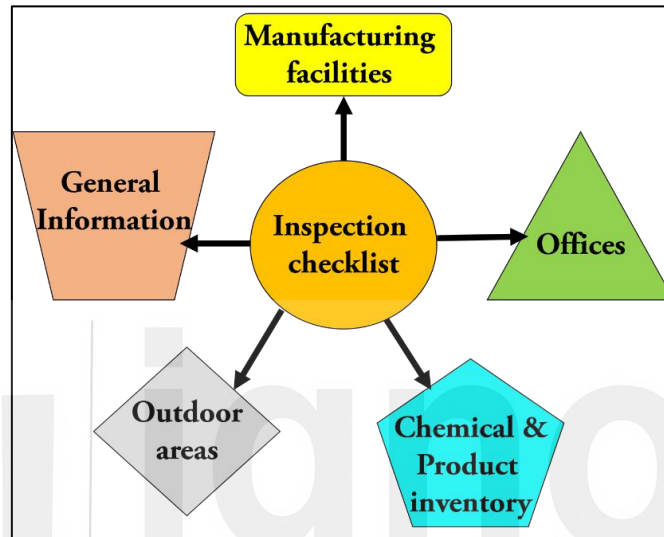


Figure 16.2: Customized Check List for Inspection

Reports

Inspection report is a crucial document and should be maintained properly. Past inspection report indicates the flaws which were previously identified and set a road map for the future inspections. It also provides the information regarding the areas which were not included in the previous inspections. The inspection report should not be copied from the previous reports, instead more attention should be paid on the critical elements which were mentioned in the previous reports. The past reports can be used to look for the issues and a check should be made whether the recommendations are implemented or not. The effective changes should be recorded down.

16.8 COMMON PRACTICES TO PREVENT ACCIDENTS IN THE WORKPLACE

- i) **Create a Safe Work Culture:** The workplace will be safe only when it is on the first priority of both the employers as well as of employees. Unfortunately, the safe work culture is not promoted by all the employers and as result of it a careless attitude is developed in the workplace. The employers should reward or recognize the workers who are practicing the safe work habits without hampering the production rate. These type of initiatives encourage workers to perform in a better way

and such positive steps also significantly contribute for the long run and safe workplace culture.

- ii) **Implement Fall Prevention Systems:** The occupational safety and health administration (OSHA) drafts the fall prevention regulations which is to be necessarily followed by all the organizations. The OSHA standards compels the manufacturer to find the fall prevention equipment as per the particular need.
- iii) **Perform Preventative Maintenance:** The severe accidents and injuries can be significantly reduced by conducting the preventive maintenance of equipment's in the installation. In addition to the safe work culture, preventive maintenance also extends the life span of equipment's involved in the production. The potential hazards can be identified and effectively cured in the regular preventive maintenance and thereby avoids the probability of accidents.
- iv) **Keep the Workplace Clean:** The clean work area is essential for the effective production rates. However, in manufacturing industries the cleaning of work sites is rather difficult but it can be a disaster for companies. The management should provide guidelines to the workers for keeping their work area clean which can also reduce the risk of falls and trips. The awareness programs for workers can be organized by managements for keeping the work area clean for the workers own safety.
- v) **Provide safety training for all employees:** The employees should be aware and prepared for the work hazard that may arise due to their nature of job. This is the responsibility of management to provide adequate training on all the work place safety standards and hazards to the workers. Workers should also provide a genuine feedback about the health and safety policies for their job. The documented safety policy should include the first-aid procedure for the each and every injury that may cause in the industry. It should also mention the name and location of the trained first-aid personnel. The employees should not operate the equipment's on which they are not having proper training.
- vi) **Utilize protective clothing and gear:** Many jobs require a specially designed uniform as per its nature of interaction with the workplace. The workers should wear proper uniforms and other recommended safety equipment's during working. These equipments may include hard hat, high-visibility clothing, goggles, protective suits etc.
- vii) **Avoiding Safety Shortcuts:** The shortcuts at the cost of safety are never recommended in the work place. It is always better to follow the standard procedure for the safe work environment of own and fellow workers in the organization.
- viii) **Miscellaneous : Some other practices are**
 - a) Lifting Quickly
 - b) Skipping Breaks
 - c) Using Tools Improperly
 - d) Applying the Wrong Safety Label

- e) Stock Ignoring 'Near Misses'
- f) Insufficient Emergency Equipment
- g) No Clear Emergency Exit Path

By investigating every incident, we learn about causes and can take actions towards mitigating or removing the causes.

16.9 HEIRARCHY OF ACCIDENT PREVENTION AND CONTROL MEASURES

An accident is an unexpected, unplanned event in a sequence of events that occurs through a combination of causes which results in physical harm, injury or disease to an individual, damage to property, a near miss, a loss or any combination of these effects. Risks should be avoided / eliminated and if not possible reduced by taking preventive measures. The order of priority is also known as the hierarchy of control. There are five common steps in the heirarchy of accident control.

Step-1: Elimination

Elimination of hazards refers to the total removal of the hazards. Elimination means that a risk is reduced to zero. Elimination is the ideal objective of any risk management. This is a permanent solution and should be attempted in the first instance. If the hazard is removed, all other management controls, such as work place monitoring, training, safety, auditing and record keeping will no longer be required.

Step-2: Substitution

Substitution means replacing the hazard by one that presents a lower risk. The concept of replacing the dangerous chemicals by the non-dangerous or the less dangerous chemicals can be applied. Step-3: Engineering control: Engineering controls are physical means that limit the hazard. These include structural changes to the work environment or work processes. Local exhaust ventilation (LEV) to control risks from dust or fume is a common example. Separation of the hazard from operators by methods such as enclosing or guarding items of machinery and equipment.

Step-4: Administrative controls

Administrative controls are also known as organizational measures. Administrative controls reduce or eliminate exposure to a hazard by adherence to procedures or instructions. Documentation should emphasise all the steps to be taken and the controls to be used in carrying out the activity safely.

Step-5: Personal protective equipment (PPE)

Personal protective equipment (PPE) should be used only as a last resort. Thus accident prevention has been based on learning from accidents and near misses incidents. By investigating every incident, we learn about causes and can take actions towards mitigating or removing the causes.

16.8.1 Job Safety Analysis (JSA)

Job Safety Analysis (JSA) is a procedure that identifies the hazard or potential accident associated with each step of a job. It helps to develop

solutions that will either eliminate or guard against hazards. Job safety analysis is a procedure which helps in integrating accepted safety and health principles into a particular task or job operation. In job safety analysis, each basic step of the job is to identify potential hazards and to recommend the safest way to do the job. There should be a group of experienced workers and supervisors in order to complete the analysis through discussion. An advantage of this method is that more people are involved in a wider base of experience and promoting a more ready acceptance of the resulting work procedures. Basic steps for making a job safety analysis There are four basic steps for making a job safety analysis:

- a) Select the job to be analyzed
- b) Breakdown the jobs into successive steps
- c) Identify the Hazards in each step and the potential of Accidents
- d) Develop ways to eliminate hazards and potential accidents. Hence job safety analysis produces safe job procedures that guide a worker through a task from start to finish orderly and safely which in turn serves as a best tool in accident prevention program.

16.8.2 Basic steps to Handle Emergencies in the Work Place

Emergencies include accidental releases of toxic gases, chemical spills, fires, explosions and bodily harm.

Planning:

The effectiveness of response during emergencies depends on the amount of planning and training performed. Management must show its support for plant safety programs and the importance of emergency planning. If management is not interested in employee protection and in minimizing property loss, little can be done to promote a safe work place. It is therefore management's responsibility to see that a program is instituted and that it is frequently reviewed and updated. The input and support of all employees must be obtained to ensure an effective program. The emergency response plan should be developed locally and should be comprehensive enough to deal with all types of 13 emergencies specific to that site. The plan must be in writing and it must include as a minimum the following elements:

- Emergency escape procedures and emergency escape route assignments. Procedures to be followed by employees who remain to perform or shut down critical plant operations before the plant is evacuated.
- Procedures to account for all employees after emergency evacuation have been completed.
- Rescue and medical duties for those employees who are to perform them.
- The preferred means for reporting fires and other emergencies.
- Names of regular job titles of persons or departments to be contacted for further information or explanation of duties under the plan.

The emergency action plan should address all potential emergencies that can be expected in the work place. Therefore it will be necessary to perform a hazard audit to determine toxic materials in the work place, hazards and potentially dangerous conditions. For information on chemicals, the manufacturer or supplier can be contacted to obtain material safety data sheets. These forms describe the hazards that a chemical may present, list precautions to take when handling, storing or using the substance and outline emergency and first-aid procedures. The employer must list in detail the procedures to be taken by those employees who must remain behind care for essential plant operations until their evacuation becomes absolutely necessary. This may include monitoring plant power supplies, water supplies and other essential services that can not be shut down for every emergency alarm and use of fire extinguishers. For emergency evacuation, the use of floor plans or work place maps that clearly show that the emergency escape routes and safe or refuge areas should be included in the plan. All employees must be told what actions they are to take in emergency situations that may occur in the work place such as a designated meeting location after evacuation. This plan must be reviewed with employees initially when the plan is developed, whenever the employees responsibilities under the plan change and whenever the plan is changed. A copy should be kept where employees can refer to it at convenient times. In fact, to go a step further, the employer could provide the employees with a copy of the plan, particularly all new employees.

16.10 GOOD SAFETY PRACTICES. CASE STUDY: BRITISH SUGAR (UK)

Background:

In 2003, two fatal accidents occurred at British sugar despite of having a well-equipped occupational health and safety provisions. These accidents caused a casualty of two workers. After the tragedy, the organization invested a heavy fund for the complete transformation of the work procedures and for the better implementation of the safety measures. British sugar's health and safety management model is shown in Figure 16.3.

Difficulties

It was observed, that **the workers have not adapted the new work procedures** even after the huge capital investment made by the organization in the transformation. This work behaviour is due to the **sense of insecurity among the workers** regarding the new safety provisions which were initiated by the organization.

Solution

As a solution to the problem the company came up with a proposal of "Safety debate" program as an implementation tool in 2006. It is an E-learning platform which is developed by the British sugar. This platform facilitates the

confidential discussion between the managers, middle managers and workers regarding the plant and work safety. The objectives of this program were as follows:

- **Mutual anonymous discussion between the managers and workers.**
- Planning cooperative steps for the improvement of safety procedures
- Implementation of new technologies, communication procedures and action plans on paper.

Benefits

- The accident frequency rate (i.e. number of accidents per million hours) was decreased from 5.2 in financial year 2005-06 to 3 in the financial year 2008-09 making an overall improvement of ~ 40%.
- The ratio of safety observations in 2005-06 was drastically increased by 346% in year 2008-09. The observation of unsafe acts was also increased from the ratio of 4:1 to 20:1 after the implementation of program. These statistical data indicates an excellent commitment and involvement in the safety procedures at all production levels.
- The program have significantly improved the procedures and work standards.
- In 2009, the British Sugar was awarded the “DuPont safety award” for its effective and innovative approach for the safety management.

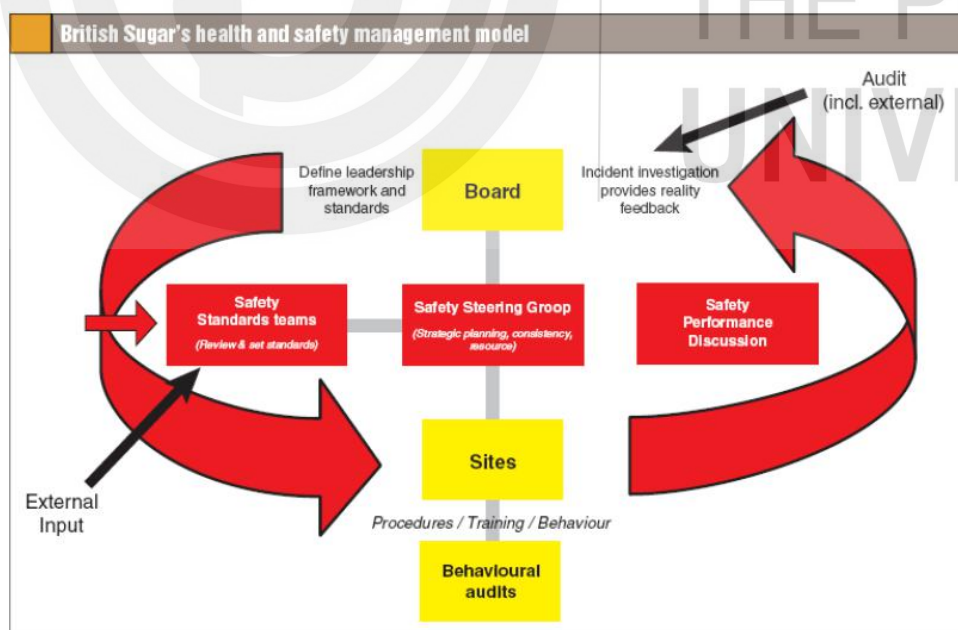


Figure 16.3: British sugar’s health and safety management model

Conclusions

From this case study, it can be concluded that the huge investments are not required in all the cases and instead, an innovative approach with an active

participation of the human capital can serve the purpose in context of health and safety measures in the organization.

16.11 LET US SUM UP

How to achieve Safety: The important pillars to achieve the safety are shown in Figure 16.4.



Figure 16.4: Important pillars to achieve safety

Broadly it is grouped in to 5 Es methods;

- 1) Engineering - Process Control
- 2) Enforcement -Rules & Procedures
- 3) Education - Training
- 4) Enthusiasm -Behavioral Aspect
- 5) Evaluation - Audit, Mock Drills

A trained workforce alert of hazards, aware of guards & facilities and also aware of the need to work safely is indeed an asset because it is ultimately the safety performance on the shop floor that matters. Hence human touch to all your shop floor policies is an important strategy in any Organisation for a Total Disaster Prevention Program.

16.12 KEY WORDS

Accident: An accident is an event that causes unintentional damage or injury.

Incident: An incident (near-accident) is an event that almost causes unintentional damage or injury.

Hazard: The term hazard is often used to denote a possible source or cause of an accident.

Risk: It can be defined as the possibility of an undesired consequence.

Accident investigation: An accident investigation is the collection and examination of facts related to a specific occurred accident.

Risk management: Risk management consists in coordinated activities to direct and control an organization with regard to risk.

Safety management: Safety management is a way of managing hazards and risks in an organization.

16.13 ANSWERS TO SAQs

For answers to SAQs, please refer to the relevant text in the unit.

16.14 REFERENCES AND FURTHER STUDIES

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 - Labour Turnover: Definition, Causes and Cost | Industries

<http://prevenblog.com/en/good-safety-practices-case-study-british-sugar-uk/>

MIS – 021
SAFETY PHILOSOPHY AND PRINCIPLES OF ACCIDENT
PREVENTION

BLOCK 1 INTRODUCTION TO INDUSTRIAL SAFETY

UNIT 1	Basic Concept of Industrial Safety
UNIT 2	Safe Working Practices
UNIT 3	Personal Protective Equipment (PPE)
UNIT 4	Fire Safety

BLOCK 2 INTRODUCTION TO INDUSTRIAL SAFETY
ENGINEERING

UNIT 5	Concept of Safety Engineering (Ergonomics, Process Safety)
UNIT 6	Storage of Material Handling of Hazardous Material
UNIT 7	House Keeping (5S Concepts)
UNIT 8	Safeguarding of Machinery

BLOCK 3 INTRODUCTION TO INDUSTRIAL SAFETY
MANAGEMENT

UNIT 9	Safety Organizations
UNIT 10	Safety Policy
UNIT 11	Training and Awareness Creation
UNIT 12	Safety Audit

BLOCK 4 INDUSTRIAL ACCIDENTS AND ITS
PREVENTION

UNIT 13	Introduction to Industrial Accident
UNIT 14	Types of Accidents and Its Analysis
UNIT 15	Cost of Accidents
UNIT 16	Prevention of Accidents