

Industrial Safety and Accident Prevention; A Managerial Approach

Tom Jose V, Sijo M T, Praveen

Abstract— The industries are looking to their production systems in the different direction to get the competitive advantages. But the most important is to find out the problem of the production system to make improvements. In this paper, a part of the production system of companies is studied to find the problems of the safety system of the company to make the improvements and to recommend some points to the companies for the achievements of its goals and avoid accidents. Increasing number of accidents involving workers has drawn our attention towards safety measures in the factories

Index Terms— Accidents, Companies, Production, Safety.

I. INTRODUCTION

With the start of the new century, the competition and pressure to perform competitively have increased on the companies. This new age will be challenge for the companies to provide new, exciting, innovative and cost effective products in the market. Now the business has become globalize and competitive. To survive, a company has to offer best prices to its customers with high quality, service and operate with lowest cost. It is only possible for a company if all of its departments are well managed.

In today's competitive environment, companies want to get the benefits of the different techniques which are being used in the product processes. They have implemented total quality management (TQM), just in time (JIT) manufacturing and total employee involvement (TEI) [1]. Now many companies have shifted their focus to optimization of their assets. One of the main parts of the company which has a strong influence on the assets is the safety department or the employees responsible for maintenance the different concepts to meet the requirements of the manufacturing plant are not successful without the support of the quality and maintenance strategy. There is no doubt that the safety has a vital role in the companies. Now a days most of the companies are giving attention to this important function which is considered as the necessary evil for the companies, i.e. an expense to the companies and a non-value addition function. The companies cannot survive

for long time without considering the safety as an important function because they will be put out of the business by the companies that are considering the safety as a competitive weapon

A. Industrial Accident

Accidents occurring in the industries are called industrial accidents. These are generally due to faulty equipment and machinery or negligence on the part of the workers. Proper precautions can reduce the accidents. There are always some causes for the occurring of the accidents. There are always some chances of accidents while working on the machinery and equipment. All industrial operations increase the chances of accidents. Proper training and knowledge should be given about the dangers of accidents. Accident occurs in industries due to faults of the workers. They can be negligent dis-interested in jobs and under the influence of of intoxicants resulting in a higher number of accidents.

B. Classification of Accidents

According to length of recovery; This is an important method of classifying the industrial accidents. This is further divided into three categories.

First Aid Cases: The injuries due minor accidents are not serious. The workers are given first aid at the factory hospital. After getting the medical treatment at factory hospital, the worker can again start the work. In this type of accidents no time is lost except when the worker is receiving first aid treatment. No compensation is paid to the injured worker.

Home case accidents: The injured worker is given preliminary treatment at the factory hospital and is allowed to go home. The worker recovers in this period and is ready to resume his duties. So, the worker loses the day, shift or turn of work in which the accident has taken place. This type of accidents do not involve any compensation to the workers as the workers do not fall under the preview of workmen's compensation act.

Lost Time Accidents: For these accidents, the factory has to pay compensation. The worker has to leave the work on account of accidents for more days in addition to the day, shift or turn in which the mishappening has taken place. The worker is generally admitted to the hospital. In this case temporary type permanent type of disablement may result. The accident may lead to enquiry and investigation if difference of option is found regarding the causes of the accidents. For example, the hand, arm, leg or any other part of the body is injured seriously or cut by the machine.

According to cause of events: Some example of machine accidents are given:

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Tom Jose V, S.C.M.S School of Engineering and Technology, Cochin, Kerala, India, Mobile No: 09020322814,

Sijo M.T, S.C.M.S School of Engineering and Technology, Cochin, Kerala, India, Mobile No: 098477520278.

Praveen, S.C.M.S School of Engineering and Technology, Cochin, Kerala, India,

1. Catching of fingers, arms, clothing etc. in machine.
2. Catching of tool, guides etc. in machine.
3. Catching of fly objects or particles.

These are common but generally less serious type accidents. Some examples are given below:-

1. Falling objects.
2. Objects on floor.
3. Pushes, bumps etc. by other persons objects.

According to damage caused: This classification is based on damage caused. Damage can be that of property, material or building. Some examples are given below:

1. Damage to the store material.
2. Partial or complete loss of container or contents.
3. Damage to hand trucks.
4. Damage to trolleys.
5. Damage to belt conveyors, cranes or machines.

According to nature of injury: This classification is as follows: Fatal Accidents: In such an accident, one or more persons are killed, Permanent Disablement: Due to accident the worker loses earning capacity, Temporary Disablement: These accidents are less serious than of previous category.

C. Concept of Safety

Industrial safety is primarily a management activity which is concerned with reducing, controlling and eliminating hazards from the industries or industrial units. Safety is opposite to accidents. If accidents are harmful, safety is beneficial. Man's greatest desire is security. He wants longer life. Accidents are one of the major causes of deaths. So accidents should be minimized. Safety is beneficial in all respects. Safety has become an essential feature of all walks of life [2], [3]. The maintenance of safety has become a major program in the industries. Specially trained persons known as safety engineers are appointed in the industries. The government has also framed rules and regulations towards safety. The factories act has special provisions on safety. Violation of these provisions is punishment. Some of the factories conduct special programmers in first aid treatment. The workers are acquainted with the preliminary treatment to be given to the injured. Programmers like extinguishing fire, removing the people from the building on fire are also carried out.

II. RESEARCH METHODOLOGY

Research methodology is considered as a supporting subject. It is used to develop a variety of research paradigms. These paradigms are varying in their contents and substance but their broader approach to inquiry is the same. 'Although the basic logic of scientific methodology is the same in all fields, its specific techniques and approaches will vary, depending on the subject matter'. There are two basic steps in the research process. The first step is to decide the goal or research questions. The second step is to find out the way to get the answers of the questions. The path to get the answers of the questions is composed of the research methodology. The selection of suitable methods, procedures and models are played an important role in each operational step of the research process to get the objectives of the research. There are two types of data which are collected for the research purpose, primary data and secondary data. Primary data mean new data. While secondary data mean the data which already

exist. The methods used to collect the new data are observations, interviews and experiments. There are some problems to the use of the data. One problem is the compatibility and the other trustworthiness.

III. PROBLEM DEFINATION

Nowadays many companies are interested to improve their safety system. Because, they have come to know that this is the system through which companies can reduce the cost of their products and can develop a reliable and safe production process. A well designed safety system structure can be helpful for the companies to get the competitive advantages. But majority of companies are not able to manage safety system. The two main reasons for that are the lack of proper measurement and the lack of top management interest for safety [3]. The main goal of the industrial safety is to reduce the accidents in the industrial plant, machinery and equipment. A good safety policy cannot be 100 percent effective at all the time. Even now a good safety policy can get 70 to 90 percent efficiency.

Nowdays companies are realising the importance of the safety in the competitive environment. They are looking to get the benefits from safety practices and to reduce accidents. They want to make a reliable manufacturing system with minimum accidents and to improve the production capacity of their plants. The purpose of this study is to take a systematic and scientific way to analyse the current situation of the safety system of the company and to pick up the weakening in the safety system those do not allow the company to achieve the set goals. Is the company using its safety equipment in a proper way to reduce accidents and to get the competitive advantages? If not, then find out the main reason for that. Which kind of problem is there? And what are the influences of these problems to achieve the safety goals of the company. The company cannot compete in the competitive market unless it uses its resource and capabilities to the maximum level keeping the accidents in the minimum level [5]. The company must have to work to get rid of the problems to reduce accidents and to get the competitive advantages with respect to cost, service, quality and on time delivery.

IV. DATA ANALYSIS AND INTERPRETATION

A. Data Collection Through Survey

Secondary data rarely solves a research problem completely. Therefore, additional information to the problem at hand - primary data - is needed. Once secondary data has been examined, primary data can be selected by communication or observation. Communication involves the asking of questions to respondents in an oral or written form by the use of questionnaires. Communication may be served by questionnaires and interviews conducted either in person or over the telephone. Observation means that the researcher observes particular situations in order to record facts, actions, or behaviors that may be of interest for solving the research problem. The selection of primary data by communication is faster and cheaper than observation, and holds the advantage of versatility. On the other hand, observational data is more objective and accurate due to the fact that the collected

information is not influenced by a person's memory, mood, or reluctance to provide the desired data.

As mentioned before, the combination of several methods allow to consider the units under study from several directions and to enhance the understanding. The methodology employed in this research consisted of a questionnaire and the use of sample interviews. For instance, the questionnaire gathers only data about issues, which are a part of it, and may neglect other important things. This weakness might be compensated by the use of interviews.

The primary advantage of questionnaires is the opportunity to reach a high number of respondents. Moreover, there is no interviewer bias and the costs are relatively low. In addition, respondents may be more willing to provide information about certain issues, have time to answer questions, and may answer the questions at times that are convenient. On the other hand, it may consume a lot of time when waiting for answers, non-response rates may be high, existing bias due to non-response, especially where response is slow, and certain types of questions cannot be asked. Furthermore, misinterpretations and misrepresentations are common with questionnaires. However, provided that the survey is carried out properly, the results are reliable and represent a wider population than that directly investigated. The questionnaire recollected is 50. Thereafter, the answers of the respondents were analysed by using the percentage. Moreover, the received data can be easily used in a statistical form, which makes comparisons between different groups possible

B. Interviews

After analysing the questionnaire results, personal interviews were conducted with five employees of the company. The interviewees differed in the age, gender, marital status, position, work area, and years in the company. The interviews were performed to gain a deeper knowledge of the results received by the questionnaire respondents. Those results were presented in diagrams. In order to not affect the answers of the respondents we asked them how they would interpret the data and to give reasons why those differences might occur. The interviews were structured in order to ensure the objectivity of the research, and open-ended questions were used.

The environmental aspect was rated as very important. The interviewees mentioned that it is important to have a good relationship with co-workers, to be able to talk about something else other than work sometimes, to have fun together and not just to work. In addition, it was argued that the employees depend mostly on their co-workers and spend more time with them at work than with their families, sometimes more than 40 hours a week. Therefore, it is important to feel comfortable with work colleagues - no matter which type of work. Since people spend so many hours a day and so many days of their lives at work, the work conditions are important in order to feel comfortable and to be sure that the health is not at risk in any way. The issue of work conditions is often discussed on television and in papers today, and people are very aware of the fact that nothing should influence their personal health in a negative way. The Hawthorne studies emphasized the environment, in particular

the social as well as industrial relations, as very important for the safety of employees.

V. RESULTS AND DISCUSSIONS

A. Causes of Accidents

Accidents do not just happen but there are always some causes. If we want to decrease the accidents, then the causes of accidents must be studied in details. The various causes can be divided as follows:-

Physical causes based upon unsafe conditions of work: These are linked with the machinery and surroundings. These are beyond the control of the worker. The conditions are likely to cause accidents. This is further classified as follows:-

Causes related to machinery and plant: Following can cause accidents:

1. Unguarded and unfenced moving machine parts.
2. Unbalance, noisy and improper adjusted machine parts.
3. Space between the machines is less.
4. Old and worn out machines.
5. Improper insulation of electric circuit and machinery.
6. Insufficient lubricated moving parts get heated.
7. Improper plant layout.

Causes related to tools and materials:

The following will more number of accidents:

1. Dull or damaged tools.
2. Tools without handles.
3. Very sharp edged tools.
4. Inflammable and hot materials.
5. Poisonous and toxic materials.
6. Breakable materials.

Causes Related to Dress:

1. Loose or improper dress.
2. Slippery foot wears.
3. Not wearing personal protective equipment e.g. goggles, gloves, screen required during welding

Causes related to working conditions:

1. Lighting is not proper.
2. Improper ventilation for the exit of dust and gases.
3. Slippery floors and stairs cases.
4. Working hours are too long resulting in tiredness.
5. Bad discipline.
6. Defective buildings and projected objects.

Physiological causes based upon defects of physical body of the worker: The causes of accidents are related to physical body of the worker e.g. a weak man cannot lift a heavy load. Weak eye sighted person cannot do the work on machine. An old man cannot do heavy work. Some of causes of accidents are due to following physiological defects:

1. Weak eye-sight.
2. Poor listening power.
3. Weak health.
4. Any part of the body may be defective.
5. Fatness and high blood pressure.
6. Fatigue and exertion of work.
7. Older employees.

Psychological causes based upon mental disturbances of the worker: These are linked with the mental disturbance of individual worker. This is not some external environment but the internal characteristics of the employee that the accident occurs to him. The worker is regarded as careless and is victim of an accident. He does not give proper attention to

safety rules and regulations. The worker may involve himself in the accident on account of following:

1. His habit of ignoring the things that is carelessness.
2. Frustration, worry or depression.
3. Emotional non equilibrium due to mental tension.
4. Improper co-ordination between body and mental faculties.
5. Nervousness and impulsiveness.
6. Over confidence.

Human factors causes of accidents.

- (a) Workers being unaware of the hazards;
- (b) Lack of or inadequate working procedures;
- (c) Workers being inadequately trained;
- (d) Inappropriate working conditions;
- (e) Conflicts between safety and production demands;
- (f) Excessive use of overtime or shift work;
- (g) Inappropriate work design or arrangements such as single-manned workplaces;
- (h) Conflicts between production and maintenance work;
- (i) Drug or alcohol abuse at work.

B. Management Measures

How can you increase worker protection, cut business costs, enhance productivity, and improve employee morale? There are many ways you, as a business owner or manager, can approach this challenge. One way is by doing a better job of managing your company's safety and health program [8]. No matter how sophisticated your safety and health efforts, they can always be improved. No matter how small your worksite, systematic methods for protecting workers can work for you. Effective management is the key to reducing the numbers and severity of workplace injuries and illnesses. This means using proven methods to find and understand existing and potential hazards, and then either preventing or controlling those hazards. A direct relationship exists between effective management and low numbers and severity of injuries. We also credit good management with lower levels of work-related illness: a well-managed safety and health program prevents or controls employee exposure to toxic substances or other unhealthful conditions that can cause sickness.

Management leadership and employee involvement: This element describes the leadership that management provides to encourage employee involvement at all levels in safety and health protection. Many actions listed under this element are applicable to all areas of business management. The Guidelines simply put them to use in improving worker safety and health protection. The actions cover:

- Safety and Health Policy,
- Goal and Objectives,
- Visible Top Management Leadership,
- Employee Involvement,
- Assignment of Responsibility,
- Provision of Adequate Authority and Resources,
- Accountability, and
- Program Evaluation.

Worksite analysis: Worksite analysis is a combination of systematic actions that provide you with the information needed to recognize and understand the existing and potential hazards of your workplace. While these actions may appear complicated at first glance, they consist of activities that already are being performed in most workplaces. For the

ake of clarity, the Guidelines differentiate these actions as follows:

- Comprehensive Hazard Identification
- Comprehensive Hazard Surveys
- Change Analysis
- Routine Hazard Analysis
- Regular Site Safety and Health Inspections
- Employee Reports of Hazards
- Accident/Incident Investigations
- Injury and Illness Trend Analysis

Hazard prevention and control: Once you have inventoried the hazards and potential hazards of your workplace, you can begin designing a program of prevention and control. Your program will consist of:

- Appropriate Controls
- Preventive Maintenance
- Emergency Preparation
- Medical Program

Safety and health training: For an effective program of safety and health management, it is crucial that everyone at the worksite understand his/her role in that program, the hazards and potential hazards that need to be prevented or controlled, and the ways to protect themselves and others. Additional specialized training may be needed to teach skills required for the job or for activities under the safety and health program. Ensure that all employees understand the hazards to which they may be exposed and how to prevent harm to themselves and others from exposure to these hazards, so that employees accept and follow established safety and health protections.

Supervisors should be given special training to help them in their leadership role. They should be taught to look for hidden hazards in the workplace under their supervision, to insist upon the maintenance of the physical protection in their areas, and to reinforce employee hazard training through performance feedback and, when necessary, fair, consistent enforcement.

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Mr. Tom Jose V is currently doing his masters in production an Industrial Engineering from SCMS School of Engineering and Technology, Karukutty, Cochin. He has completed his bachelors degree in mechanical engineering from Vimal Jyothi Engineering College, Chemperi, Kannur with the highest grade point. As the part of his curriculum he has undergone training in many reputed industries like Calicut Diesel Power Plant, Carborundum Universal Limited. Through his training programs he had opportunities to intract with many safety experts. He has attended many international and national seminars, conferences at various fields in mechanical engineering and industrial safety.

ersonal profile which contains their education details, their publications, research work, membership, achievements, with photo that will be maximum 200-400 words.

Mr. Sijo M.T is a senior faculty in mechanical engineering at SCMS School of Engineering and Technology, Karukutty, Cochin. He has wide knowledge in the field of mechanical, production and industrial engineering and guides many thesis and project works for students. He has completed his bachelors degree in mechanical engineering from Government Engineering College Trissur, and he also completed his masters in production engineering from Cochin University of Science and Technology with the highest grade point. His main publication includes a book on dynamics of machinery. He has also many international and national journal papers to his credit. He is currently the course coordinator for students undergoing post-graduation at SCMS School of Engineering and Technology, Karukutty, Cochin. He is also a visiting faculty in many engineering institutions all over Kerala.

Mr. Praveen is a senior faculty in mechanical engineering at SCMS School of Engineering and Technology, Karukutty, Cochin. He have excellent knowledge in the field of mechanical, and industrial safety engineering and guides many thesis and project works for students. He has many international and national journal papers to his credit. He is currently associate professor in mechanical engineering department at SCMS school of engineering and technology, karukutty, cochin. He is also guides many project works for industries.