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# An Effective Safety Management System

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**Abstract:** *Being Safe is everyone's right and responsibility. An effort has taken to analyse the performance of a manufacturing organisation in Hyderabad before and after adopting a safety management system to know the relationship between Safety practices and Injury management among the employees in their workplace. This study gathers data about Organisation Safety Management system includes Policies, Procedures, and Frameworks and Training, Incident statistics, Behavioural studies, HIRA, Root cause analysis, Corrective actions and its effectiveness in reduction of incidents.*

**Keywords:** *Safety Management System, Manufacturing Industries, Occupational Health and safety, HIRA, Incident reports*

## I. INTRODUCTION

Working safely on the site is the fundamental right of every worker. Safety is about what an Organisation can do for protecting their workers. Daily they should go out as they came in for duty. The practices of Safety and health are very important to get optimum output, ensure better working conditions for workers and good reputation of the Organisation in the Market. In Today's competitive world to meet the demands of the Market, there is push on the workers and machines to increase the productivity within the short time. If the safety management system is not properly implemented and the personnel are not following safe practices then it will end up with less productivity, loss of business. The outcomes of this study form a basic framework that Employers of an Organisation can get Safety Management system/procedures that they should implement for their employees So that they can work and live safely within their daily environments and to act in case of an emergency in their workplace. Besides that, safety and health practices will reduce the chances of an accident in the workplace [1]. The basic reason for the most of the accidents caused by employees is just because of lack of awareness. Most of the cases, assigning jobs to untrained people, shortage of skilled labour, Improper maintenance of machinery, Miss communication, taking shortcuts accidents get worse and people end up losing lives. If workers are properly trained, proper precautions are taken, strict laws, rules, and regulations are made, employee awareness programs were held frequently, the number of accidents in their workplace could be controlled. This can be achieved by adopting a Safety Management System.

## II. LITURATURE REVIEW

### A. OSHAS 18001:2007

The Occupational Health and Safety Assessment Series is a widely used British Standard for occupational health and safety management systems. The OHSAS helps an Organisation to have control, have knowledge of, all relevant hazards, and continually improve its performance. OHSAS follows PDCA cycle methodology to minimise the Occupational Health & Safety (OHS) issues. It describes each term related to OHS in order to understand the significance of every activity and risks associated with it [2].

### B. Safety Management System by International Civil Aviation Organisation(ACIO)

The concept of Safety, Safety culture and Safety Management system requirements [1] are clearly mentioned Safety Management Manual (SMM-2013) published by International Civil Aviation Organisation(ACIO). According to ACIO the Safety Management System (SMS) framework is a combination of four components. 1. Safety Policy and Objectives 2. Safety Risk Management 3. Safety Assurance 4. Safety promotion

### C. Industrial Safety Management by Mr. Raj Kishore Ojha

According to Mr. Raj Kishore Ojha the Author of Industrial Safety Management book, he proposed 38 mantras to avoid or minimize accidents in the workplace. These 38 mantras if implemented properly will considerably reduce the risk of injuries and improves the organisation performance towards employee's protection.

### D. The Swiss-Cheese model by Professor James Reason [5]

According to the Swiss-Cheese model is Risk analysis and management model the reason for incident is because of failure of successive defences can lead to an incident. This concludes that there are so many factors behind the occurrence of an incident, the failure of preventive measure will ultimately result into incidents.

#### E. Safety and Health Management and Injuries management in Manufacturing Industries by Md. Taufeeq and Abdul Kadir

This paper concludes the relationship between safety and health practices of work environments. The reliability analysis shows that all independent variables are positive relationship to injury management. Out of five of safety and health practices (includes training, safe work procedures, consultation, reporting safety, management commitment), the reporting safety is high correlation compare with other variables. So the reporting of incidents should be done immediately without fail in order to avoid further injuries in near future and eliminate root cause.

### III. SAFETY MANAGEMENT SYSTEM

#### A. Safety Fundamentals[2]

Safety is freedom from risk, applying common sense to avoid any incident and/or damage.

Incident work-related events in which an injury or ill health or fatality occurred, or could have occurred

#### B. PDCA cycle

PDCA is defined as Plan, Do, Check, Act. The Safety Management System follows PDCA methodology to implement the management systems goals, objectives and requirements.

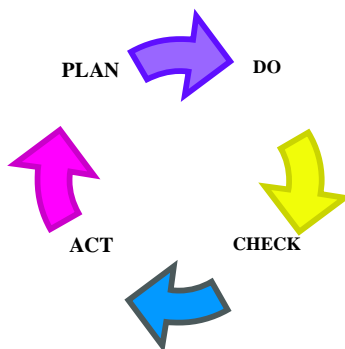


Fig.1 The PDCA cycle

#### C. The Frame work of Safety Management System

This introduces the framework and implementation of Safety Management System (SMS). It also emphasizes the significance of establishing processes for maintaining and evaluating the effectiveness of the SMS.

The Four Pillars SAFETY MANAGEMENT SYSTEM:

- 1) Safety Policy – Clearly defined policies, procedures, and organizational structure.
- 2) Safety Risk Management –Hazard identification and risk assessment, resource allocation, and system monitoring.
- 3) Safety Assurance – Continuous quality improvement of processes and products.
- 4) Safety Promotion – Continuous communication of safety values and practices that support a sound safety culture.

#### D. Characteristics of an Effective Safety Management System

The policy of Safety Management System should be clearly written and displaced in the Organisation; it should be appropriate to the nature of the organisation OHS risks. The policy should state responsibilities and accountabilities, Accident and incident investigation, performance improvement commitment. The Organisation under SMS shall establish, implement and maintain procedures for identifying and accessing the legal and other OH&S requirements that are applicable to it. The Safety Management should provide planning, implementing and control with regard to safety at different stages and functionalities in the organization [2]. The Safety Management System should cover the all functions, Jobs in the Organisation performance. Hazard identification and risk assessment (HIRA) shall be done for all activities and workers should be trained with HIRA procedure so that they can add/modify the procedures in order to eliminate/minimize risks. Everyone at different levels have the responsibility to participate in safety programs as stated in the safety management system. Generally, the programs shall cover the entire organization and require the employees to involve in activities such as hazard identification and risk assessment.

Communication is the medium of passing information between two individuals or departments. In effective SMS the organization shall establish, implement and maintain procedures internal and external communication [2]. The communication place a vital role in understanding the situation and exact information about the job to be done. Documentation including records, determined by the

organization to be necessary to ensure the effective planning, operation and control of processes that relate to the management of its OH&S risks. Documental evidence clearly defines the scenario of incident that gives true value about what happened and how. If the similar conditions are noticed in the organisation with the help of this documentation it can be prevented by taking effective corrective actions and precautionary measure in other places. With the help of Documentation the effectiveness of the corrective actions and trend of incidents can be tracked and minimized or eliminated as much as possible.

#### E. Factors for incidents

- 1) Human factors
- 2) Technical factors
- 3) Environmental factors

An effective Safety Management should cover all the factors causing incidents, the implementation of SMS should arrest all the factors that are leading to incidents. While removing the hazard the Hierarchy of control should be followed. The Environmental factors which are affecting the performance of business of organisation may be recorded in the Environmental Management System (EMS) register and actions must be taken to reduce the impacts of Environment on the organisation. The mere following of regulations in EMS will eventually reduce the risk of environmental nonconformities and legal requirements and a healthy environment favours the working conditions.

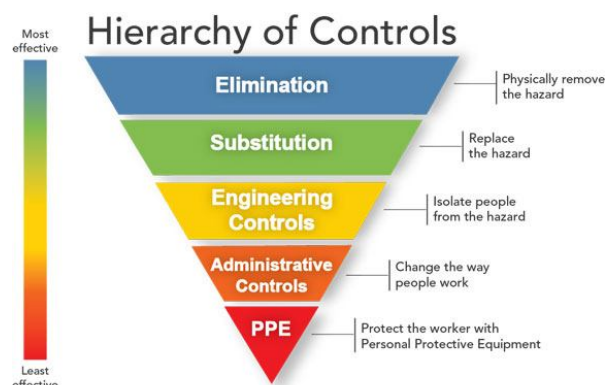


Fig.2 Hierarchy of Hazard controls

#### F. Most common causes for work place accidents

- 1) Shortcuts
- 2) Lack of knowledge, training
- 3) Poor Housekeeping
- 4) Violation of safety procedures
- 5) Distractions
- 6) Environmental conditions

#### G. Incident Investigation [2]

Incident investigation is the crucial part of a safety management system it considers so many factors, parameters for analysing the root cause of the incident. Once root cause is identified and the consequences that favoured the occurrence of incident are identified. The conditions during the incident are gathered by asking the witness and/or checking the video footage and corrective actions are taken against the root cause elimination and/or behavioural issues. According to OHSAS, the Incident may be defined as work related event in which an illness, injury or fatality occurred or could have occurred. Incident investigation plays a crucial role to understand the severity of the problem, helps to take corrective actions based on surface, root cause analysis. Any negligence or mistakes can be identified easily. Once the Hazard is identified then it is reviewed with the related HIRA register to measure its scale, severity, probability and distribution. If the identified Hazard is not present in the HIRA register then changes are made to HIRA register. This HIRA register is maintained and updated periodically by inspecting and measuring the hazards and significant risks associated with them.

The basic characteristics of safety reporting are the least time, Information, accuracy, flexibility, willingness and accountability [1]. The investigation committee should consist of people from different departments for eg. HSE, HR, Technical and PR, all these people should work toward the common goal of identifying root cause and eliminating it. The investigation team should reach



within minimum possible time. Once the investigation is completed the report should be shared among the departments, workers so that they can understand the importance of problem, and they will never repeat the same thing. Reporting of incidents slowly will eliminate the hazards present in the operation of the company and critical examination of the incidents will lead to decrease in the number of accidents.

#### *H. Injury management [6]*

Injury management is very crucial in attending a situation, if treated within the golden hour duration there is probability of saving a life is more than 70%. Every organisation must ensure that adequate facilities are made to attend any emergency situation and injuries within the minimum possible time. Every employee must be trained about the common injuries and emergency situation that may occur in future and if trained properly this will boost up the safety environment for the employee. Injury management as referred to Murphy. G, Foreman. P, Young (1997) is one of the safety and health's tools in order to manage workplace injuries and accidents with support by legislation.

#### *I. Gap Analysis [1]*

The Gap analysis compares the existing safety management with procedures and policies with requirement in the actual framework. If any organisation is not implemented any SMS till yet, then it should build upon the existing structures, controls and legal requirements. This gap analysis facilitates the development; implementation of Safety Management System by identifying the gaps, lapses of the system which must be addressed to fully implement an SMS.

### **IV. INTEGRATION OF MANAGEMENT SYSTEMS**

Each organisation is layered of so many activities and departments. It should be given a uniform governance to guide the activities towards achieving the common objectives. The framework, policies and procedures set by an organisation to achieve its common objectives is called a management system. Based on the nature of business each organisation can integrate the typical management systems available. The following are some typical management system

- A. Environmental Management System (EMS)
- B. Occupational Health and Safety Assessment Series (OHSAS)
- C. Quality Management System (QMS)

An organisation may integrate any management systems that suits its business operations which should give common specified achievable goals is called as Integrated Management system. The Safety Management System we supposed is the integration of EMS and OHSAS. The adaption these systems will reduce the operational risks, reduction of injuries, increase the profitability, assign accountabilities.

### **V. BETTER WAYS TO MINIMIZE WORKPLACE INCIDENTS WITH SAFETY MANAGEMENT SYSTEM**

#### *A. Communicating policies to staff and contractors*

Every organisation must define its OHS, EMS policy clearly in official and local languages, it should be displayed in major areas, available to everyone in the form of a photocopy or pamphlet or pocket book so that the workers can easily understand the policy and everyone will work towards to achieve the objectives.

#### *B. Training and Education*

A screening should be conducted for employees to understand their skills and capabilities. If the skill matrix is made then it is easy for the supervisor to assign the jobs based on the skill set which will eventually reduce risk. If any employee is weak in skill or completely unaware of organisation procedure or if any new technology is introduced then training must be required for them. Based on the training they need their supervisor may conduct training arrangement can be made with outside agency or other departmental persons who are master in that subject matter. Emergency situations must be created to train the workers about the emergency conditions and their response during trainings must be recorded and program must be re-conducted such that everyone should aware of the procedure of attending an emergency situation[3].

### C. Hazard Identification and Risk Assessment (HIRA)

HIRA is a process of identification of hazards and evaluating risk and it will suggest the necessary controls to eliminate or minimising the risk. HIRA must be done for each and every job regardless of its periodicity, occurrence, scale or duration. HIRA of each activity is recorded and it is updated periodically. These HIRA must be communicating to workers so that they will be aware of hazards and risks associated with activities they are dealing. While doing HIRA it is advised to include the worker of particular work to identify the real time risks associated with the job.

### D. Display of safety information

All the information related to safety precautions, operating conditions, confined spaces, PPE usage, limits and safety procedures must be clearly displayed in the appropriate areas. Care must be taken while displaying this information as it should satisfy legal and organisation's requirements.

### E. Inspection and Maintenance of machineries

The machineries which involves direct and indirect operations in the organisation must periodically inspected and checklist has to be carried out to inspect each and every element of the machinery based on the planned schedule any non-compliance should be treated as an emergency issue and must be corrected before keeping the machinery into operation. The log book should record the finding that what actually happened and what is the maintenance being done to eliminate the issue. This will enable the future workers to understand the modification changes and act accordingly.

### F. Provide Personnel Protection Equipment and First Aid facilities

Personnel protection equipment should be provided for the required activities and always make sure that their specifications meet legal and organisational requirements. Personnel Protection Equipment (PPE) shall also calibrate and inspected periodically in order to meet all compliances and serve the performance. The Organisation also has to take care of first Aid facilities for their employees and it should be stocked according to requirements. Training must be provided about the PPE and First Aid facilities to all man force.

### G. Management Commitment

The top management shall commit to wellness of their employees and it should always show a positive and healthy attitude towards their employee's safety. The policies shall be made to protect everyone and improve their working conditions. If the management is committed to employee's safety and employees are aware of commitment and procedures of management then their behaviour will eventually reduce the unsafe environment. Marsh (1995), management commitment plays a crucial role in all aspects of safety.

## VI. RESEARCH FRAME WORK, RESULTS AND ANALYSIS

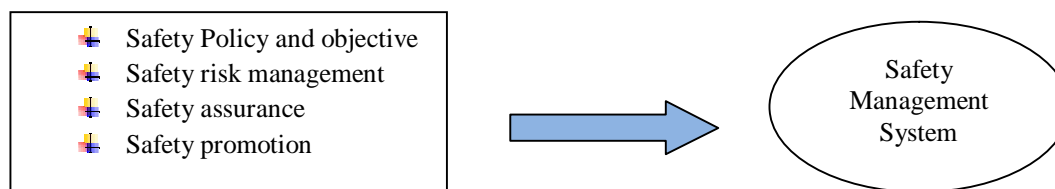


Fig.3 Framework of Safety Management System

### A. Incident statistics

A study has been conducted to study the number of accident occurring over a span of one financial year (2016-17) in a manufacturing organization in Hyderabad and the findings are tabulated. As the results are from four quarters of the organization a simple average method is used to present the data. The corresponding average values are minor injuries 36, major injuries 12, illness 17 and near miss 0. It is clear that every organization is effected with the incidents happening and the effective solution is implementation of Safety Management System (SMS). There was nothing called as a near miss, which is an alarming condition in the industries. If the near miss is captured and causes are identified, then Safety Management system will suggest for conducting incident investigation report which will considers all the parameters and violations evidenced, with the help of this causes (hazards) are eliminated to create a healthy environment for workers.

The below figure 4 gives information about the statistics of incidents in the organization's before and after implementing Safety Management System

### B. Before and after implementation of Safety Management System

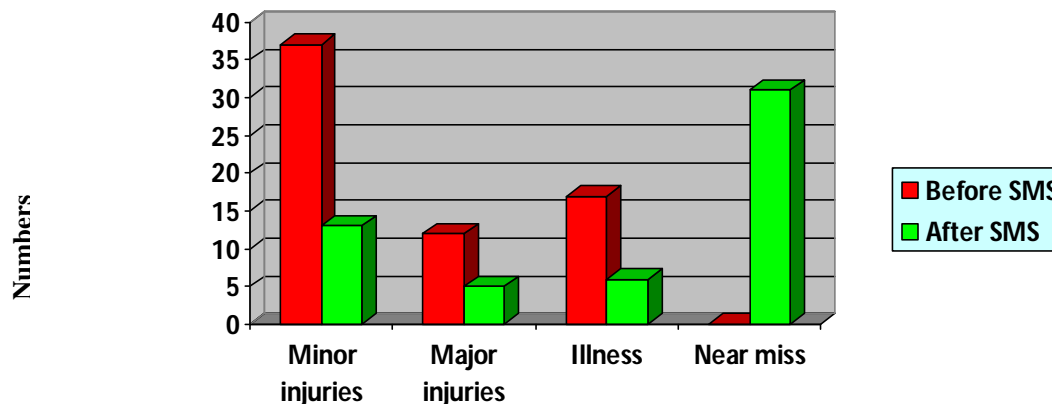


Fig.4 Statistics of Incidents in the Organization

From this data it is clearly found that after implementing the SMS in an organisation the overall accidents are reduced by 74% and the near miss capturing is positively affected the identification and elimination of hazards. The implementation of Safety Management System has reduced minor injuries by 64%, major injuries by 58%, Illness by 64%. The adoption of SMS may take some time and it involves expenditure of some capital amount. But when management is committed about the safety of their employee's then the implementation of this system ultimately it improves the business profitability, accountability of business operations and improves the safety standards.

## VII. CONCLUSION

In moderate world there is need for higher rate of production as well as low cost of production. In these competitive market every firm is focussing on the increasing the productivity rates. But the safety and welfare of employee's also shall be every organisation's foremost responsibility. A detailed analysis done on the organisation performance before and after adopting a safety management system is presented. It is clear that before implementing a SMS the accident occurrence rate was 74% and it was reduced to 36% by implementing the policies, procedures, management commitment, HIRA, training and providing basic First aid facilities.

It is clear that if hazards are not eliminated, workers are not trained, equipment is not maintained in good condition, employees are unaware of safe work procedure if the incident investigation is not properly done then the likelihood of occurrence of incidents will increase. So there is need in implementing a sound Health and Safety Management System which clearly mentioned above with its characteristics and framework. The effectiveness of an SMS mainly depends on the management commitment, employee's contribution and level of communication. The management and man force shall continually work for improving their safety management performance.

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