# M.Tech Dissertation

# On

# SAFETY AUDITS AND TOOLS TO IMPROVE EHS IN CORPORATE OFFICE

*Submitted by*

**PANKAJ SHARMA**

**R080213040**

*In partial fulfilment for the award of the degree of*

**MASTER OF TECHNOLOGY IN**

**HEALTH SAFETY AND ENVIRONMENTAL ENGINEERING**

*Under the guidance of*

**Abhishek Nandan**

**Venkata Krishnakanth**

**Department of HSE UPES Dehradun**


**DEPARTMENT OF HEALTH, SAFETY, FIRE AND ENVIRONMENT**

**COLLEGE OF ENGINEERING STUDIES**

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

**DEHARADUN**

**2015**

# UNIVERSITY OF PETROLEUM AND ENERRGY STUDIES, DEHRADUN


## BONAFIDE CERTIFICATE

Certified this titled ***"SAFETY AUDITS AND TOOLS TO IMPROVE EHS IN CORPORATE OFFICE"*** is the bonafide work of **PANKAJ SHARMA (R080213040)** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

**GUIDE NAME**

**Abhishek Nandan**
Lecturer
Department of HSE UPES
Dehradun

**Venkata Krishnakanth**
Lecturer
Department of HSE UPES
Dehradun

# ABSTRACT

The opportunity for industry to take advantage of safety audit has never been timelier. The International Organization for Standardization (ISO) with the release of 14001:2004 has taken steps to ensure that it aligns with the OHSAS 18001 has initiated greater emphasis on standards integration as well as combined audits. Common elements and language makes both implementation and auditing easier than in the past. The purpose of the present study was to develop plans for third-party auditing as well as internal audits of an organization registered to the standards with added components being the requirement to develop a multi-site audit plan. The project was undertaken by both EHSC and the EHSC organization audited in developing the third-party audit and internal audit program, respectively. With regard to the third-party audit process, the EHSC reviewed all current guidelines for both the development of the site EHS audit plan as well as those for the sustainable development process itself. A similar process was used by the auditing organization but with more flexibility due to the more limited requirements. Using several examples of components of the multi-site plan as well as the auditing criteria itself, the EHSC was able to develop a viable audit process and plan. With respect to the organization's audit process, the implementation of the plan required the integrated quality, environmental and safety management system audit at each of its 3 locations throughout the Noida (U.P.) which complemented internal regulatory audits. The resultant audit checklist includes common elements of all the standards. This project concentrates on the internal audit tool, the source data to the audit checklists.

**Keywords**: *Safety Audit, Checklist, integrates quality, Sustainable development*

# ACKNOWLEDGEMENT

I feel very pleased to acknowledge that I have completed my Project Work from **EHSC** Noida (U.P.**).** I am very thankful to the Head of Health and Safety Department of University of Petroleum and Energy Studies, **Dr. Nihal Anwar Siddiqui** & also my guide **Mr. Abhishek Nandan** and **Mr. Venkata Krishankanth** for providing me support & guidance throughout the project work.

I am with EHSC from past four months and this project work was an opportunity to observe the organization more closely. It was a great pleasure to be with the organization & learn about its culture, practices, people, processes & safety activities.

I really feel very pleased to take this opportunity to thank **Mr. Subrat Mitra , Sr. EHS Officer (EHS dept.**) my project head/guide, for provided me with the wonderful and stimulating environment to work in and devoting his valuable time in helping me and guiding me. His suggestions helped me in adding new dimensions to my knowledge and have always inspired me for the successful completion of the project.

In the end I would like to thank all the employees of safety department and all my friends, for their friendly gestures and for giving me the valuable assets of their knowledge and experience. Without their presence I would not have been able to successfully complete my training in such an esteemed organization.

# LIST OF TABLES

# LIST OF FIGURES

# LIST OF SYMBOLS AND ABBREVIATIONS

| | |
|---|---|
| EHS | Environment, Health and Safety |
| OSHA | Occupational Safety & Health Administration |
| PPE | Personal protective equipment |
| FMA | Factory and machinery act |
| OSH | Occupational, safety and health |
| HCS | Hazardous chemical substances |
| VOCs | Volatile organic compounds |
| TDS | Total dissolved solids |
| TSS | Total suspended solids |
| ACGIH | American Occupational Safety & Health Administration Industrial |
| PAH | Polycyclic aromatic hydrocarbon |
| NORM | Naturally occurring radioactive material |
| HAZOP | Hazard and operability |
| CIMAH | Control of industrial major accident hazards |
| COMAH | Control of major accident hazards |
| SCR | Safety case regulations |
| NIOSH | National institute for occupational safety and health |
| UVCE | Unconfined vapour cloud explosion |
| APIs | Active pharmaceutical ingredients |

| | |
|---|---|
| WHO | World health organization |
| ILO | International labour organization |
| ETP | Effluent treatment plant |
| $L_{eq}$ | Equivalent noise level |
| SEL | Average sound exposure level |
| TCE | Trichloroethylene |
| EDC | Endocrine disrupter chemicals |
| IARC | International agency for research and cancer |
| MSD | Musculoskeletal disorder |
| OEL | Occupational exposure limit |
| EPA | Environment protection agency |
| SPM | Suspended particulate matter |
| UCOST | Uttarakhand State Council for science and technology |
| MSDS | Material safety data sheet |
| CPCB | Central pollution control board |
| TLV | Threshold value |
| BOD | Biological oxygen demand |
| COD | Chemical oxygen demand |
| PSM | Process safety management |
| WWTP | Wastewater treatment plant |
| FDA | Food and drug administration |

# TABLE OF CONTENTS

**DESCRIPTION** **PAGE NO**

# Chapter 1

# Introduction

## 1.1 General

Safety Audit is a fine approach to find the gaps between the framed policies and their practical implementations. Based on ISO and OSHA standards EHSC has formulated the checklists for all the different audits. I have worked as an auditor and for all the non-conformities recommended action is to be taken by responsible person or department. One part of my project is to review and implement the standard procedures by using tools and other part is to find out gaps by conducting audits. In the coming chapter I am going to explain the different types of audit and their methodology and after that two chapters are based on tools.

Practically no system is impact free and not all implemented controls can eliminate the impact they are intended to address or reduce the impact to zero level. If the Impact could not be reduced to an acceptable level then impact management cycle should be repeated to identify the way of lowering the residual impact to an acceptable level.

EHSC is expanding and acquiring new facilities across different locations. Local regulatory requirements & geographic specific issues may pose new environmental challenges. Also by time the equipment suffer wear and tear & personnel changes occur which may throw up an already mitigated impact to surface again. Thus a periodic evaluation and assessment of aspects and impacts is necessary for sustained & continuous improvement. Evaluation of all the activities, including the ones added over the last one year, will be carried out by EHS annually to identify the new significant aspects / impacts to frame new process and improve EHSC Environmental health and Safety Performance.

## 1.2 Aim

The aim of the project is to ensure compliances with legal and other requirements by managing significant EHS risks to promote internal and external stakeholder engagement and improve resource efficiency also to improve Ehs culture by using the various tools in all the activities.

## 1.3 Objectives of the study

- Objective of the project is to identify level of compliance in an organization
- To fulfil Legal and other requirements related to operational and business requirements
- To define ISO objectives and targets and use two tools to improve EHS by preparing HIRA study and AIA.
- To follow up the closure of all the non-conformities identified during Audits.

# Chapter 2

# Literature review

I have reviewed all the following papers from the occupational safety and health journals. All the findings are listed out in table 2.1.

**Table 2.1 ; Literature Review**

| S.No. | Name of the Author & Year | Objective | Working Principle | Findings |
|---|---|---|---|---|
| 1 | Marieta Olaru , Ionela Carmen Pirnea , Andrei Hohan & Mihaela Maftei in 2013 | The main objective of the quality-environment-occupational health and safety integrated management systems is to optimize the efforts of businesses to meet customer demands and all stakeholders | Authors conducted a study based on questionnaire during 2011-2012 on a sample of 173 small and medium enterprises in Romania. | The results of this study can be used to improve the monitoring of business performance of small and medium enterprises by facilitating the development of new business models for performance evaluation by integrating nonfinancial indicators |
| 2 | Marieta OLARU , Dorin MAIER , Diana NICOARĂ c, Andreea MAIER in 2011 | Establishing the basis for development of an organization by adopting the integrated management systems: comparative study of various models and concepts of integration | Models of various management systems (especially those based on ISO 9001, ISO 14001 and OHSAS 18001 referential) highlighting the advantages and disadvantages of the models studied. | Small and medium companies lack most of all information about the benefits of the systems and need guidance in order to implement them as a Integrated management system |

| | | | | |
|---|---|---|---|---|
| 3 | HUANG Lin-jun , LIANG Dong in 2013 | Development of Safety Regulation and Management System in Energy Industry of China: Comparative and Case Study Perspectives | Authors compare Australian and Chinese legislations and company practices to learn lessons and best practice to provide Foundation to improve the safety management in China | Authors suggest that an effective way of implementing safety legislation is to use a basic set of minimum normative requirements, supplemented with the requirement that industry demonstrate continuous improvement of safety management systems, consistent with industry's development |

# Chapter 3

# EHS AUDITS METHODOLOGY

## 3.1 EHS audits at GENPACT

Genpact is a software company and EHSC has taken the responsibility of all the sites of Genpact with respect to Environmental Health and Safety. There are some owned and few are leased sites. The only difference is the scope of work as in any owned building or site our Ehs team has to cover all the fields like pump room, LT panel, RO drinking water plants, AHU(air handling units), Transformer area, Diesel tanks, Diesel Generators, Hazardous waste management, E waste management, Batteries return etc. But in any leased site our scope is limited to internal fire protection system; chemical management etc. there is no high severity operations on leased site as most of the systems are under builder's scope.

## 3.2 Scope of audits

### 3.2.1 Site safety Audit

This is a monthly audit which covers the whole facility system of an individual building. It includes each and every area of the site which is under our scope.

### 3.2.2 Medical Room and Ambulance

Standard check lists have been made and all the non-conformities has to be fulfilled within a certain date

### 3.2.3 IRI (Infra Readiness Index) Audit

All the active fire detection and protection system has to be checked under this audit. All the equipment's are having different frequencies of testing and testing. So according to their schedule randomly testing happens.

### 3.2.4 Compliance Audit

All the legal documents are checked according to their requirements as described or as per the rules of PCB or local authority.

**Benefits and Obstacles to Legal / Compliance Audits**

**Benefits**

- In-house legal team is costly to maintain
- High attrition rate leaves gaps in In-house team and creates problems in audit
- In-house team, where present, is generally busy with the urgent legal matters.
- An external audit team is given preference in terms of time and attention then the in-house team.
- An external audit team will give independent and fair report.

**Possible Challenges**

- Fear of audit resulting in Non-Cooperative attitude of units
- Manipulation of records & Concealment of facts
- Fear on confidentiality of data
- Controlling and preventing mistakes / non-compliances between audit periods

### 3.2.5 Transport cab audit

It covers the compliance management and transportation safety of the employees also the driver's awareness to the road safety.

### 3.2.6 Base kitchen Audit

This audit covers the food hygiene according to the ISO 22001 and HACCP hazard analysis and critical control point. It also covers the practices of the food handlers and condition of the cold storages.

## 3.3 General Audit Methodology

### 3.3.1 Stage 1 – Compliance Audit Checklist

- Preparation of Compliance Audit Checklist (CAC) covering all relevant laws Applicable to the target unit.

### 3.3.2 Stage 2 - Visit to location

- Verification of relevant records and documents available.

- Compilation of draft report based upon findings and observations of the audit team
- Review meeting with the unit head / work directors to discussion on the finding of audit.

### 3.3.3 Stage 3 – Report

- Submission of detailed Non Compliance (NC) report to the company (Board of Directors or Compliance Head)
- Follow up with the unit to verify action taken

**Compliance Audit Checklist**

Divided into 4 main parts:

- List of Registers, Abstracts, Notices, Returns
- HR related acts and regulations
- Engineering & Environment Laws
- Taxation

CAC acts as a guideline, but not as exhaustive limit for audit team CAC filled with reference to actual documents verified, not only based on Feedback from auditee. Copies of key documents retained in working papers.

**Report**

- Preparation of Non-Compliance list during plant visit
- Discussion of observation with Unit Head
- Inputs from Unit Head and HOD of relevant dept. recorded in working papers

### Preparation of Final Audit Report consisting of

- Non Compliance Summary
- Registers List – Compliance Status
- Comparison (if possible) with previous reports to identify long-standing issues not resolved
- Impact and Criticality of Non-Compliance identified in report for each item reported
- General Penalty for non-compliance and Criticality (Critical, Serious, Minor, Technical)

# Chapter 4

# EHS TOOL 1 – HIRA STUDY

## 4.1 Hazard identification and Risk assessment and Risk Control

### 4.1.1 Purpose

- To identify the Hazards of all activities, products and services which EHSC performs in order to determine those that could potentially have significant impacts on the environment or Health and Safety of employees/ & Key stakeholders.
- To establish objectives & targets for continual improvement.

### 4.1.2 Scope

This procedure covers all activities, products and services of the site to.

- Establish a road map for Aspect & Risk Identification, Impact & Hazard Management
- Clarify and to bring in consistency in the methodology adopted for Aspect & Hazard Identification - & its Impact Management.
- Identify Objectives and targets for EHS improvement.

These guidelines help identify the significant environmental aspects & Health and Safety Hazards of operations so as to control them through an effective IMS for enhanced environmental, Health & Safety performance.

### 4.1.3 General framework

- **Our approach**

The aspect, impact & Hazard management guidelines allow the EHSC management to identify its activities and related aspects / Risk to put controls to mitigate the significant impacts & Risk to meet the organizational environmental Health and Safety objectives. The approach is shown in the below figure.

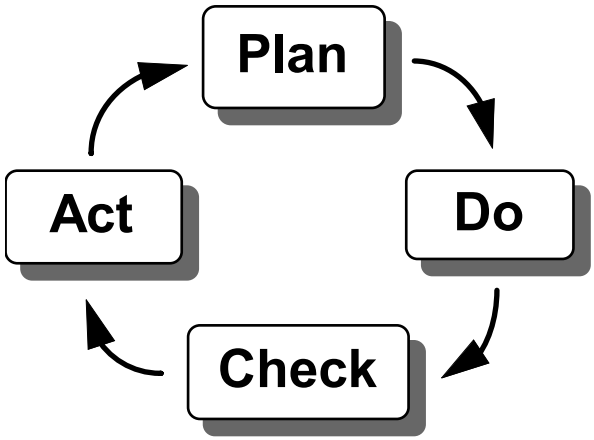


**Figure 3.1 PDCA Cycle**

Environmental Health and Safety impact is the net impact of the related aspects & Hazards, considering the probability of occurrence, frequency of occurrence and the available detection and control capability. EHSC's impact & Risk management encompasses the following five key milestones.

1. **Activity List:** All the activities performed in EHSC are listed function wise & checked for duplication / overlapping & reconsolidated.
2. **Hazard identification & Risk Evaluation:** The identified impacts are rated in light environmental & risk elements considered to be important to EHSC context like probability of occurrence, frequency of occurrence, detection and control capability etc.
3. **Prioritization of Significant** The different environmental, Health and Safety impact ratings given by the team are segregated to identify the vital ones from the rest using Pareto Analysis.
4. **Impact Assessment & Identification of Mitigation Plans :** Identified significant impacts/Risk are assessed & analysed for the probable causes. The causes are again prioritized by segregating them into most probable, somewhat probable and Unlikely causes. Mitigation plans are identified for the most probable causes.
5. **Review of mitigation plans & continual improvement:** Mitigation plans are reviewed for proper deployment / implementation, resource adequacy & effectiveness. The review results and learning's are reflected back on the annual process of identification of significant aspects / impacts, for enhancing the environmental health and safety performance.

The entire impact management is a team approach starting from identifying the activities / aspects, impacts, evaluating the impacts, prioritization of impacts, identification / review of mitigation plans to reflecting back on the process.

### 4.1.4 Integration of Impact & Risk Management into EHSC's Business Processes

EHSC Business Process has four phases – Acquisition / Installation / Renovation, Operation, Maintenance and Closing & disposal. The impact & Risk management is an iterative process that can be performed during each phase of the business process life cycle. Table 4.1 describes different characteristics of each of the business process life cycle phases and indicates how the impact management shall be performed in support of each of the phases.

**Table 4.1: Risk Management**

| Business Process life Cycle Phase | Phase Characteristics | Impact Management Activities |
|---|---|---|
| Phase-I Acquisition / Installation / Renovation | Need for a new facility / equipment / renovation of existing facility / equipment is expressed and the purpose and scope of the same is documented. The new facility / equipment is procured / acquired / renovated & is made operational / installed. This also includes the routine purchase of any new material / consumable.<br><br>This includes subcontracting of activities | Identify the potential environmental health and Safety aspects / impacts/hazards & legal requirements associated with the new facility / equipment / renovation process. The identified environmental aspects / impacts/Hazards and legal requirements also include the ones associated with physical process of installation & renovation. The same are suitably addressed in line with the recommendations of IMS manual EHSC, Aspect and impact & Hazard management guidelines, Procurement Process, Process for |

| | | |
|---|---|---|
| | | vendor selection evaluation & approval, Equipment Selection & Installation Guidelines, Plant and Machinery Maintenance Process & Procurement Process<br><br>Any waste generated during this phase is disposed off in accordance with waste management process. |
| Phase-II Operation | The new / renovated facility / equipment is enabled / commissioned & made operational.<br><br>This includes the use of all routine material / consumables, loaned items & subcontracted activities. | Aspect /impact & Hazards management Guidelines supports the assessment of the existing activities to establish the necessary mitigation plans.<br><br>The same are suitably addressed in line with the recommendations of the AIHRA Guidelines.<br><br>Also the legal requirements and key environmental health & safety characteristics are monitored and controlled on routine basis.<br><br>Any waste generated during this phase is disposed off in accordance with waste management process. |
| Phase-III Maintenance | The facility / equipment when being used on routine | Whenever major changes are made to the facility / equipment including |

| | | |
|---|---|---|
| | basis is subjected to deterioration & wear & tear. This calls for continuous monitoring, preventive measures & repairing & maintenance work. | renovation, Aspect/ Impact & Hazard management guidelines are followed suitably.<br><br>Any waste generated during this phase is disposed off in accordance with waste management process. |
| Phase-IV Closing & disposal. | This phase involves closing of a facility, discarding / transfer of an equipment & disposal of scrap / waste generated from such activities.<br><br>Also this includes disposal of waste generated from the day-to-day operations / activities carried out in the organization. | Aspect/Impact & Hazard management guidelines are applied to the activities associated with this phase & suitably addressed. The wastes generated in this phase are handled & safely disposed in accordance with the recommendations of the waste management process. |

## 4.2 Key Roles and Responsibilities

The key roles and responsibilities related to Impact & Risk Assessment are documented as part of IMS manual. Site Logistics leader along with site EHS Leader will be over all responsible for maintaining updated EHSC AIHRA Register & shall review annually for any changes.

### 4.2.1 Access to AIHRA Register and Management Database

EHS team owns the AIHRA REGISTER management Database. EHS teams have the writing, updating and review rights of this database. Rests of the core members have read only access to the database.

# CHAPTER 5

# EHS TOOL 2 – AIA study (Aspect & Impact ASSESSMENT)

## 5.1 Identification of Activity

Almost all activities, products & Services have some impact on the environment or health and Safety of employees or key stakeholders which may occur at any or all stages of the activities, product or services life cycle. These functions could be from anywhere between material acquisition and distribution to use and disposal.

The different Functions considered are as follows.

1. Activities associated with employees/operations
2. Activities associated with Facility/logistics
3. Activities associated with Projects
4. Activities associated with Maintenance
5. Activities associated with Transport
6. Activities associated with IT Stores
7. Activities associated with security
8. Activities associated with sourcing
9. Activities associated with Legal
10. Activities associated with Medical

## 5.2 Identification of Aspect

While identifying the environmental aspects, EHS core team shall consider aspects associated with the past & on-going activities, products and services. In all such identified activities due consideration shall be given to the following situations

1. Normal & Abnormal Operating Conditions
2. Start Up and Shut Down maintenance
3. Emergency situation and accidents
4. Legal requirements

5. Organization controlled Activities / Aspects /Hazards
6. Activities / Aspects/Hazards that the organization can influence

The above identified situations have been in turn applied to the following identified into 9 environmental impacts and 7 Risk elements to comprehensively capture the aspects & Hazards associated with the organization's activities.

**Table 5.1; Environmental Elements and Risk elements**

| Sr. No. | Nine Environmental Elements | Seven Risk Elements |
|---|---|---|
| 1 | Natural Resource Depletion( NRD) | Injury to body |
| 2 | Natural Resource Depletion ( Power) | Property damage |
| 3 | Impact on Human | MSDs- ergonomics |
| 4 | Land Contamination | Hygiene concern |
| 5 | Potential hazardous condition to Flora & Fauna. | work related Stress |
| 6 | Air pollution | work related illness |
| 7 | Sound Pollution | Others |
| 8 | Water Pollution | |
| 9 | Others. | |

## 5.3 Impact Evaluation Methodology

Each Aspect and Hazards are rated considering the severity or the problem, its probability of Occurrence and ability to detect the aspect or Hazard in the score of 1 to 10.(1 being lowest and 10 being highest) and an RPN no is derived by multiplying each Sev X Occ X Det= RPN.

If the activity/aspect/ Hazard is related to Legal requirement then entire RPN calculation will be waved of and the activity/aspect/ Hazard directly becomes Significant.

Table A B C respectively shows the detailed description of rating.

Severity is decided considering the Business criticality, impact on interested parties, and how severe the aspect is with regard to health & safety of the employees and key stake holders and to the environment.

**Table 5.2** Severity Number (SEV)

| **CRITERIA** | **Severity No. (SEV)** | **Class** |
|---|---|---|
| Failure mode may cause death of persons or Catastrophic loss or damage extending beyond site (point of origin)/Onsite facility//Extensive reportable environmental release affecting site and offsite facilities/Loss or damage permanently suspends routine operations throughout site and other sites/Major loss of market share/Major physical (proto-type unit or device) or intellectual (strategic plans) property loss or impact or affecting key stake holders & occurs without warning | 10 | **Critical** |

| CRITERIA | Severity No. (SEV) | Class |
|---|---|---|
| Failure mode may cause death of persons or Catastrophic loss or damage extending beyond site (point of origin)/Onsite facility//Extensive reportable environmental release affecting site and offsite facilities/Loss or damage permanently suspends routine operations throughout site and other sites/Major loss of market share/Major physical (proto-type unit or device) or intellectual (strategic plans) property loss or severely affecting key stake holders & occurs with warning | 9 | |
| Failure mode may cause death of employees the key stake holder or permanent physical damage or Catastrophic loss or damage extending beyond site (point of origin)/Onsite facility// reportable environmental release affecting site and offsite facilities/Loss or damage permanently suspends routine operations throughout site and other sites/Major loss of market share/Major physical (proto-type unit or device) or intellectual (strategic plans) property loss or severely affecting key stake holders & occurs with warning more than 24 hrs. | 8 | |

| CRITERIA | Severity No. (SEV) | Class |
|---|---|---|
| May result in limited disruption/ moderate loss to business or damage affecting entire site/Environmental damage requiring an extensive clean-up resulting in extensive loss work time, Significant loss of high-value assets . Major hospitalization case, serious injury or illnesses to either employees or key stake holders.100 % of the services are disrupted with restore time more than an hour. Hospitalization cases but resolved in less than 24 hrs. major injury case | 7 | **Major** |
| May result in limited disruption/ moderate loss to business or damage affecting entire site/Environmental damage requiring an extensive clean-up resulting in extensive loss work time, Significant loss of high-value assets . Major hospitalization case, serious injury or illness to either employees or key stake holders. hospitalization needs more than 24 hrs.100 % Major part of the services disrupted with restore time less than 1/2 hour | 6 | |
| Negligible loss or damage/non-reportable environmental release/Informal investigation is required/Loss or damage does not affect operations.. Minor hospitalization case, can be discharged within 24 hrs.100 % of the services are disrupted with restore time more than an hour. Partial services operable with parallel restore time | 5 | |

| CRITERIA | Severity No. (SEV) | Class |
|---|---|---|
| Services operable but at the cost of convenience of the employees. Negligible loss or damage/non-reportable environmental release/Informal investigation is required/Loss or damage does not affect operations. Recovery is less than 24 hrs. Major first aid case but can be treated within the facility | 4 | |
| Services operable but at a reduced level of performance with delays. Negligible loss or damage/non-reportable environmental release/Informal investigation is required/Loss or damage does not affect operations. Minor first aid cases or No impact on the Business | 3 | **Minor** |
| Service operable but with complaints and escalations. Complains from employees. No impact on the Business | 2 | |
| Failure modes which may effect the backend operations without disrupting the front-end services. No impact on the Business | 1 | |

**Table 5.3** Occurrence Evaluation Criteria

| **PROBABILITY** | **LIKELY FAILURE RATES** | **Occ No. (OCC)** |
|---|---|---|
| Very High : Persistent Failures | Everyday | 10 |
| | Once in 2 days | 9 |
| High : Frequent Failures | Once in 5 days | 8 |
| | Once in 7 days | 7 |
| Moderate : Occasional Failures | Once in 15 days | 6 |
| | Once in a month | 5 |
| | Once in a Quarter | 4 |
| Low : Relatively few Failures | Once in 6 Months | 3 |
| | Once in a Year | 2 |
| Remote : Failure Unlikely | Once in 2 years | 1 |

**Table 5.4** Detection Evaluation Criteria (DET)

| **Detection** | **Criteria** | **Inspection Types** | | | **Suggested Range of Detection Methods** | **DET** |
|---|---|---|---|---|---|---|
| | | **A** | **B** | **C** | | |
| Almost Impossible | Absolute certainty of non-detection | □ | □ | □ | Cannot detect or is not checked | 10 |
| Very Remote | Controls will Probably not detect | □ | □ | □ | Control is achieved with indirect or random checks only | 9 |
| Remote | Controls have poor chance of detection | □ | □ | □ | Control is achieved with visual inspection only | 8 |
| Very Low | Controls have poor chance of detection | □ | □ | □ | Control is achieved with double visual inspection only | 7 |
| Low | Controls may detect | □ | □ | □ | Control is achieved with Control Charts | 6 |
| Moderate | Controls may detect | □ | □ | □ | Control is achieved basis variable gauging | 5 |
| Moderately High | Controls have good chance to detect | □ | □ | □ | Error detected in a subsequent step while executing the step in the process | 4 |
| High | Controls have good chance to detect | □□□□□ | □ | □ | Error detected while executing the present step in the process | 3 |

| Detection | Criteria | Inspection Types | | | Suggested Range of Detection Methods | DET |
|---|---|---|---|---|---|---|
| | | A | B | C | | |
| Very High | Controls almost certain to detect | □ | □ | □ | There cannot be service disruption because the critical points of the steps are manned | 2 |
| Very High | Controls certain to detect | □ | □ | □ | There cannot be service disruption because the Process steps are error proofed and unmanned | 1 |

The impact evaluation model of EHSC consists of Five Key Factors. The key factors are as follows.

1. Business Impact
2. Legal Requirement
3. Probability of Occurrence
4. Frequency of Occurrence
5. Detection and Correction Capability

## 5.4 Process of Impact Evaluation

- The first cut impact ratings will be assigned by the functional teams. The EHS and Core team will review the impact ratings with respect RPN Value and legal requirements:

- Any Activity/ Aspect/ Hazard having scored the RPN Rating more than 125 would be consider Significant.
- This template and RPN rating score is particularly selected as this is simple and a standard Quality matrix used across EHSC.

**Impact Mitigation**

Approach to Impact Assessment, Mitigation Planning & Review

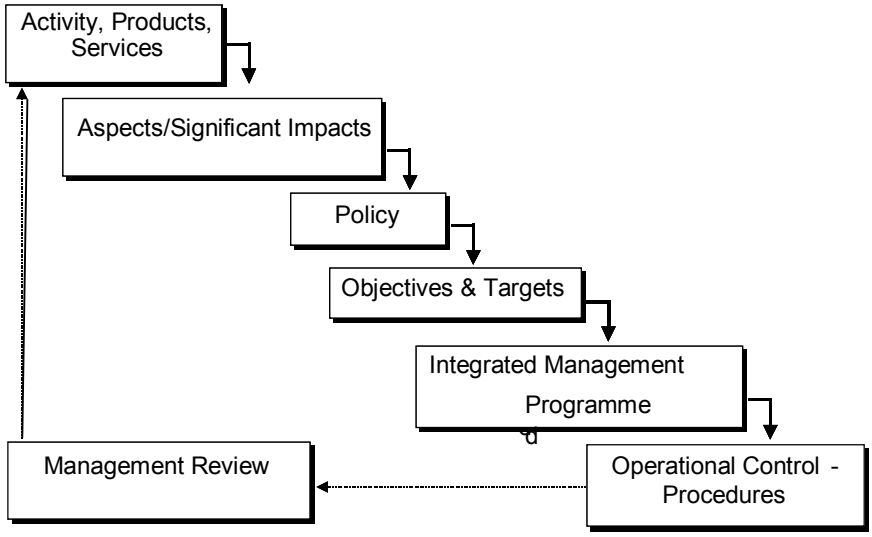


**Figure 4.1: Impact mitigation**

## 5.5 Approach

Impact mitigation involves prioritization, evaluation and implementing the appropriate impact reducing controls. The elimination of all the impact is usually impractical or close to impossible, it is the responsibility of EMIT to use the least-cost approach and implement the most appropriate controls to decrease mission impact to an acceptable level, with minimal adverse impact on the organization's resource and mission.

The following impact mitigation methodology is used to address the impact mitigation at EHSC

1. **Select Vital Few:** Out of entire list of significant, select a vital few based on criticality, its application to legal and which are faster and easier to implement based on resources required**.**

2. **Prioritize Actions:** Based on the impact levels present in the impact assessment report, the implementation actions are prioritized. In allocating the resources, top priority shall be given to impacts items which require immediate corrective action to protect the EHSC's interest and objectives considering the complexity, feasibility, legal dimension etc.,

3. **Evaluation of recommended control Options:** The controls recommended in the assessment process may not be the most appropriate and feasible options for entire organization. During this step, the feasibility, compatibility, user acceptance and effectiveness (e.g., degree of protection and level of impact mitigation) of the recommended control option are analysed. This activity helped the team in selecting most appropriate control option for minimizing impact.
4. **Conduct cost benefit analysis:** In this stage, to aid management in decision making and to identify cost-effective controls conduct a cost benefit analysis.
5. **Select Controls:** On the basis of result of cost benefit analysis, in consultation with management determine the most Cost – effective controls for reducing impact to EHSC. The selected controls are combination of technical, operational and management controls element.
6. **Assign Responsibility and timeline:** Appropriate functional activity owner will be nominated from the team based on skill set and expertise and who has control over the activity. On periodic basis, EMIT and management team shall monitored the implementation.
7. Post implementation of the mitigation plan, the EHS & core team will conduct an annual aspect & Impact & Hazard study afresh to identify new areas for improvement.
8. Residual Impact evaluation & continuous improvement. Implementation of new or enhanced controls can mitigate the impact by

- Eliminating some of the system's vulnerabilities (flaws and weakness), thereby reducing the possibility of aspects or Hazards getting converted into concerning impacts or Risk to life & Property.
- Adding a targeted control to check the vulnerability / susceptibility & thereby reduce the possibility of aspects or hazard getting converted into concerning impact/Risk. Reduce the magnitude of the adverse impact/ Risk.

# CHAPTER 6

# EHSC Procedure for Identification and maintenance of Legal compliance

## 6.1 Purpose

The objective of this procedure is to assure that the site has appropriately addressed statutory requirements & complied with all applicable regulations. The procedure also establishes mechanism for regular update on various legal requirements

## 6.2 Scope

- This procedure covers all employees, Contractors & processes of EHSC at All India Sites.
- Legal requirements are not directly applicable to EHSC leased sites.
- EHSC does not bear responsibility to ensure the implementation of legal requirement pertaining to leased site.
- EHSC will ensure that the lease agreement has the requirement of complying to legal requirement from Owners side.

## 6.3 Responsibilities

- The compliance team will be responsible for the overall implementation of the Regulatory Compliance Program.
- The following person(s) or job classification will be responsible for Regulatory Compliance

**Table 6.1; Responsibilities**

| | |
|---|---|
| ▪ Regulatory Compliance | ▪ Logistic Leader / Maintenance Leader/ EHS Specialist |
| ▪ Regulatory Updates | ▪ EHS Specialist |
| ▪ Training | ▪ EHS Specialist |
| ▪ Review | ▪ Internal Audit Team with MR |
| ▪ Program Assessment | ▪ MR & Site Logistic Leader/ EHS Specialist |
| ▪ Record keeping | ▪ Logistic Leader/ RIM team |

## 6.4 Process flow

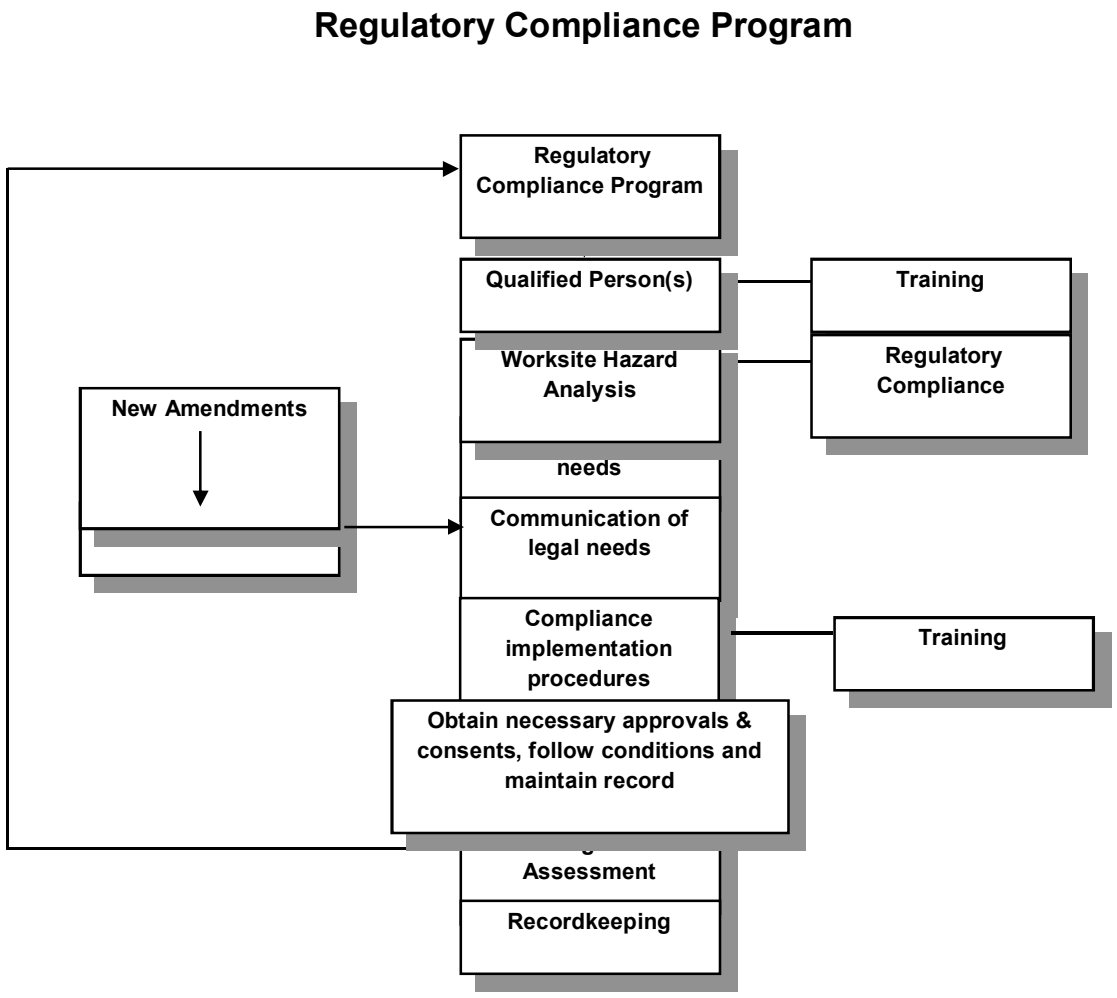


**Figure 6.1**

## 6.4.1 Compliance program

- A compliance program will be implemented. Inspections using area-specific checklists to identify key items will be scheduled and performed at least quarterly or upon change in legal applications whichever is earlier. Inspections should include talking with concerned employees on safety issues, and compliance issues.
- Any gap in compliance of legal requirement shall be complied immediately on priority.
- Quarterly report shall be prepared and submitted to leadership for review.

### 6.4.2 Regulatory compliance issues & Updates

- Regulatory compliance issues will be addressed immediately at the facility
- EHSC will subscribe to Environ trends- a regulatory update facility from Indus Environ to get the real-time updates on Regulatory requirements.

### 6.4.3 Program Evaluation

- EHS team shall quarterly review the updates on legal requirements.
- The effectiveness of the Regulatory Compliance Program will be reviewed on an annual basis by Management Representative annually with leadership.

### 6.4.4 Corrective Action Plan

- The gaps found during evaluations will be closed through a Corrective Action Plan.
- The Corrective Action Plan would include clear responsibilities assigned.
- Corrective action items will be identified and prioritized, and a schedule for completion of action items will be developed. Corrective action items will be tracked to completion. Management will review open action items monthly.
- A tracking system will be developed to verify closure of action items. Corrective action items will be closed on a priority-based schedule.

## 6.5 Training

Those responsible for designated aspects of the Regulatory Compliance Program will be provided with training on the skills required to complete these responsibilities. The training will be accomplished through Classroom training by EHS Leader / through some other source Impact Evaluation Methodology by Checking Environment, Health and Safety Audits

### 6.5.1Purpose

Purpose is to establish a procedure to ensure and maintain an audit program. Periodic EHS management system audits to be carried out in order to determine whether or not the EHS management system conforms to the planned arrangement for EHS management including the requirements of ISO 14001 and OHSAS 18001 requirement and specifications.

- Determine whether or not EHS management system has been properly implemented and maintained
- Determine whether or not EHS management system is effective in meeting EHSC's policy and objectives
- Review the results of previous Audits
- Provide the information on the results of Audits to EHSC's Management.

### 6.5.2 Scope

This procedure applies to all Employees of EHSC and to each of the EHSC controlled Activity and entity.

## 6.6 General Frameworks and Procedure

- EHS Manageent Audits shall be conducted according to the planned arrangements Additional Audits can need to be performed as circumstances require.
- EHS Audits shall be carried out only by compentent , independent perosnnel .
- EHSC has identified internal auditors from each enabling function who are qualified and cometent to conduct the EHS Audits.
- EHSC considers the detailed assessments of the effectiveness of EHS procedures, the level of compliance with procedures and practices and where necessary identifies the corrective actions
- EHSC EHS management system audits shall be recorded and reported to management in a timely manner.
- Management shall review the results of the Audits and shall suggest the corrective actions where necessary.

### 6.6.1 Audit Scheduling

An Annual plan is prepared for carrying out internal EHS Audits . It covers the entire operation of the EHSC and for the entitys which are controlled by EHSC

The frequency of the Audits is related to includes:

- Risks associated with various failure modes of elemements of EHS management
- Data available
- Output from Management Reviews

- Extent of EHS Management system that EHSC operates are subject to change

Additional , unplanned, EHS management system can need to be conducted if situation occur which warrant them eg., after an Accident or any other crisis

### 6.6.3 Auditors

EHSC has identified Team of internal Auditors covering all Enabling functions.They are trained in EHS management Auditing. Auditors are aware of and have access to standards and guidelines relevant to the work they are engaged in. Audits shall be conducted by personnel independent of those having direct responsibility for the activity being examined

### 6.6.4 Audit Data collection and interpretation

The techniques and aids used in the collection of the information will depend on the nature of the EHS Management system Audit being undertaken . The EHS Management system shall ensure that a representative sample of essential activities is Audited and that relevant personnel ( including EHS representatives where appropriate ) are interviewed . Relevant document should be examined . This can include the following documentation :

- EHS Management system documentation
- EHSS policy statement
- EHS objectives
- EHS emergency procedures
- Permit to work systems and procedures
- EHS minutes of meeting
- Accident / Incident Reports and Records
- Any Reports or communication from EHS enforcement or other regulatory bodies ( verbal, letters, notices etc)
- Statutory registers and certificates
- Training records
- Previous EHS management system reports
- Corrective action requests

- Non-conformance reports
- EHS inspection Reports

### 6.6.5 Audit Results

The Audit results shall contain

- EHS objectives and scope
- Auditors identification
- Identification of reference documents
- Details of Non conformances
- Degree of conformity with EHS Management and standard requirements of ISO 14001 and OHSAS 18001
- The ability of EHS management system to ahieve the stated EHS management objectives
- Distiribution of final EHS management system audit report

Audtis resulsts would be communicated to the concerned as soon as possible to allow corrective actions to betaken. Action plan of agreed remidial measures would be drawn up together with the identified responsilbe persons , completion dates , and reporting requirements. Follow up monitoring arrangments shall be follwed as defined in NC / PA/CA plan to ensure satisfctory implementation of the Audit recommendations.

Confidentiality shall be considered when communicating the information contained within the EHS Audit Reports

### 6.6.6 Key Roles and Responsibilities

- Management Representative, EHS Country Head, Site EHS Head are jointly responsible to implement the Audit plan
- Concerned Functional Heads and SLL are responsible for closing the Audit observations and NC's and reporting back to MR and EHS Team

- EHS Site Leader is responsible for Audit Reporting to MR, Country EHS Head, SLL and other required people.

### 6.6.7 Attachments

- Audit Annual Plan
- List of Internal Auditors and other authorized Auditors
- Audit check lists

### 6.6.8 Documentation

- The Site EHS Team shall maintain all the documents, records and Reports related to audits
- The Documents are both in Physical and Electronic Format.

# CHAPTER 7

# Checking and Corrective Action

## 7.1 EHS Performance Measurement and Monitoring

### 7.1.1 Objective

The purpose of this procedure is to measure the effectiveness of each EHSC's EHS element, program & related activities and annually identifying next steps for continuous improvement.

### 7.1.2 Scope

This procedure covers all EHS requirement of EHSC's and ISO 14001 and OHSAS 18001 Requirement. Based on all the observations the recommended actions has to be taken care on the site.

### 7.1.3 Responsibilities

Site Leader / Site Logistic Leader/ EHS Leader are responsible for the overall implementation of the EHS Program Evaluation.

**Table 7.1 ; Responsible person/dept. for various gaps**

| S. No | Implementation | Responsibility |
|---|---|---|
| 1 | Program Evaluation Team | Site Leader/ Site Logistics Leader/ EHS leader/EHS Specialist |
| 2 | Program Evaluation | Business Leader/ Site Leader |
| 3 | GAP Assessment | Site Leader/ Site Logistics Leader/ EHS leader/EHS Specialist |
| 4 | Corrective Action | Respective element Head |
| 5 | Communication of Corrective & Program | Respective element Head |

| | | |
|---|---|---|
| | Modification | |
| 6 | Training | EHS Specialist |
| 7 | Record keeping | EHS Specialist/ Respective element Head |
| 8 | Session E & Self Assessment | Business Leader/ Site Leader/ Site Logistics Leader |

### 7.1.4 Process Flow

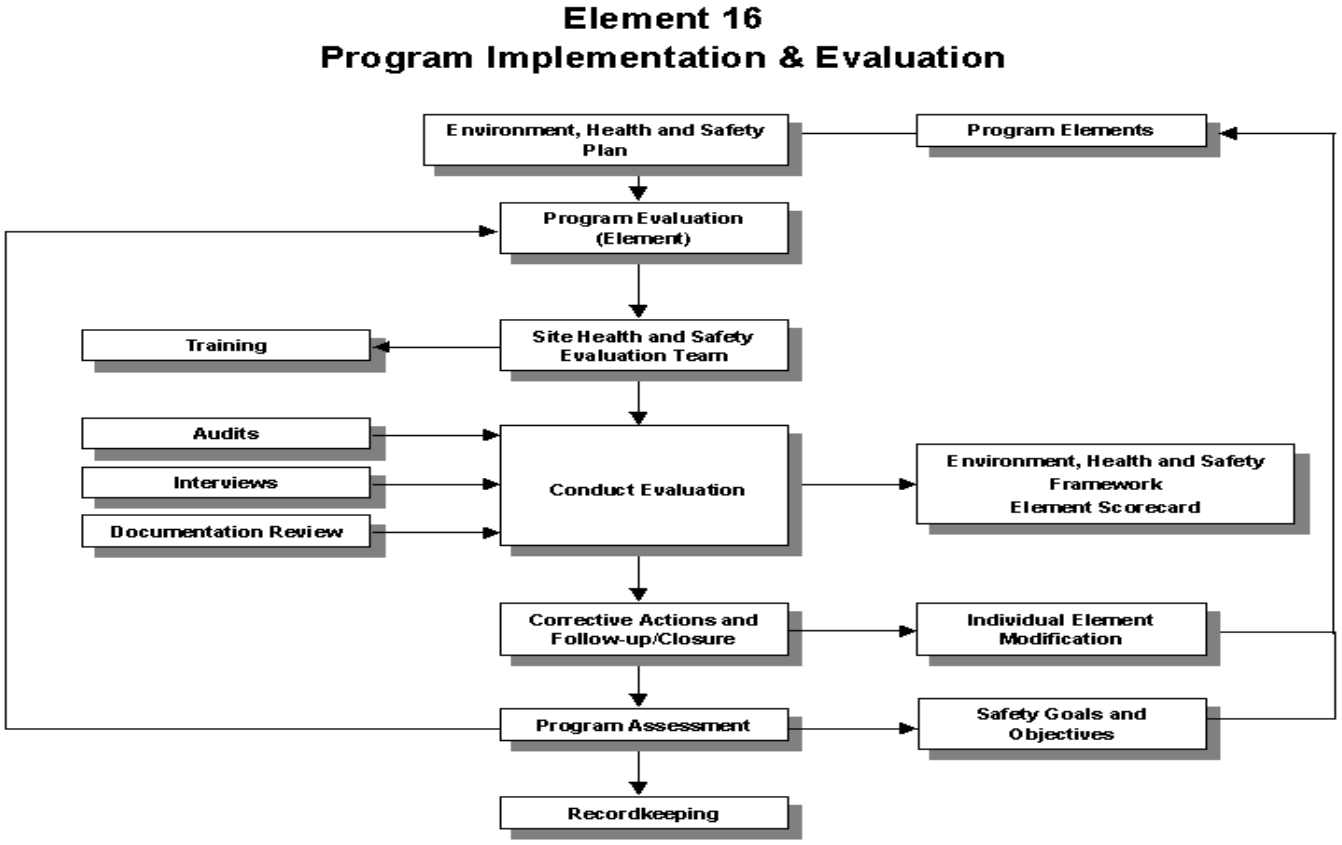


**Figure 7.1**

### 7.1.5 Details of Program

**Table 7.2; Program Evaluation & Timelines**

| Program Evaluation | Timeline | Site EHS Evaluation Team | Used For |
|---|---|---|---|
| EHS Framework Element Procedures | Half yearly | EHS Specialist, EHS Leader | Updating of Elements, procedures, responsibilities, regulation etc. |
| EHS Framework Scorecard | Yearly | Respective Element Head, EHS Specialist ,EHS Leader, Site Logistics leader | Review of Implementation of Program, Training requirements, Performance of Respective element Team- leading to Performance appraisal for Team members of Enabling function, |
| Session E | Yearly | Business Leader, Site Leader, Site Logistics Leader, EHS Leader | Next Year's Goal Statement |

The following aspects will also be incorporated into the system and may be used in addition to the EHS Framework Element Scorecard to evaluate the overall EHS program

- Review of injury and illness trends and performance.
- Employee/management interviews.
- Location/operation audits.
- Observation of job tasks and inspection of work areas.
- Review of written reports and records.
- Documentation of audit findings.
- Corrective actions and follow-up.

- Mention key charcteristics of each function as to what they do.
- Engg : / Legal : stat monitoring
- BCP – drill reports / time
- Monitoring of risk register

After the completion of each evaluation, findings will be summarized for each element.

The EHS team will tabulate the results (key needs/findings and key strengths) for all the assessments.

## 7.2 Corrective Action Plans

For each key need/finding identified in the EHS Framework/element Procedures or overall program evaluation, a Corrective Action Plan with key findings, recommended management solutions, responsible person/function and completion date will be developed by the team to address the finding. All corrective action will be tracked to completion through follow-up audit. EHS Framework Work Plan evaluation findings will be incorporated into the business metrics.

### 7.2.1 Communication of Findings

The findings of the Program Evaluation will be communicated to all concerned levels of employees. This communication will be accomplished through E-Mail or EHS Notice Board / intranet.

The communication of findings will emphasize the root cause of the finding and the established corrective action plan. Completed EHS Framework Scorecards will be sent to business-level EHS, annually by submitting scores through Power suite/ alternate tool.

### 7.2.2 Program Modification

The Program Evaluation findings and Corrective Action Plans will be used to:

- Improve EHS program effectiveness.
- Establish additional performance requirements.
- Set priorities for completion of goals.
- Determine training needs.
- Identify the need for additional activities or resources.

- Enhance implemented EHS Framework Work Plan elements.

## 7.3 Training

Individuals responsible for designated aspects of the Program Evaluation will be provided with training on the skills required to complete these responsibilities EHS Specialist will give the necessary training.

### 7.3.1 Program Assessment

The effectiveness of the Program Evaluation protocol will be reviewed on an annual basis. Subsequent program updates will be made consistent with the review findings.

### 7.3.2 Record keeping

The findings of the individual self-assessments and the overall Program Evaluation will be maintained to document the ongoing review and modification of the EHS Program. These findings will be referenced in the coming year's safety and health program priorities.

# CHAPTER 8

# Result, Discussion and Conclusion

## 8.1 Findings

Following Major findings have been observed in my project

- Electric, Lift licence of the site is expired
- Air Handling Unit is not integrated to the fire panel
- LOTO kit was incomplete and engineering team was not aware of the impotance of lock out and tag out
- Chemical Management was not according to the policy of the company
- UP PCB has issued a notice to install a sewage treatment plant as soon as possible.
- E-waste management was not proper.

After all my findings of the project I have conducted closing meetings where engineering and logistics heads istructed all the responsible departments. I have followed up regulary for all the non-confirmities according to the expected closure dates.

Based on the tools I have implemented the EHS system in the company and their practical implementations I have verified during audits. By doing the legal compliance inspections I have identified the non-conformities. Gap has been removed in E waste management system. Preventive maintenance schedules have been revised and fixed for all systems/equipment.

I have helped the facility team to decide the ISO objectives and targets with plans to achieve them. Weekly EHS training to all the employees from engineering, housekeeping, security, outsiders (vendors) has been started. Role of MSDS was much clearer to everyone after the project. Failure of change management has been identified and rectified immediately. Gas flooding system was not complete with gas release and abort switches so complete system has been installed and security is aware of the operation of gas flooding system now. In a high rise building the automatic fire fighting system was missing (acc. to NBD chapter 4) in IT store so ceiling mounted halotron cylinders has been installed due to my project. I have made them aware of all these requirements to get the fire NOC from local fire department without any issue.

By showing such commitment to my project top management has decided to arrange weekly EHS common calls to close the issues as soon as possible. Previously call was monthly and EHS observations closure rate was low. This project has gave me a wide exposure for the implementation of the EHS standards in an industry.

## 8.2 Conclusion

- All the legal requirements have been checked with respect to latest updates and mitigation actions have been taken to fulfil the requirements
- Site has decided their ISO objectives and targets with respect to environment and sustainability
- All the issues have been rectified within the time limit
- HIRA (Hazard identified and Risk assessment) study and AIA (aspect impact assessment) study has improved the EHS presence on site
- I have recommended the site logistics leader to add safety and emergency response orientation sessions for all the new employees.

# REFERRENCES


- Carrie, C., & Stallwoad, C. (2004). Occupational health and safety management systems and integrated management systems. *Colombian Safety Council*. Retrieved March 22, 2013
- HUANG Lin-jun, LIANG Dong, Development of Safety Regulation and Management System in Energy Industry of China: Comparative and Case Study Perspectives ,Safety Science,October 2013
- Integrated Management system EHSC, India- ( Doc No : Gen-IMS-Jaipur ), March 2008
- Approaches of IMS in EHS from MIT
- An introduction to EHS Management System Standards and the benefits of Certification manual.
- Integrated Management system EHSC, India- ( Doc No : Gen-IMS-Jaipur ), March 2008