Chapter 1

INTRODUCTION

1.1. Descon Oxychem Limited (DOL):

Descon is one of the largest conglomerates in Pakistan operating for over three decades. Founded in 1977, initially it was a multi-faceted engineering and manufacturing concern that has now become the largest Engineering, Procurement, Construction & Commissioning [EPCC] company in the country.

A few years after its establishment, the focus turned to chemicals, materials and power generation. For over three decades now, Descon Chemicals Limited has built Descon's culture into what it is today, a place for creating and bringing ideas to life. Descon's Chemical Business comprises of Descon Chemicals Limited, NIMIR Resins Limited, Descon Corporation Limited and Descon Oxychem Limited. From the manufacturing of a wide variety of chemicals to their trading, they provide a one-stop solution for all industrial chemical's needs.

Having a workforce of over 600 persons and operating from Lahore, Pakistan, Descon group of industries offer a wide range of around 200 innovative products and services for markets including Coating & Emulsion, Paper and Packaging, Textile Auxiliaries, Printing Inks and Unsaturated Polyester. Descon enterprise is more than a collection of successful businesses that are owned under one roof. Descon strive to gain competitive advantage from opportunities for constructive collaboration.

Descon Oxychem Limited (DOL) was another chemical plant to the Descon chemical business area that merged by Descon in 2004 as a Private Limited Company with the highest business

scope of Hydrogen Peroxide (H_2O_2) production and marketing. The plant is located at 18Km, Sheikhupura Road Lahore in Punjab province and spread over an area of 24 acres. Within the facility boundaries there are the following plants/ small units i.e. hydrogen plant, demin plant, jerry can production area, hydrogen peroxide plant, concentration area, dispatch area, warehouse, workshop and waste area. Descon Oxychem Ltd. is a medium size industry with approximately 180 employees and a production capacity of 22000 metric tons/year. The main product is hydrogen peroxide. At present Descon Oxychem Limited is producing 84 metric tons of hydrogen peroxide (H_2O_2) daily. It is one of the only two hydrogen peroxide plants present in Pakistan. Descon Oxychem also is the first manufacturer of the production of food grade hydrogen peroxide in Pakistan. DOL have started selling its food grade product to the local industries. DOL also export Hydrogen Peroxide to Turkey, India, Sri Lanka, Bangladesh, South Africa, UAE, and Iran.

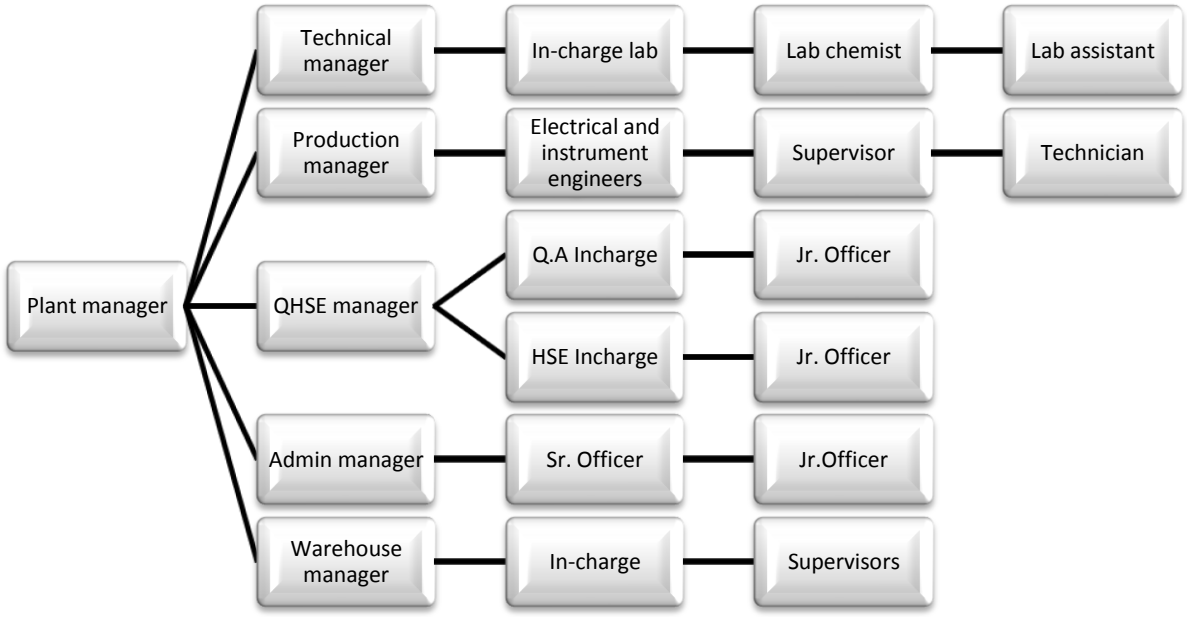

Fig. 1: Hierarchy of Descon Oxychem Plant

Hydrogen Peroxide (H_2O_2) is an eco-friendly chemical with wide range of applications. The main uses of hydrogen peroxide include the use in waste water treatment, as a bleaching agent in paper, pulp and textile industries, in exhaust air treatment and as disinfect in several applications. When applied it does not produce any harmful by-products as when it decompose it only yield oxygen and water.

Now a days, Hydrogen peroxide is produced almost entirely according to the process of Anthraquinone-autoxidation. In this AO process, an anthraquinone derivative, which is circulated, acts as a "reaction carrier" and the H_2O_2 is produced from hydrogen and atmospheric oxygen. Then the crude hydrogen is purified that derived through the AO process and concentrated upto a desired limit. It is usually marketed as a liquid solution after suitable stabilization in 35 and 50 percent concentrations by weight.

Listed below is a selection of different hydrogen peroxide grades available from Descon Oxychem Limited.

- 35% Hydrogen Peroxide (Technical Grade)
- 35% Hydrogen Peroxide (Food / Aseptic Grade)
- 50% Hydrogen Peroxide (Technical Grade)

The main application fields for these three grades are as bleaching agent in the paper and pulp industry and in the textile industry and used in chemical industry in oxidation reactions. Hydrogen peroxide is available in concentrations of 35 percent by wt. and 50 percent by wt. For different applications, special grades are available. Depending on the requirement, shipment is made in small or large containers. For consumption in large quantities consumers are recommended to the construction of a tank installation.

Hydrogen peroxide is commonly packed in the form of:

- High Density Poly Ethylene (HDPE), 30 Kg Jerry Cans
- 1 ton capacity IBC (Intermediate Bulk Container)
- 17 and 34 tons capacity Container,
- 20 and 40 tons capacity Road tanker

Only those materials are suitable to construct and store the hydrogen peroxide that does not stimulate the catalytic decomposition of hydrogen peroxide. Recently stainless steel or polyethylene (up to 60 percent by wt. H_2O_2) is used as construction material for storage tanks due to its quality of reduced corrosion problems. For the construction of storage tanks pure aluminum ($AIMg_3$) is also used as a construction material.

Heat may cause decomposition of hydrogen peroxide into oxygen and water so it should always be stored in vented containers and it can be kept in roofed and fireproof rooms. It can, however, endure cold winter temperatures as well as summer temperatures. Hydrogen peroxide should be protected against all types of contamination because it can also cause decomposition. The hydrogen peroxide solution can be stored for long period of time in the same tank or container with proper storage without evident losses (less than 2% relative per year) in active oxygen.

The major hazards in the whole process of manufacturing Hydrogen peroxide are the formation of explosive gas mixtures that can catch fire, high level noise, emissions of flue gases, wastewater and chemical waste.

In September 2011, Descon Oxychem Limited was certified with Quality standard, ISO 9001. However, they are not yet certified with Occupational Health and Safety standard (OSHAS

18001) and Environmental Management System standard (ISO 14001). They are now working on the Occupational Health and Safety standard (OHSAS 18001) and Environmental Management System standard (ISO 14001). Descon Oxychem Limited has a target to implement both the Occupational Health and Safety standard (18001) and Environmental Management System standard (14001) as an integrated system in April 2013.

1.2. Aims and objectives:

• To work on and develop an integrated management system for the organization and create a health, safety and environment culture inside the organization.

• To formulate integrated QHSE (Quality, health, safety and environment) policy and SOPs (standard operating procedures) for the organization.

• To carry out gap analysis of OHSAS 18001 and ISO 14001.

• To evaluate risk assessment and identify hazards in all areas of the plant.

• To identify what kind of difficulties will be faced by an organization in implementing IMS.

Chapter 2

LITERATURE REVIEW

In present economic situation the trend towards Integrated Management System (IMS) is increasing more and more but the experience of different companies having different size and sectors and even in different regions is dissimilar. Now a days the certification of organization systems clearly exhibits the prospect for an organization to reveal to its 'interlocutors' the consistency of its management and its good management of quality, environment, health and safety and its social issues. From the data of ISO survey of certifications, at 31 December, 2005 the total number of ISO 9001:2000 certifications counted to 776,608 worldwide, however for ISO 14001 the estimated number of certifications was 111,162. Another updated unofficial statistic report recounted an estimated 103,583 ISO 14001 certifications in January 2006. China was the country with the highest number of 9001 certifications (143,823). And the Italy exhibits the second place with 98,028 certifications. For 14001 certifications japan was the leading country with 23,466 certifications, while Italy ranked fourth with 7080 certifications (Salomone, 2008).

In a framework where new standardized management systems (MSs) appear commonly most of the organizations are implementing not only a single standard but many different standards at the same time to fulfill their own requirements and to satisfy their external stakeholders (ISO, 2009).

Different authors define integration in a different way e.g. Integration is defined as the ''degree of alignment or harmony in an organization whether different departments and levels speak the same language and are tuned to the same wavelength''. Or ''a process of putting together different function-specific management systems into a single and more effective IMS''. Or ''a

genuinely integrated system is one that combines management systems using an employee focus, a process view, and a systems approach, that makes it possible to put all relevant management standard practices into a single system (Merce Bernardo et al., 2009)".

The management system standards (MSSs) are increasing by implemented conjointly by the companies as they often incorporate common elements such as continuous improvement, the control of documents and records, management review, corrective and preventive action and internal audits. And this is the main reason of popularity of IMS as companies find it more equitable to integrate their MSs rather than manage them individually (Simon et al., 2012).

In IMS the purpose of alignment of different standards is to reduce the burden of cost, but on the other hand, the procedures for different standards are continued but placed in one manual. For more level of integration it is necessary to develop a culture of learning which ensures the participation of stakeholders (Jorgensen et al., 2006).

According to literature there is no unique model for integration. It completely depends on an organization how it achieves integration in what way and at what level. There are different degrees of integration e.g. partial or complete. It is clear from the survey of different companies that most of the companies follow the pattern of integration in which they start with the aims and goals, documentation process and procedures (policy, SOPs, Targets and objectives and manual in the case of the goals and documentation, and record control, internal audits and internal communication for procedures), integrating operations and strategies later on (Merce Bernardo et al., 2009).

There are methods of integration, firstly the integration of the originally separate systems by follow the original system, and secondly from the start the development and implementation of

an integrated management system. The standards OHSAS 18001 and ISO 14001 are fully compatible, there are few differences as OHSAS emphasis on risks and the environmental standard considered environmental aspects. But overall the procedures and steps are the same. All OHS issues are integrated into EMS documents step by step. Implementation team establishes combined procedures for both the standards (Labodova, 2004).

Main motivations that encouraged a company to EMS (14001), QMS (9001), OHSAS (18001) were associated mainly to better image, continual improvement, competitive advantage on the market, exploit new market opportunities, reduce management costs, customer pressure, product improvement, greater productivity, pressure from local and public authorities, pressure from suppliers and stakeholders (shareholders, groups, staff). A few are having a real desire to protect the environment and the possibility to monitor constantly compliance with environmental legislation. The study showed that all macro-sectors want to get the certification for enhanced image and continual improvement and the purpose of all small, medium and large firms to implement an management system standards is to continue to enhance image and continual improvement, in micro-firms new market opportunities are also the main motivation followed by (in equal measure) continual improvement and competitiveness (Salomone, 2008).

To implement an IMS system the increasing compatibility of standards, and furthermore the common understanding of the tasks of organization involved in combining process are necessary. It is better that an IMS established on PDCA Plan-Do-Check-Act in an organization. For integration the similarities in a management systems are: top management commitment, definition of a policy, planning of objectives and targets, procedures for training of employees, communication procedures, audits, documentation and records control, control of non-compliance, corrective and preventive actions, and management review (Jorgensen et al., 2006).

For the successful implementation of integrated management system it is required that there should be complete coordination from the top manager to the bottom front-line staff and manager must continuously push it forward (Zeng et al., 2007).

Management systems integration is not an obligatory requirement for an organization to comply with when it decides to implement two or more than two management systems; it's just an opportunity driven by the possibility that can bring advantages for an organization like in terms of resource and skills. Certainly the organization feels the need of integration at its operation level not just because it cannot handle the different management systems separately but the significant advantages to be gained from integration e.g. reduce the cost of audits and from staffing to unified plans and policies to establish unified objectives (Salomone, 2008).

The integration of management systems are becoming more and more popular because it helps an organization to set unified objectives and targets and this can have a positive effect on an organization efficiency and effectiveness, because of reducing the cost of individually managing each system (Simon et al., 2012).

Australia, France, the Netherlands, Denmark and Spain have developed or are developing their own IMS standard. For ISO due to increased trend and organizations interest in IMS the next step would be to develop a stand for integrated management system (Jorgensen et al., 2006).

Consequently, many organizations either due to market demand or their own internal incentives have increasingly implemented integrated management system (Karapetrovic and Casadesus, 2009).

In most of the companies integration of management systems is the result of pressure from customers or suppliers. In some cases it was the choice of top management due to the benefits they get from it like the reduction in bulk of documents, the interaction of different management systems, thereby saving time, money and labor. For micro firms IMS enabled firms to eradicate conflicts between strategies of different companies and to define responsibilities more clearly. In micro firms the most significant role of integrated management system is to enhance unity of objectives like integrating policy, objectives and targets, more defined roles and responsibilities and improvement processes. The other actions include the need of firms to reduce the time and costs in managing record keeping, trainings, and internal audits and to combine the approaches related to the these variables(Salomone, 2008).

International standard organization (ISO) has revised each standard and published their new editions. These management standards have correspondence among one another and this is the reason now there is an increased trend to integrate and implement these standards together. To comply with these standards separately is likely to result in increase of paperwork, burden on administration and conflict in demand of each standard. From an administrative point of view, with integration an organization can easily save its money by reducing paperwork, saving time and resources and minimization of documentation and records. These ISO standards are flexible and can easily apply to any small or medium size enterprise and in any sector (Jorgensen et al., 2006).

Some authors describe the benefits of IMS regarding the integration of their internal audits that can be carried out together thus reducing the cost of individual audits. The firms, in order to avoid failure in integration of management standards, they should overcome the difficulties involved such as the lack of human resources,departmentalization of functions, the lack of

management support, and individual concerns of the people involved. But if it is managing properly these difficulties can be reduced over time (Simon et al., 2012).

Integration of occupation health and safety standard and environmental standard can bring benefits to an organization because the principles of prevention are quite similar for both the standards so integration can avoid duplication of work, while some aspects like waste management and prevention of industrial accidents, noise control, occupational and environmental factors and chemical safety are closely associated to one another. On their job the personnel can easily identify the occupation health and safety risks as compared to the environmental risks because it's the part of their work (Honkasalo, 2000).

The main benefits of implementing Integrated Management Systems includes reduced management cost, decreased paperwork, decreased complexity of internal management, facilitates continuous improvement and simplified certification process (Simon et al., 2012).

A practical example of the brilliance of IMS is the welding process in which quality demands for the fine product, health and safety stresses either the worker is equipped with PPEs or the environmental standard demands how the organization manages the waste (Jorgensen et al., 2006).

By integrated approach in small companies a rapid and visible improvement in product quality, health and safety and environmental performance is observed. It is also experienced that because of communication among all departments inside a company there is an increase in good housekeeping practices and prevention of waste and emissions. Quality management, environmental management and health and safety are parts of the same organization. "They are shadows which start to exist only by shining light on the same organization from the point of

view of quality, health and safety and environment". In integration the system is designed in the way that it completely comply with the requirements of ISO 9001, ISO 14001 and health and safety regulations (Fresner and Engelhardt, 2004).

A study conducted in South Wales, UK revealed that the SME are less interested in implementing IMS system as compared to large organizations. One of the reasons is the invasion of a new system which might grind down the position of the present system manager. This is the common issue among organization and these kinds of issues can be easily handled by the senior managers who are above the environmental, quality and health and safety manager, they have better analyzed the overlap and duplication of different management systems and also the strategic considerations of building an IMS. For achieving a competitive advantage IMS has to be implanted throughout the organization and in all stakeholder relations (Jorgensen et al., 2006).

Once an organization finalizes the design of its management system, the owner of each management subsystem (quality, safety, environment, human resource department) should be recognized and then they will start developing the documentation of each subsystem by planning and scheduling the development process. The availability of resources can restrict the limit of documents that develop for each subsystem. Training of employees can also plays an important role in understating of new management procedures and for those personnel who had not been able to review the new documentation. For this purpose it is suggested that new system may not be implemented until 30 days after the last training session is completed. For continuous improvement of management system it is recommended that all employees have a training to identify non-conforming conditions needed to activate corrective and preventive actions, complete all the compliance requirements and all applicable and recommended practices (Holdsworth, 2003).

Different issues, such as the organization's structure, size, market competition and regulatory demands have a significant effect on the decision of an organization whether there is a need of integration or not or at what level (Jorgensen et al., 2006).

The environmental management system standard, ISO 14001 was first published in 1996, and revised in November 2004. An environmental management system is a part of an organization's management system used to develop and implement its environmental policy and to manage its environmental aspects (Jorgensen et al., 2006).

ISO 14001 Standard is voluntary and any organization can implement it which wants to control its environmental aspects (Kenneth et al., 2004).

"An EMS is a set of organization specific policies, procedures, and guidelines that govern the strategic and day-to-day operations of a company's environmental activities (Cushing and McGray, 2005)".

The environmental management system helps organizations not only to define targets but also the methods to achieve those targets, but these targets can change during the process. The environmental management system does not include the risks and its prevention methods. In environmental policy of the firm it is obligatory to include the clear targets by the top management that are measureable and are according to the aspects of that firm. These targets must lead to the continuous improvement of that firm. As compared to occupation health and safety risks the environmental risks are not measureable as they have long lasting effect on atmosphere (Honkasalo, 2000).

These standards are flexible and are only designed to help firms of any business type and size to reduce their environmental impacts and improve safety performance. Green manufacturing practices can also support firms in reducing operational and business cost by improving the design of the product and usage of energy raw materials, or labor in a more effective way (Hui et al., 2001).

Environmental management system is an effective way to manage internal agency issues that can cause adverse impacts as well as it helps organization to set environmental objectives and explore the ways to achieve these objectives that can result in improved performance of an organization. It may help managers to identify and implement the most cost effective means to comply with legal and regulatory requirements (Johnstone and Labonne, 2009).

In USA the management systems are usually implemented to comply with wastewater, air pollution, solid and hazardous waste, and worker's health and safety regulations. Different studies demonstrate that implementing EMS can have positive effect on business by adopting cleaner production activities that may be of huge concern to investors and stakeholders (Cushing and McGray, 2005).

ISO 14001 standard is voluntary, there are two main reasons of why firm certify for ISO 14001, one is to strengthen their present strategies thereby further enhancing their competitive advantage and the other is to direct others about the strategic positioning change (Bansal and Hunter, 2003).

EMS standard (ISO 14001) commands the introduction of an strong corporate environmental policy, with the identification of the environmental aspects of its activities; the identification of legal and other requirements; the establishment of an audit and review system; and procedures to

rectify any shortcomings identified. Implementing effectively, such measures can help facilitates and improve their environmental performance (Johnstone and Labonne, 2009).

The implementation of environmental management system also strengthens the image of a company and business strategy to have a competitive advantage on others. To decrease the environmental impacts of a manufacturing industry "the following five factors are commonly employed as indicators: Waste Reduction, Waste Reuse, Waste Recycle, Waste Treatment and Use of Sustainable Resources" and to achieve this engineers have to proactively improve or develop the business/operation processes (Hui et al., 2001).

In organization the concept of continuous improvement assumes that no system is perfect completely. An EMS can help your organization to improve its performance and compliance, but this does not mean that the problem will never arise again. Though, an effective EMS system will help you to find waysand fix these problems and avoid their recurrence (Stapleton et al., 2001).

Many findings indicates that now a day's enterprises are increasingly certified with different standards, and the factors prompting implementation include transnational corporate policy, the potential for regulatory, government-sponsored environmental projects, international trade, economic, the interest of top company management and environmental benefits (Cushing and McGray, 2005).

Environmental management system has tremendous effect on SMEs performance. Several studies indicates that it contribute to continuous improvement of firm and monitoring of compliance. It also helps in improving and increased staff morale and encourages them to better firms' performance and upgraded company image and reputation (Nee and Wahid, 2010).

The companies of US that implemented ISO 14001 have shown improvement both quantitatively and qualitatively in their environmental performance. Generally, the main benefits fall into the following categories: pollution reduction, cost savings, reduced resource use, improved regulatory compliance, infrastructure investment, diffusion and new procedures (Cushing and McGray, 2005).

In recent years the standards for management systems have become more compatible and recent audit findings show that there is a repetition of work for health and safety, environment and quality work procedures "(e.g. inspection and testing, contractor, training, auditing and others)" management system should be designed in accordance with the quality, health and safety and environmental performance so that the performance should be enhanced. Also the management system should be reviewed by the management system teams and the participation of employees should be ensured to optimize performance (Holdsworth, 2003)

The increasing pressure from government policies and legal requirements, and increasing environmental awareness among local people influenced companies to adopt a Green Manufacturing (GM) or an Environmental Management System (EMS). "The needs for environmental protection (such as waste minimization, pollution prevention, energy conservation and other health and safety issues) have been widely publicized". The firms which adopt green manufacturing practices recognized that it plays a vital role in decreasing waste generation and pollution. The environmental management system helped firms to review their business strategies but also provided guidance to find the ways to achieve both corporate and environmental goals (Hui et al., 2001).

According to the results of an ISO survey, it is revealed that ISO 9001, ISO 14001 and OHSAS 18001 standards have similar principles and techniques. Implementing these standards individually in parallel demand may imitate the work of management and also it has been confirmed it is difficult to handle and fulfill the requirements of each standard individually. An organization usually has separate management systems and staff to handle these systems which may cause clash in organization (Zeng et al., 2007).

Other than EMS and QMS the company can integrate other standards as well like OHSAS and SA standard. Furthermore, ISO 9001 and ISO 14001 have tremendous impact on trade and organizational performance that has encouraged ISO to develop other standards that have the common management system approach to particular aspects or sectors (ISO, 2009).

For a healthy and safe work environment occupational health and safety management (OHSM) System is a benchmark for industries. It covers health and safety policy, procedures and all the health and safety risks and hazards and its control measures (Hohnen, 2011).

Chapter 3

METHODOLOGY

This chapter describes about the methodology adopted to review the existing HSE system at Descon Oxychem Limited. The study comprised of primary data taken from the industry. DOL has not yet established HSE Integrated Management System, and they are working on it. For the purpose of developing of Integrated HSE management system following methodology was adapted.

3.1. Physical survey of the Descon Oxychem Limited:

First of all survey of the whole plant (site survey) was carried out to familiarize with the processes used for the production of hydrogen peroxide. Health and Safety conditions of all the sections within the facility boundaries were documented. Hydrogen plant, demin plant, jerry can production area, hydrogen peroxide plant, concentration area, dispatch area, warehouse, workshop and waste area we studied in detail.

3.2. Desk Study:

Desk study involved the review of the relevant literature, detailed study of the previous documents and records related to Environmental Management System as well as Health and Safety System including standard operating procedures, previous policy and master list of documents related to HSE and their training records.

3.3. Visits of all the units:

All units within the facility boundaries; hydrogen plant, demin plant, jerry can production area, hydrogen peroxide plant, concentration area, dispatch area, warehouse, workshop and waste area were visited along with hazard identified data sheet including risk assessment matrix to identify hazards in all units of plant.

3.4. Checklists:

The information on the Environmental Management System and Occupational Health and Safety in Descon Oxychem industry was gathered with the help of different types of checklists e.g. firefighting system, emergency procedure drills, safety, corrective action plans, sanitation food and medication, vehicles maintenance and daily safety and housekeeping checklist.

3.5. Hazard Identification Risk Assessment and Control (HIRAC) study:

All units within the facility boundaries; hydrogen plant, demin plant, jerry can production area, hydrogen peroxide plant, concentration area, dispatch area, warehouse, workshop and waste area were visited along with hazard identified data sheet including risk assessment matrix to identify hazards in all units of plant and suggest control measures.

3.6. Gap analysis

Detailed audit questionnaires for Integrated ISO 14001 and OHSAS 18001 were developed to carry out internal audit and the gap analysis of standards. And also to check the existing components of the system i.e. by evaluation of the current status of environmental management

system and occupational health n safety system in the organization and by identifying the current processes for managing environmental issues and health and safety risks.

3.7. Meetings and discussions

Meetings and discussions were also carried out from time to time with concerned units.

Chapter 4

PROCESS DESCRIPTION

Descon Oxychem Limited has installed and is operating a Hydrogen Peroxide manufacturing plant at 18-km Sheikhupura road, Lahore for the purpose of generating Hydrogen gas (used as a raw material in Hydrogen Peroxide production). A second hand Hydrogen Generation unit (originally operated by Hickson and Welch Limited at Castleford, Yorkshire (England) and designed by HOWMAR International Limited (1990) was deprived and shifted to Oxychem's Hydrogen Peroxide manufacturing plant site. Original hydrogen generation unit has been designed to produce 1700 Nm^3/hr. of high purity hydrogen using natural gas as feedstock. Main processes involved are:

- Catalytic Steam Reforming (In Furnace)
- High Temperature Shift Convertor
- Purification of Hydrogen Product (PSA)
- Series of Heat Exchangers.

Stream Description

Feed Stock and Fuel:

With the high content of nitrogen this plant is designed for the natural gas feedstock. The extreme of operation on 15^0C and 2.0 bars is given as:

Component	Mol%
Methane	91.01
Ethane	3.9
Propane	1.0
i-butane	0.19
n-butane	0.2
i-pentane	0.1
n-pentane	0.1
Carbon Dioxide	0.5
Nitrogen	3.0

For the natural gas feedstock the sulfur content is 20 ppmv (max).

Hydrogen Product:

Composition	Mol%
Hydrogen	99.999
Methane, Carbon Dioxide, Carbon Monoxide, Nitrogen.	0.001 (Max)

4.1 Hydrogen Production Plant:

The hydrogen plant is designed for the production of 1700 Nm^3/h of pure hydrogen.

Following processes are involved in the production of hydrogen from hydrocarbon (Natural Gas).

- Hydro treating / Desulfurization
- Steam Reforming
- Shift conversion
- Condensate Separation
- Purification of Hydrogen

Hydro-treating/ Desulfurization:

Sulfur acts as a catalyst poison in reformer during reforming so it is necessary to reduce its concentration from feed stock, its concentration must be less than 0.1 ppmv.

The following steps are taken to remove the sulfur from feed stock:

- Addition of Hydrogen to Natural Gas
- Heating Feed
- Hydro treating
- Adsorption of H_2S

Steam Reforming:

In the reformer, catalytic reforming of hydrocarbon is carried out. The reformer reaction occurs at high temperature and consumes large quantity of heat. For this reason (nickel catalyst) pellets

are packed into tube through which process stream flows. Hydrogen, Carbon dioxide, excess steam and un-reacted methane are the normal reformer effluent compound

Desired Reaction:

In the reformer, following reaction take place

$CH_4 + H_2O + Heat$ ---------- $CO + 3H_2$ (Reforming)

$CO + H_2O$ ---------- $CO_2 + H_2$ (Shift)

The reformer reaction is in the forward direction is favored by;

- Highly endothermic
- Favored by high temperature
- Favored by low pressure
- Favored by excess steam
- Favored by CO removal

The above condition is sought in the design and operation of the reformer, the operator desire for the suitable safety operation:

- Maximum temperature of inlet and outlet
- Minimum pressure
- Maximum steam

Undesired Reaction:

Due to loss of the steam/carbon ratio, carbon forms within the catalyst pores which cause the physical breakdown of the catalyst. This cause leads to the immediate shutdown of plant. This problem is prevented by maintaining the required ratio of steam/carbon.

The undesired reactions are:

$2CO$ ---------- $C + CO_2$

$CO + H_2$---------- $C + H_2O$

CH_4 ---------- $C + 2H_2$

CH_2n ---------- $C + nH_2$

Shift Conversion:

During the hydro-cracking of hydrocarbon, carbon monoxide is produced. Shift conversion of carbon monoxide from process stream accomplished two purposes

- increase the hydrogen production
- easier hydrogen purification

This reaction is carried out in High Temperature Shift Converter (R-103), Shift conversion is an exothermic reaction and contains Iron oxide as catalyst and catalyst activity decreases with time and usage, both inlet and outlet temperatures are slightly increase. The conditions are:

Inlet temperature $357\ ^0C$

Outlet temperature 436 ^{0}C

In the shift converter following reaction takes place

$CO + H_2O$---------- $CO_2 + H_2$ + Heat

The shift reaction in forward direction is favored by:

- lower temperature
- Excess steam

Condensate Separation:

To provide optimum inlet conditions (38 ^{0}C, Free of bulk water droplets) to the PSA system, the process gas cool and condensate. The condensate separation is largely effected in Trim Cooler (E-108) which directly drains to condensate separator (V-107). The finally condensate separation is achieve by passing cooled gas through V-107 vapor space and demister, the remaining heat is removed by de-aerator, boiler feed-water followed by cooling water in heat exchanger E-106, E-107 and E-108 respectively.

The cooling water system must never be blocked either it must be left open or when not in use.

Purification of Hydrogen (PSA):

Syngas contains impurities such as methane, carbon dioxide, carbon monoxide, nitrogen and water. To remove these impurities, Syngas passes through the bed of adsorbent material at a pressure of 16 bars and allows the pure hydrogen to pass through final pipeline. Hydrogen is

displaced from the bed during the adsorption phase. This is an unsteady state process. Each vessel contained an adsorbent bed comprising of four layers,

Layer	Material	Removed Impurities
Bottom Layer	Alumina	Water Vapors
Middle Layer	Activated Carbon	CO_2, CH_4
Uppermost Layer	Molecular Sieve	CO, N_2

4.2 Hydrogen Peroxide Production Plant:

This process is based on a circulating working solution, known as the autoxidation process for hydrogen peroxide production. The steps, which the working solution passes through, are:

- Hydrogenation
- Oxidation
- Extraction
- Drying
- Regeneration.

The working solution consists of:-

- 2-ethylanthraquinone
- Organic solvent (Solvesso 150)

- Tri-Octyl-Phosphate
- Tetra-Butyl-Urea

Hydrogenation:

Working solution and hydrogen are fed to a hydrogenator with the help of pump and in the presence of catalyst (Palladium), 2-ethyl-tetra-hydro-anthra-quinone (H_4EAQ or THEAQ) is partially converted to 2-ethyl-tetra-hydro-anthra-hydro-quinone (H_4EAQH_2 or $THEAQH_2$) (Reaction 1). The conversion ratio is primarily controlled by the amount and activity of the catalyst present in the system, temperature and hydrogen concentration. The working solution, excess hydrogen and catalyst discharge from the top of the hydrogenator.

The working solution and catalyst flow to primary filters. Here, the forward flow of liquid is separated from catalyst and passes on to an oxidizer feed tank while the remaining working solution and catalyst are returned to the hydrogenator through an eductor.

Oxidation:

The hydrogenated working solution is combined with air (oxygen) in an oxidizer. It is in this step of the process that hydrogen peroxide (H_2O_2) is actually produced. The H_4EAQH_2 in the working solution chemically reacts with oxygen from the air to produce H_4EAQ and H_2O_2 (Reaction 2). Hydrogen peroxide at this point is dissolved in the working solution and the only visible indication that reaction has taken place is a color change in the working solution. The hydrogenated solution is dark brown, during the oxidation the color changes and becomes reddish brown, then pass through secondary filters and oxidizes for the hydrogen peroxide.

Extraction:

Working solution from the oxidizer degasser is fed into the bottom and demineralized water into the top of an extractor. Water is the continuous and working solution the discontinuous phase. Due to the different densities of the two phases (organic being the lighter) the working solution flows upwards and discharges from the top of the extractor after being stripped of its hydrogen peroxide. The aqueous phase discharging from the bottom of the extractor contains up to 35 % hydrogen peroxide.

Dryer:

The working solution leaving the extractor is saturated with water. Free water is removed in a coalesce. The remaining dissolved water is removed by heating the working solution and flashing it under vacuum. The benefits with less water in the working solution are better catalyst efficiency and a lower operating temperature in the hydrogenator, resulting in less side reactions.

Regeneration:

Due to the circulating working solution, undesirable compounds (principally different quinones) can accumulate in the system. In order to keep the concentration of the undesirable compounds in the working solution to a low level, it is essential to convert these undesirable compounds into active quinones. This is carried out in columns with activated alumina, the process is known as regeneration.

Intermediate & Day Storage Tank:

After being extracted H_2O_2 from extractor, it has been stored in intermediate and day storage tanks which stabilize it and keep the concentration level after being through the concentration unit and gives the final hydrogen peroxide product of (35/50/60%) grade as per the market demands and needs.

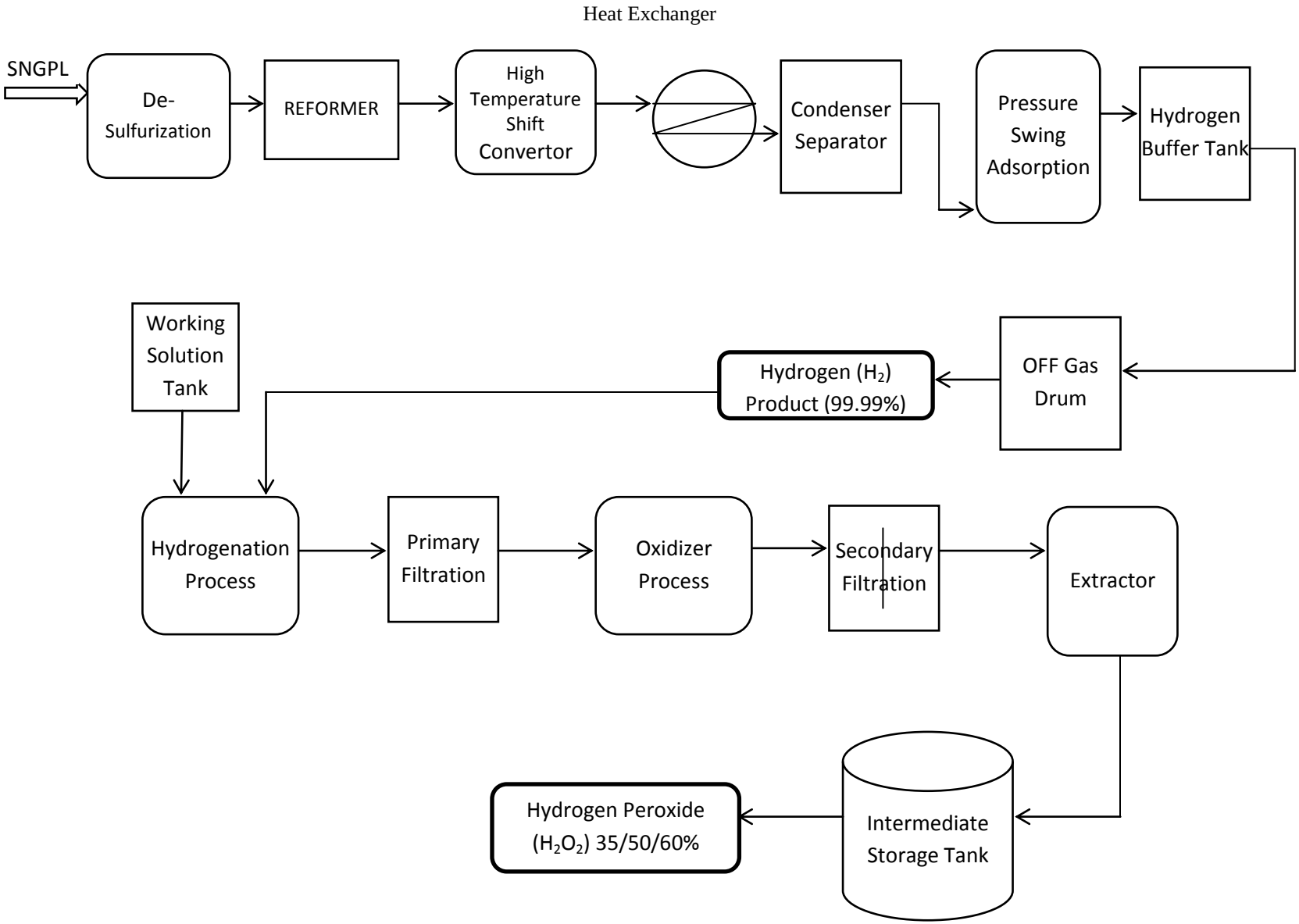

Fig. 2: Process of manufacturing Hydrogen peroxide

Chapter 5

RESULTS AND DISCUSSION

5.1. Standard Operating Procedures (SOPs):

"A Standard Operating Procedure (SOP) is a set of written instructions that document a routine or repetitive activity followed by an organization. The development and use of SOPs are an integral part of a successful quality system as it provides individuals with the information to perform a job properly, and facilitates consistency in the quality and integrity of a product or end-result (United States, 2001)".

5.2. Integrated Standard Operating Procedures Of Descon Oxychem Limited:

The Descon Oxychem limited has following standard operating procedures for the plant. These procedures are made according to the nature of the industry, yet they are not implemented and are under review by the top management. The integrated standard operating procedures are made according to the similarities of both the standards and their clauses.

Table.1: Correspondence between OHSAS 18001 and ISO 14001

OHSAS 18001:2007		**ISO 14001:2004**	
	OH&S management system		Environmental management

	elements (title only)		system requirements (title only)
4.1	General requirements	4.1	General requirements
4.2	**OH&S policy**	4.2	**Environmental policy**
4.3	**Planning (title only)**	4.3	**Planning (title only)**
4.3.1	Hazard identification, risk assessment and determining controls	4.3.1	Environmental aspects
4.3.2	Legal and other Requirements	4.3.2	Legal and other Requirements
4.3.3	Objectives and programme(s)	4.3.3	Objectives and programme(s)
4.4	**Implementation and operation (title only)**	4.4	**Implementation and operation (title only)**
4.4.1	Resources, roles, responsibility, accountability and authority	4.4.1	Resources, roles, responsibility and authority

4.4.2	Competence, training and awareness	4.4.2	Competence, training and awareness
4.4.3	Communication, participation and consultation	4.4.3	Communication
4.4.4	Documentation	4.4.4	Documentation
4.4.5	Control of documents	4.4.5	Control of documents
4.4.6	Operational control	4.4.6	Operational control
4.4.7	Emergency preparedness and response		Emergency preparedness and response
4.5	**Checking (title only)**	4.5	**Checking (title only)**
4.5.1	Performance measurement and monitoring	4.5.1	Monitoring and Measurement
4.5.2	Evaluation of compliance	4.5.2	Evaluation of compliance
4.5.3	Incident investigation, nonconformity, corrective action and preventive action (title only)	—	

4.5.3.1	Incident investigation	—	
4.5.3.2	Nonconformity, corrective and preventive action	4.5.3	Nonconformity, corrective and preventive action
4.5.4	Control of records	4.5.4	Control of records
4.5.5	Internal audit	4.5.5	Internal audit
4.6	**Management review**	4.5.6	**Management review**

Source: OHSAS-18001

5.2.1. Procedure for Hazard and Aspect Identification, Risk Assessment and Control:

The major aspects of the plant are wastewater, flue gases, noise level and solid waste. The quality, health, safety and environment (QHSE) department is responsible for identification of all the hazards and aspects related to the processes.

DOL have preparedstandard operating procedure and all the Hazard/Aspect Identification, Risk/Impact Assessment and Control checklists for all the areas of plant.These checklists are available to all the sections of plant. Incharge HSE is responsible to document the findings on the Hazard/Aspect Identification, Risk/Impact Assessment and Control (details in appendix 1).

Hazard Identification, Risk Assessment and Control:

Descon Oxychem planthas sub sections in which they have identified major hazards and determined its control measures. The main sub sections are hydrogen plant, hydrogen peroxide plant, ware house, jerry can production area, grid station, filling hall, CCR cable laying room and Substation cable lying room.

Following are the checklists of HIRAC of these sub sections:

Checklist 1: Hydrogen Peroxide Plant

Hydrogen Peroxide Plant			Risk Assessment by:			Verification by:	
Location: Hydrogen Peroxide Plant	Date: 06-08-2011	Sign:	Date			Date	
SECTION I: RISK ASSESSMENT						Signature	

Sr. No.	Identified Hazard	Likelihood Scale		Severity Scale		Risk Level (LC)
		Rating	Description	Description		
1	Fire water media should be reviewed to extinguish the fire in case of emergency at top of plant.	3	Possible	4	Major Damage	**3*4 = 12 Medium**
2	Working solution drops continuously from safety vent of S2063 that should be reviewed	3	Possible	2	Minor Damage	**3*2 = 6 Low**
3	Stacking of used filter and empty bag of Alumina Catalyst within plant premises can cause incident	4	Likely	4	Major Damage	**4*4 = 16 High**
4	un covered and damaged electrical cables inside the Open pit tank can cause incident	3	Possible	4	Major Damage	**3*4 = 12 Medium**
5	Support required for platform at Extractor man hole entry point from first to top floor	3	Possible	3	Major Health Effect or Injury	**3*3 = 9 Medium**
6	Oil leaks from Gear Box(B3221) and drops from 3rd floor to 2nd floor can cause tripping hazard	3	Possible	3	Major Health Effect or Injury	**3*3 = 9 Medium**
7	Main cable trays are uncovered and can be damaged by steam or by hot solution.	4	Likely	2	Minor Health Effect or Injury	**4*2 = 8 Medium**
8	PPE's are not being used properly as per standard requirement	3	Possible	2	Minor Health Effect or Injury	**3*2 = 6 Low**
9	Cable trays were installed in the center point of access at extractor on different floors that can cause tripping hazard	2	Unlikely	2	Minor Health Effect or Injury	**2*2 = 4 Low**
10	Caustic / Nitric and Solvent tanks are in bolted that can cause generate the fumes in open environment	2	Unlikely	1	Slight Effect	**2*1 = 2 Low**
11	Workers do not have proper access to attend the job at top of the tank (T2001).	4	Likely	3	Major Health Effect or Injury	**4*3 = 12 Medium**
12	Leakage of working solution from Vessels glass can cause harm to any person	4	Likely	3	Major Health Effect or Injury	**4*3 = 12 Medium**

Checklist 1: Hydrogen Peroxide Plant

SECTION 02: Guidelines for Risk Assessment

Likelihood Scale

Likelihood Level	Descriptor	Description	Indicative Frequency
5	Almost Certain	Will certainly occur in most of the circumstances	Once every six months
4	Likely	Will probably occur in most circumstances	Once a year
3	Possible	Might occur at some time	Once every three years
2	Unlikely	May occur in exceptional circumstances	Once every fifteen years
1	Highly Unlikely	Have never heard of such happening	Once every 100 years

Severity Scale

Severity Level	Description		
	People	Equipment	Environment
5	Multiple Fatalities	Extensive Damage	Massive Effect
4	Single Fatality	Major Damage	Major Effect
3	Major Health Effect/Injury	Localized Damage	Localized Effect
2	Minor Health Effect /Injury	Minor Damage	Minor Effect
1	Slight Health Effect /Injury	Slight Damage	Slight Effect

Risk Assessment Matrix

Severity	Consequences			Likelihood				
				1	2	3	4	5
	People	Equipment	Environment	Once Every 100 Years	Once Every Fifteen Years	Once Every Three Years	Once a Year	Once Every Six Months or More Frequently
1	Slight Health Effect or Injury	Slight Damage	Slight Effect	1	2	3	4	5
2	Minor Health Effect or Injury	Minor Damage	Minor Effect	2	4	6	8	10
3	Major Health Effect or Injury	Localized Damage	Localize d Effect	3	6	9	12	15
4	Single Fatality	Major Damage	Major Effect	4	8	12	16	20
5	Multiple Fatality	Extensive Damage	Massive Effect	5	10	15	20	25

Legend: 1~6 = Low Risk, 8~12 = Medium Risk, 15~25 = High Risk

Control Measures:

1	Installation of Sprinkler system needs to be reviewed
2	Concerned department should take the action and save the company asset and environment
3	Stacking of Combustible material should be avoided from peroxide plant area
4	cable tray at process building should be properly covered
5	It should be done in shutdown because HOT job can not be allowed in peroxide plant area
6	It should be done rectified
7	All cable trays should be covered properly
8	PPE's particularly Masks must be used in process building.
9	It should be removed from that point.
10	This should be properly bolted.
11	Proper access should be developed.
12	It should be certified by the concerned.

Checklist 2: Hydrogen Plant

Hydrogen Plant			Risk Assessment by:			Verification by:	
Location: Hydrogen Plant	**Date:04-08-2011**	**Sign:**	**Date**			**Date**	
SECTION I: RISK ASSESSMENT			**Likelihood Scale**		**Severity Scale**	**Signature**	
Sr. No.	**Identified Hazard**		**Rating**	**Description**	**Description**		**Risk Level (LC)**
1	No equipment is available to perform the Gas leakages test on regular basis		4	Likely	5 Extensive Damage		**4*5 = 20 High**
2	Boiler feed Water pump main supply cable was wrapped with polythene bag and tape that can cause short circuit		3	Possible	4 Major Damage		**3*4 = 12 Medium**
3	Improper cable supply from FD fan pool to chemical dosing pump can cause short circuit		3	Possible	4 Major Damage		**3*4 = 12 Medium**
4	un covered drain channels can cause tripping hazard		3	Possible	4 Major Damage		**3*4 = 12 Medium**

SECTION 02: Guidelines for Risk Assessment

Likelihood Scale

Likelihood Level	Descriptor	Description	Indicative Frequency
5	Almost Certain	Will certainly occur in most of the circumstances	Once every six months
4	Likely	Will probably occur in mostcircumstances	Once a year
3	Possible	Might occur at some time	Once every three years
2	Unlikely	May occur in exceptional circumstances	Once every fifteen years
1	Highly Unlikely	Have never heard of such happening	Once every 100 years

Severity Scale

Severity Level	Description		
	People	**Equipment**	**Environment**
5	Multiple Fatalities	Extensive Damage	Massive Effect
4	Single Fatality	Major Damage	Major Effect
3	Major Health Effect/Injury	Localized Damage	Localized Effect
2	Minor Health Effect /Injury	Minor Damage	Minor Effect
1	Slight Health Effect /Injury	Slight Damage	Slight Effect

Risk Assessment Matrix

Severity	Consequences			Likelihood				
				1	2	3	4	5
	People	**Equipment**	**Environment**	Once Every 100 Years	Once Every Fifteen Years	Once Every Three Years	Once a Year	Once Every Six Months or More Frequently
1	Slight Health Effect or Injury	Slight Damage	Slight Effect	1	2	3	4	5
2	Minor Health Effect or Injury	Minor Damage	Minor Effect	2	4	6	8	10
3	Major Health Effect or Injury	Localized Damage	Localized Effect	3	6	9	12	15
4	Single Fatality	Major Damage	Major Effect	4	8	12	16	20
5	Multiple Fatality	Extensive Damage	Massive Effect	5	10	15	20	25

Legend: 1~6 = Low Risk, 8~12 = Medium Risk, 15~25 = High Risk

	Checklist 2: Hydrogen Plant	
Control Measures:		
1	Gas Detection equipment should be made available	
2	Proper insulation on cables must be ensured	
3	Extension lead must be removed and proper supply should be used	
4	All drain channels should be properly covered	

Checklist 3: Ware house

Ware House			**Risk Assessment by:**			**Verification by:**	
Location: Ware house	**Date: 04-08-2011**	**Sign:**	**Date**			**Date**	
SECTION I: RISK ASSESSMENT						**Signature**	

Sr. No.	**Identified Hazard**	**Likelihood Scale**		**Severity Scale**		**Risk Level (LC)**
		Rating	**Description**	**Description**		
1	There were gas cylinder (combustible) placed in the ware house without any proper storage system. It may fall and can cause injury	4	Likely	5	Extensive Damage	**4*5 = 20 High**
2	Polyethylene particles were spread in the area can result in slippery of workers	3	Possible	4	Major Damage	**3*4 = 12 Medium**
3	A lot of dust coming from outside due to running of fork lifter	3	Possible	4	Major Damage	**3*4 = 12 Medium**
4	Risk of falling alumina bundle that are placed at the height of 13 inch	3	Possible	4	Major Damage	**3*4 = 12 Medium**

SECTION 02: Guidelines for Risk Assessment

Likelihood Scale

Likelihood Level	**Descriptor**	**Description**	**Indicative Frequency**
5	Almost Certain	Will certainly occur in most of the circumstances	Once every six months
4	Likely	Will probably occur in most circumstances	Once a year
3	Possible	Might occur at some time	Once every three years
2	Unlikely	May occur in exceptional circumstances	Once every fifteen years
1	Highly Unlikely	Have never heard of such happening	Once every 100 years

Severity Scale

Severity Level	**Description**		
	People	**Equipment**	**Environment**
5	Multiple Fatalities	Extensive Damage	Massive Effect
4	Single Fatality	Major Damage	Major Effect
3	Major Health Effect/Injury	Localized Damage	Localized Effect
2	Minor Health Effect /Injury	Minor Damage	Minor Effect
1	Slight Health Effect /Injury	Slight Damage	Slight Effect

Risk Assessment Matrix

Severity	**Consequences**			**Likelihood**				
				1	2	3	4	5
	People	**Equipment**	**Environment**	Once Every 100 Years	Once Every Fifteen Years	Once Every Three Years	Once a Year	Once Every Six Months or More Frequently
1	Slight Health Effect or Injury	Slight Damage	Slight Effect	1	2	3	4	5
2	Minor Health Effect or Injury	Minor Damage	Minor Effect	2	4	6	8	10
3	Major Health Effect or Injury	Localized Damage	Localized Effect	3	6	9	12	15
4	Single Fatality	Major Damage	Major Effect	4	8	12	16	20
5	Multiple Fatality	Extensive Damage	Massive Effect	5	10	15	20	25

Legend: 1~6 = Low Risk, 8~12 = Medium Risk, 15~25 = High Risk

Control Measures:	
1	Gas cylinders should always be securely restrained to prevent them falling over
2	After loading of polyethylene bags the area should be cleaned immediately
3	Sprinkling of water time by time can reduce the dust
4	The overlying of alumina bundle should be avoided

Checklist 4: Jerry Can Production Area

Jerry Can Production Area			**Risk Assessment by:**			**Verification by:**	
Location:Jerry Can Production Area	**Date: 05-08-2011**	**Sign:**	**Date**			**Date**	
SECTION I: RISK ASSESSMENT			**Likelihood Scale**		**Severity Scale**	**Signature**	
Sr. No.	**Identified Hazard**		**Rating**	**Description**	**Description**		**Risk Level (LC)**
1	Damaged/Non-useable Cans cutting machine without safeguard can cause injury		4	Likely	3 Major Health Effect or Injury		**4*3 = 12 Medium**
2	Oil leakage from machines can cause slipping hazard and availability of electric cables can cause big fire due to short circuit		4	Likely	4 Major Damage		**4*4 = 16 High**
3	Tangled and loose joint cables found in the whole area		4	Likely	4 Major Damage		**4*4 = 16 High**
4	open drain channels and channels covered with cemented slabs can cause tripping hazard		3	Possible	2 Minor Health Effect or Injury		**3*2 = 6 Low**
5	Improper use of PPE's		2	Unlikely	1 Slight Health Effect or Injury		**2*1 = 2 Low**

SECTION 02: Guidelines for Risk Assessment

Likelihood Scale

Likelihood Level	Descriptor	Description	Indicative Frequency
5	Almost Certain	Will certainly occur in most of the circumstances	Once every six months
4	Likely	Will probably occur in most Circumstances	Once a year
3	Possible	Might occur at some time	Once every three years
2	Unlikely	May occur in exceptional circumstances	Once every fifteen years
1	Highly Unlikely	Have never heard of such happening	Once every 100 years

Severity Scale

Severity Level	Description		
	People	**Equipment**	**Environment**
5	Multiple Fatalities	Extensive Damage	Massive Effect
4	Single Fatality	Major Damage	Major Effect
3	Major Health Effect/Injury	Localized Damage	Localized Effect
2	Minor Health Effect /Injury	Minor Damage	Minor Effect

Risk Assessment Matrix

Severity	Consequences			Likelihood				
				1	2	3	4	5
	People	**Equipment**	**Environment**	Once Every 100 Years	Once Every Fifteen Years	Once Every Three Years	Once a Year	Once Every Six Months or More Frequently
1	Slight Health Effect or Injury	Slight Damage	Slight Effect	1	2	3	4	5
2	Minor Health Effect or Injury	Minor Damage	Minor Effect	2	4	6	8	10
3	Major Health Effect or Injury	Localized Damage	Localized Effect	3	6	9	12	15

	1	Slight Health Effect /Injury	Slight Damage	Slight Effect	4	Single Fatality	Major Damage	Major Effect	4	8	12	16	20
					5	Multiple Fatality	Extensive Damage	Massive Effect	5	10	15	20	25
						Legend:	**1~6=Low**	**Risk, 8~12 = Medium Risk, 15~25 = High Risk**					

Control Measure:

1	Safeguards should be installed on cutting machine and operator must wear appropriate PPE's
2	Oil leakage should be rectified and proper cables management should be reviewed
3	Cable Management should be reviewed to rectify all the issues.
4	open drain channels and channels covered with cemented slabs should be rectified
5	Proper use of PPEs should be ensured

Checklist 5: Grid Station

Grid Station			**Risk Assessment by:**		**Verification by:**		
Location: Grid Station	**Date: 03-08-2011**	**Sign:**	**Date**			**Date**	
SECTION I: RISK ASSESSMENT			**Likelihood Scale**		**Severity Scale**	**Signature**	

Sr. No.	Identified Hazard	Likelihood Scale Rating	Likelihood Scale Description	Severity Scale	Severity Scale Description	Risk Level (LC)
1	Deep excavation for septic tank which is about 8 feet deep outside the grid station is covered with wooden sheet.	3	Possible		4 Major Damage	**3*4 = 12 Medium**
2	Live Transformer is not protected by some boundary or barricading that can cause incident.	3	Almost Certain		5 Multiple Fatality	**3*5 = 15 High**
3	Poor Housekeeping inside and out side the grid station	2	Unlikely	1	Slight Health Effect or Injury	**2*1 = 3 Low**
4	Long grass can become cause of fire.	3	Possible		4 Major Damage	**4*3 = 12 Medium**

SECTION 02: Guidelines for Risk Assessment

Likelihood Scale

Likelihood Level	Descriptor	Description	Indicative Frequency
5	Almost Certain	Will certainly occur in most of the circumstances	Once every six months
4	Likely	Will probably occur in mostcircumstances	Once a year
3	Possible	Might occur at some time	Once every three years
2	Unlikely	May occur in exceptional circumstances	Once every fifteen years
1	Highly Unlikely	Have never heard of such happening	Once every 100 years

Severity Scale

Severity Level	Description: People	Description: Equipment	Description: Environment
5	Multiple Fatalities	Extensive Damage	Massive Effect
4	Single Fatality	Major Damage	Major Effect
3	Major Health Effect/Injury	Localized Damage	Localized Effect
2	Minor Health Effect /Injury	Minor Damage	Minor Effect

Risk Assessment Matrix

Severity	Consequences: People	Consequences: Equipment	Consequences: Environment	Likelihood 1	2	3	4	5
				Once Every 100 Years	Once Every Fifteen Years	Once Every Three Years	Once a Year	Once Every Six Months or More Frequently
1	Slight Health Effect or Injury	Slight Damage	Slight Effect	1	2	3	4	5
2	Minor Health Effect or Injury	Minor Damage	Minor Effect	2	4	6	8	10
3	Major Health Effect or Injury	Localized Damage	Localized Effect	3	6	9	12	15

	1	Slight Health Effect /Injury	Slight Damage	Slight Effect	4	Single Fatality	Major Damage	Major Effect	4	8	12	16	20
					5	Multiple Fatality	Extensive Damage	Massive Effect	5	10	15	20	25
					Legend: 1~6 = Low Risk, 8~12 = Medium Risk, 15~25 = High Risk								

	Checklist 5: Grid Station	

Control Measures:

1	It should be covered with Cement slab
2	There should be some barrication around Transformer
3	Plan for housekeeping should be developed and monitored
4	Grass cutting should be done on periodic basis

Checklist 6: Filling hall

Filling hall			**Risk Assessment by:**			**Verification by:**		
Location: Filling hall	**Date: 02-08-2011**	**Sign:**	**Date**			**Date**		
SECTION I: RISK ASSESSMENT			**Likelihood Scale**		**Severity Scale**		**Signature**	
Sr. No.	**Identified Hazard**		**Rating**	**Description**	**Description**		**Risk Level (LC)**	
1	Sudden overflow of final product during auto filling of cans by machine.		4	Likely	4	Major Damaged	**4*4 = 16 High**	
2	Improper handling of Filled Cans		3	Possibly	3	Localized Damage	**3*3 = 9 Medium**	
3	Improper Ventilation in filling hall		2	Unlikely	2	Minor Health Effect or Injury	**2*2 = 4 Low**	
4	During filling of Bulk tanker, entrance of sand or iron particles from man hole can cause explosion		4	Possibly	4	Major Damage	**4*4 = 16 High**	
5	Inappropriate Housekeeping		2	Unlikely	2	Minor Health Effect or Injury	**2*2 = 4 Low**	
6	Improper / Insufficient lighting		3	Possibly	2	Minor Health Effect or Injury	**2*3 = 5 Low**	
7	Filled cans stacked in open environment		4	Likely	4	Major Effect	**4*4 = 16 High**	
8	Emission of H2O2 Fumes		3	Possibly	3	Minor Effect	**3*3 = 9 Medium**	

SECTION 02: Guidelines for Risk Assessment

Likelihood Scale				**Severity Scale**				**Risk Assessment Matrix**								
Likelihood Level	**Descriptor**	**Description**	**Indicative Frequency**	**Severity Level**	**Description**			**Severity**	**Consequences**			**Likelihood**				
					People	**Equipment**	**Environment**					1	2	3	4	5
5	Almost Certain	Will certainly occur in most of the circumstance	Once every six months	5	Multiple Fatalities	Extensive Damage	Massive Effect		**People**	**Equipment**	**Environment**	Once Every 100 Years	Once Every Fifteen Years	Once Every Three Years	Once a Year	Once Every Six Months or More Frequently
4	Likely	Will probably occur in most Circumstance	Once a year	4	Single Fatality	Major Damage	Major Effect	1	Slight Health Effect or Injury	Slight Damage	Slight Effect	1	2	3	4	5
3	Possible	Might occur at some time	Once every three years	3	Major	Localized	Localized	2	Minor	Minor	Minor Effect	2	4	6	8	10
2	Unlikely	May occur in	Once every													

		exceptional circumstance	fifteen years		Health Effect/Injury	Damage	Effect		Health Effect or Injury	Damage						
1	Highly Unlikely	Have never heard of such happening	Once every 100 years	2	Minor Health Effect /Injury	Minor Damage	Minor Effect	3	Major Health Effect or Injury	Localized Damage	Localized Effect	3	6	9	12	15
				1	Slight Health Effect /Injury	Slight Damage	Slight Effect	4	Single Fatality	Major Damage	Major Effect	4	8	12	16	20
								5	Multiple Fatality	Extensive Damage	Massive Effect	5	10	15	20	25
										Legend: 1~6 = Low Risk, 8~12 = Medium Risk, 15~25 = High Risk						

	Checklist 6: Filling hall	

Control Measures:	
1	Inspection and/or calibration system of machines must be reviewed on regular basis and appropriate PPEs should be used by the workers
2	Filled cans must be handled carefully and properly
3	Industrial exhaust fans should be installed at different places to avoid suffocation inside the filling station
4	Concerned personnel performing the jobs must have regular training in this regard
5	Proper Housekeeping plan should be established covering different areas.
6	Sufficient lighting arrangements should be reviewed
7	There must be shade for the filled can stacking out side the station
8	Safety masks must be strictly used to avoid inhalation of fumes

Checklist 7: CCR Cable Laying Room

CCR Cable Laying Room			**Risk Assessment by:**		**Verification by:**			
Location: CCR Cable Laying Room	**Date: 01-08-2011**	**Sign:**	**Date**			**Date**		
SECTION I: RISK ASSESSMENT			**Likelihood Scale**		**Severity Scale**		**Signature**	
Sr. No.	**Identified Hazard**		**Rating**	**Description**	**Description**		**Risk Level (LC)**	
1	Poor housekeeping can become source of fire in CCR cable laying room.		4	Likely	4	Major Damage	**4*4=16 High**	
2	There was no open access in case of any emergency as main door remain locked all the time		4	Likely	4	Major Damage	**4*4=16 High**	
3	Tangled wires in cable laying room can become short circuit		4	Likely	4	Major Damage	**4*4=16 High**	
4	No access was found in the corners of cable lying room to control any emergency situation		4	Likely	4	Major Damage	**4*4=16 High**	

SECTION 02: Guidelines for Risk Assessment

Likelihood Scale

Likelihood Level	Descriptor	Description	Indicative Frequency
5	Almost Certain	Will certainly occur in most of the circumstance	Once every six months
4	Likely	Will probably occur in most Circumstance	Once a year
3	Possible	Might occur at some time	Once every three years
2	Unlikely	May occur in exceptional circumstance	Once every fifteen years
1	Highly Unlikely	Have never heard of such happening	Once every 100 years

Severity Scale

Severity Level	Description		
	People	Equipment	Environment
5	Multiple Fatalities	Extensive Damage	Massive Effect
4	Single Fatality	Major Damage	Major Effect
3	Major Health Effect/Injury	Localized Damage	Localized Effect
2	Minor Health Effect /Injury	Minor Damage	Minor Effect
1	Slight Health Effect /Injury	Slight Damage	Slight Effect

Risk Assessment Matrix

Severity	Consequences			Likelihood				
				1	2	3	4	5
	People	Equipment	Environment	Once Every 100 Years	Once Every Fifteen Years	Once Every Three Years	Once a Year	Once Every Six Months or More Frequently
1	Slight Health Effect or Injury	Slight Damage	Slight Effect	1	2	3	4	5
2	Minor Health Effect or Injury	Minor Damage	Minor Effect	2	4	6	8	10
3	Major Health Effect or Injury	Localized Damage	Localized Effect	3	6	9	12	15
4	Single Fatality	Major Damage	Major Effect	4	8	12	16	20
5	Multiple Fatality	Extensive Damage	Massive Effect	5	10	15	20	25

Legend: 1~6 = Low Risk, 8~12 = Medium Risk, 15~25 = High Risk

	Checklist 7: CCR Cable Laying Room	

Control Measures:

1	Housekeeping plan should be developed and monitored on regular basis
2	Door should be kept open for taking action in case of emergency
3	Ducting of electrical cables should be reviewed to avoid any hazard related to electrical short circuiting
4	CO2 auto focusing system need to be installed because there is no proper access for fire fighting

	Checklist 8: Sub Station Cable Laying Room	

Sub Station Cable Laying Room			**Risk Assessment by:**		**Verification by:**		
Location: Sub Station Cable Laying Room	**Date: 01-08-2011**	**Sign:**	**Date**			**Date**	
SECTION I: RISK ASSESSMENT			**Likelihood Scale**		**Severity Scale**	**Signature**	

Sr. No.	**Identified Hazard**	**Likelihood Scale**		**Severity Scale**		**Risk Level (LC)**
		Rating	**Description**	**Description**		
1	Non available of emergency exit	3	Possible	3	Major Health effect or injury	**3*3 = 9 Medium**
2	Poor housekeeping can become source of fire in cable laying room	3	Possible	4	Major Damage	**3*4 = 12 Medium**
3	Electrical work shop were observed in cable laying room	2	Unlikely	1	Slight Damage	**2*1 = 2 Low**
4	Tangle cabling between stairs and Diesel Generator can cause tripping hazard and major short circuit of fire	3	Possible	4	Major Damage	**3*4 = 12 Medium**
5	main door was found locked	3	Possible	4	Major Damage	**3*4 = 12 Medium**
6	There was no access for firefighting at the corners of hall	4	Likely	4	Major Damage	**4*4 = 16 High**

SECTION 02: Guidelines for Risk Assessment

Likelihood Scale

Likelihood Level	Descriptor	Description	Indicative Frequency
5	Almost Certain	Will certainly occur in most of the circumstance	Once every six months
4	Likely	Will probably occur in most circumstances	Once a year
3	Possible	Might occur at some time	Once every three years
2	Unlikely	May occur in exceptional circumstances	Once every fifteen years
1	Highly Unlikely	Have never heard of such happening	Once every 100 years

Severity Scale

Severity Level	Description		
	People	**Equipment**	**Environment**
5	Multiple Fatalities	Extensive Damage	Massive Effect
4	Single Fatality	Major Damage	Major Effect
3	Major Health Effect/Injury	Localized Damage	Localized Effect
2	Minor Health Effect /Injury	Minor Damage	Minor Effect
1	Slight Health Effect /Injury	Slight Damage	Slight Effect

Risk Assessment Matrix

Severity	Consequences			Likelihood				
				1	2	3	4	5
	People	**Equipment**	**Environment**	Once Every 100 Years	Once Every Fifteen Years	Once Every Three Years	Once a Year	Once Every Six Months or More Frequently
1	Slight Health Effect or Injury	Slight Damage	Slight Effect	1	2	3	4	5
2	Minor Health Effect or Injury	Minor Damage	Minor Effect	2	4	6	8	10
3	Major Health Effect or Injury	Localized Damage	Localized Effect	3	6	9	12	15
4	Single Fatality	Major Damage	Major Effect	4	8	12	16	20
5	Multiple Fatality	Extensive Damage	Massive Effect	5	10	15	20	25

Legend: 1~6 = Low Risk, 8~12 = Medium Risk, 15~25 = High Risk

Control Measure:

1	Emergency exit should be available for Emergency Responses

	Checklist 8: Sub Station Cable Laying Room	
2	House keeping should be done in coordination with admin department	
3	Work shop should be shifted to other place	
4	Proper cable management should be done	
5	Door should be kept open for taking action in case of emergency	
6	CO2 auto focusing system needs to be installed because there is no proper access for fire fighting	

Environmental Aspects:

The main Environmental aspects are noise level, wastewater, air emissions and solid waste.

Wastewater

Waste water was observed at several points on plant. Wastewater treatment plant is present but not in running position. Now Descon Oxychem is working on improving the condition of wastewater treatment plant.

Air emissions:

Air emissions are released during the process. At plant, filters are used to control the air emissions that removed the hazardous elements from the air. However there is a need to further improve the quality of the emissions.

Solid waste:

Solid waste at DOL plant is usually comprised of chemical drums, filters and paper waste. Jerry can containers are recycled at plant but the other chemical drums are disposed in an area adjacent to the ware house. DOL management is now planning for transaction of this waste to other companies for recycling.

Noise Level

Noise was monitored during regular operation. The word noise is often used to mean unpleasant sound that the listener does not want to hear. Noise interferes with the perception of wanted sound and is likely to be physiologically harmful.

Table 2: Environmental Aspects at Descon Oxychem Limited

Sr. No.	Category	Description of Aspects
1	**Air Emissions**	Chemical fumes from hydrogen peroxide plant
		Exhaust gases from hydrogenation reactor
		Particulate Matter from incinerator
		Diffuse gases from leakages
2	**Liquid Effluents**	Wastewater from regeneration system
		Wastewater fromdrier
		Wastewater from filter cleaning
		Wastewater from incinerators
		Sewage from Wash Rooms
		Wastewater from Boilers
		Used Lube Oil from generators
3	**Solid Waste**	Solid waste of Paper
		Solid waste of chemical drums
		Solid waste of used filters
		Incineration ashes
4	**Noise**	Noise from Nitrogen plant
		Noise from storage tank near hydrogen peroxide plant
		Noise from jerry can production area
		Noise from generators
		Noise from dispatch and loading area

5.2.2. Procedure for Legal and other requirements:

Descon Oxychem Limited (DOL) is currently following the legal requirement like NEQS, factory act 1934, Pakistan Nuclear Regulatory Authority, where other requirement includes industrial laws e.g. Punjab industrial Act (PEPA, 1997) according to their requirement (details in appendix 1).

5.2.3. Procedure for Competence, training and awareness:

At plant manager QHSE is conducting all the training for all the employees' e.g. emergency response trainings, firefighting trainings etc. Some trainings are generalized and some are specific and professional. All the trainings are approved by the CEO of Descon group of companies (details in appendix 1).

Trainings on Emergency Drills on DOL plant:

There were trainings conducted by QHSE manager at Descon Oxychem in each department to give them training how to protect personnel from fire and other emergencies and to prevent property loss, whether large or small.

1. First demonstration of emergency drill:

The description of first emergency drill is given below

Location, date & time:

Location: Admin Building / Time Office and Security Building

Time: 1215

Dated: 29-08-201

Head counting:

Total number of personnel's head counting was provided by DOL Admin department.

Number of persons: 2

Details of demonstration of emergency drill:

Roles and Responsibilities:

QHSE Team:

- At exactly 1215 the emergency alarm was activated in time office and admin block
- The total time taken by Incharge of QHSE to reach the yellow muster point was 43 sec.

First Aid Team:

- First aid team reached at yellow muster point in 45 sec

Fire Fighter Team:

- Fire Fighting Teams reached at site in around 45 sec

Rescue Team:

- One of the members of rescue team reached at yellow muster point in 47 sec.
- The other member with SCBA took 3 min and 4 sec to reach at muster point.

- Rescue team searched the whole admin block in 2 min and 5 sec.

- From admin block to time office the total search time taken by the rescue team was 3 min and 49 sec

- The rescue team after searching the time office reached at site in 53 sec.

Maintenance Team:

- Maintenance team reached at yellow muster point in 1 min 55 sec.

Reactions of the persons involved:

Staff was instructed to evacuate the buildings and reach the muster point as quickly as possible when alarm was raised in buildings. But there was a slow response by the staff members. Many staff members were non serious.

Observations:

- The last worker reached at the muster point in around 4 min and 2 sec.

- Total time of whole emergency drill was 9 min and 48 sec.

Conclusion:

Overall it was a good effort done by all the staff members. The quick response of first aid team and firefighting team was really appreciable. Good effort was done by the QHSE manager and HSE Incharge in conducting the emergency drill at DOL plant for the first time.

FIRST DEMONSTRATION OF EMERGENCY DRILL

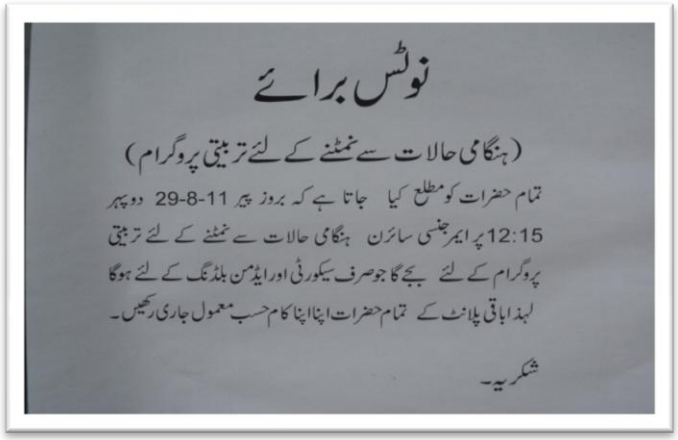

Fig. 3: Notice posted on notice board to remind the participants about drill

Fig. 4: Employees rushing towards muster point from their cabins after buzzing of the alarm

Fig. 5: The man with SCBA is rushing towards the muster point

Fig. 6: The persons coming out of their offices after the ringing of the alarm

Fig. 7: All the employees are assembled at muster point location

Fig. 8: All participants are being briefed about drill by QHSE Manager

2. Second demonstration of emergency drill:

The description of second emergency drill is given below

Summary:

1. 2nd emergency drill was conducted at plant on 12thSep'2011.

2. The drill was conducted for Technical Lab, Jerry Can Manufacturing, Engineering workshop and Warehouse areas.

3. Total 24 personnel participated in the drill including 2 visitors of Warehouse.

4. All participants were briefed about the practical operations of Fire Fighting equipment.

5. Self-Contained Breathing apparatus (SCBA) and First Aid Boxes were also practically used.

6. The drill was designed:

a) to provide participants with experience in their roles during real emergency situation (God Forbid),
b) to increase the confidence of participants
c) to identify weakness in our emergency response planning

Planning before drill:

1. Comprehensive training sessions were conducted for all personnel and they were briefed about the emergency alarms, emergency exits, Assembly points, safe routes etc.

2. Prior information was given to all other departments so that they stay in their departments during this drill.

Progress of drill:

1. All personnel evacuated from the different buildings after the siren and emergency alarms.

2. Response times of different areas were noted on the emergency response checklist.

3. A brief session was conducted by QHSE team after the drill to discuss the different areas of improvement identified during this activity.

Required corrective actions:

Some areas of improvement were also identified during the whole activity that was noted down in detail on Emergency evacuation check sheet and it would be rectified in coordination with concerned functions.

SECOND DEMONSTRATION OF EMERGENCY DRILL

Fig. 9: Manager QHSE is giving briefing about emergency drill

Fig. 10: Fire water pumpbeing checked during emergency drill

Fig. 11: Incharge HSE is explaining the use of fire water pump in case of emergency

3. Third and fourth demonstration of emergency drill:

Summary:

1. 3rd & 4th emergency drills were conducted at DOL plant on 6th & 10th Oct'2011 respectively.

2. The drills were conducted for Filling Hall including loading labor, Grid Station, CCR office hall, substation, DCS, Boiler, Hydrogen, Peroxide, and UTY area.

3. Total 65 personnel participated in the drills including drivers for dispatch vehicles.

4. Self-Contained Breathing apparatus (SCBA) and First Aid Boxes were also practically used.

5. The drills were designed

a) to provide participants with experience in their roles during an emergency situation
b) to increase the confidence of participants
c) to identify weakness in our emergency response planning

Progress of Drills

1. All personnel evacuated from the different areasafter the siren and emergency alarms.

2. Response times of different areas were noted onthe emergency response checklist.

3. A brief session was conducted by QHSE teamafter the drill to discuss the different areas ofimprovement identified during this activity.

Required Corrective Actions:

Some areas of improvement were also identifiedduring the whole activity that was noted down indetail on Emergency evacuation check sheets and itwould be rectified in coordination with concernedfunctions.

Future Plan:

Next announced drill would be held for the whole planand subsequently un-announced drills would be heldfrom time to time to check the actual response time ofpersonnel at different areas.

Fig. 12: The employees are running towards muster point during emergency drill

Fig. 13: Manager QHSE is giving updates about emergency drill

Fig. 14: All participants assembled at muster point location

Table. 3: Training Record Summary Sheet of Descon Oxychem Limited			
Sr#	**Number of Participant**	**Time Duration in (minutes)**	**Subject**
1	32	60	Plant Induction
2	43	60	Plant Induction
3	23	60	Plant Induction
4	52	60	Fire Safety
5	41	60	Fire Safety
6	28	30	Dehydration
7	13	480	5s
8	51	60	Fire Safety
9	44	60	Fire Safety
10	28	480	Understanding Of QHSE Practices
11	42	90	Plant induction and Over View briefing of HSE practices
12	4	30	Plant induction and Over View briefing of HSE practices
13	6	30	Plant induction and Over View briefing of HSE practices
14	9	45	Emergency Response Plan And Responsibilities
15	3	30	Plant induction and Over View briefing of HSE practices
16	16	45	Emergency Response Plan And Responsibilities
17	3	30	Emergency Response Plan And Responsibilities
18	5	30	Emergency Response Plan And Responsibilities
19	1	20	Plant induction and Over View briefing of HSE practices
20	5	45	Defensive Driving
21	23	90	Plant induction and Over View briefing of HSE practices
22	18	480	Internal Auditer ISO 9011-2008
23	18	480	Internal Auditer ISO 9011-2008
24	15	480	Internal Auditer ISO 9011-2008
25	15	480	Internal Auditer ISO 9011-2008
26	1	20	Plant induction and Over View briefing of HSE practices
27	21	90	Plant induction and Over View briefing of HSE practices
28	25	45	Emergency Drill Awareness Session
29	9	45	Emergency Drill Awareness Session
30	7	45	Emergency Drill Awareness Session
31	9	45	Emergency Drill Awareness Session

32	4	30	Emergency Response and Plant Induction
33	21	60	Emergency Drill Awareness Session
34	7	30	Emergency Response Plan
35	144	40	Dengue Virus Control Compgain (Drops also be provide to All)
36	10	20	Dengue Virus Control Compgain (Drops also be provide to All)
37	15	45	Emergency Drill Planning and Fire Control
38	3	30	Plant induction
39	15	60	Emergency Drill Planning and Fire Control
40	9	60	Emergency Drill Planning and Fire Control
41	19	60	Emergency Drill Planning and Fire Control
42	19	60	Emergency Drill Planning and Fire Control
43	13	60	Emergency Drill Planning and Fire Control
44	22	60	Emergency Drill Planning and Fire Control
45	6	60	Emergency Drill Planning and Fire Control
46	22	60	Emergency Drill Planning and Fire Control
47	4	60	Emergency Drill Planning and Fire Control
48	6	60	Emergency Drill Planning and Fire Control
49	17	90	Plant induction and Over View briefing of HSE practices
50	17	90	Plant induction and Over View briefing of HSE practices
51	13	60	Defensive Driving
52	13	60	Hazard Aspect Identification-Risk Impact Assessment Control.
53	13	30	Fire Demonstration Drill
54	22	30	Fire Demonstration Drill
55	3	30	Plant induction
56	1	30	Plant induction
57	41	240	And
58	35	240	Scenario Based Wet Drills
59	6	60	Plant induction and Over View briefing of HSE practices
60	2	30	Plant induction
61	16	60	Emergency Drill Planning and Fire Control
62	9	60	Emergency Drill Planning and Fire Control
63	6	60	Emergency Drill Planning and Fire Control

64	8	15	HSE TBT (work place safety) during shut down May 2012
65	8	20	HSE TBT (housekeeping) during shut down May 2012
66	2	15	HSE TBT (Safe Loading) during shut down May 2012
67	4	15	HSE TBT (work at height) during shut down May 2012
68	2	15	HSE TBT (Safe Loading) during shut down May 2012
69	6	15	HSE TBT (electric safety) during shut down May 2012
Subject			
Dehydration			
Fire Safety			
5s Training			
Internal Auditor ISO 9011-2008			
Understanding Of QHSE Practices			
Defensive Driving			
Emergency Drill Awareness Session			
Dengue Virus Control Campaign			
Emergency Drill Planning and Fire Control			
Emergency Response and Plant Induction			
Emergency Response Plan			
Emergency Response Plan And Responsibilities			
Plant induction			
Fire Demonstration Drill Drill			
Plant induction and Over View briefing of HSE practices			

5.2.4. Procedure for Communication, participation and consultation:

At plant the internal communication is carried out through emails, notices, by mobile phones and fax etc. And the external communication outside the plant with stakeholders,contractors, subcontractors and suppliers are done through fax, emails, formal letters and sometimes on telephone (details in appendix 1).

5.2.5. Procedure for Operational control:

Operational control is applicable to all activities, products and services carried out/produced/offered by any department/section/office for controlling their operations and activities that are associated with significant health, safety and environmental hazards/aspects of Descon Oxychem Limited (details in appendix 1).

5.2.6. Procedure forEmergency preparedness and response:

In case of emergency at Descon Oxychem there are four teams to combat with the emergency, the firefighting team, rescue team, first aid team and maintenance team. They get the training as how to work in case of emergency and know their responsibilities during any accident. Manager QHSE is conducting all the trainings and is responsible for this procedure(details in appendix 1). At DOL plant for gases like nitrogen and oxygen and the hydrogen peroxidethere is a proper firefighting media and alarm system.

Description of Fire Fighting Media

The purpose of Emergency preparedness and Response Plan is to develop a structured document specifying hydrogen peroxide plant and sequence of actions for effective response in case of an

emergency to prevent/minimize human injury, damage to company assets and environmental degradation.

Descon Oxychem has different types of fire media such as Fire Detection systems, Manual break glass system, Fire Extinguishers, Fire Hydrants, Monitors and Foam Monitor etc.

Fire Detection System (Smoke detectors) and manual Break Glass System is installed in all the buildings and plant area.

Main control panel is installed in Control Room with four zone classification which will detect the specific zone in case of fire.

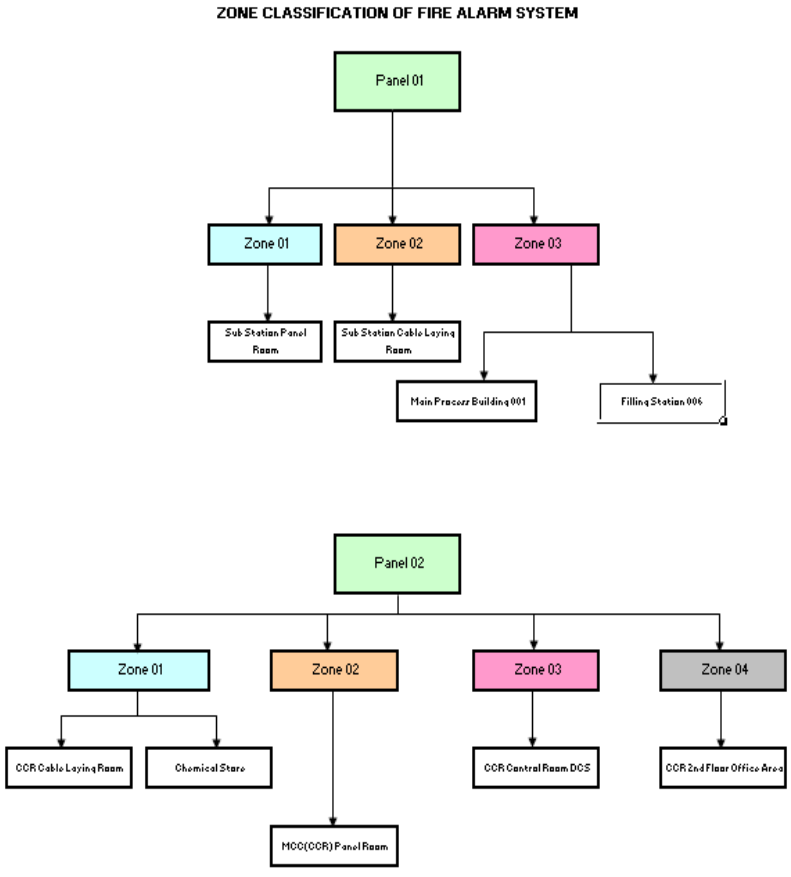

Fig. 15: Zone Classification of Fire Alarm System

Performing Procedure of Fire Water Pump:

Descon Oxychem has a raw water tank having working capacity of 1753m^3 which is the main source of water supply by the help of different hydrants and monitors in case of fire.

The whole procedure of fire water pump is that jockey pump will maintain the pressure of up to 5 bar all the time in the fire water line of plant and whenever we need to use any fire gun the pressure will be dropped at 4 bar, main fire water pump will be started automatically and will maintain the pressure of 7 bar in the fire water line.

Furthermore if power failure occurs in case of fire emergency we do have backup system of Diesel Engine which will be operated manually and will be a great resource to kill the fire in any case.

The specs of Fire Water Pumps and Diesel Engine are as follows:

Main Electric Fire Pump – 340m^3/Hr. at 81.8m (Flooded suction):

Model HGT1-150-315/132kW Horizontal Split Case centrifugal pump set. Cast iron casing fitted with bronze impeller steel shaft and soft packed sealinggland.

Suction 200mm, discharge 150mm both fitted with ANSI adaptors. Pump fitted with auto air vent. Long Coupled through flexible coupling to a 132kW 2980 rpm IP55 TEFV motor arranged for a 380v/50hz/3ph AC supply. All mounted on fabricated steel base plate with necessary guards.

Main Diesel Fire Pump – 340m³/Hr. at 81.8m (Flooded suction):

Model HGT1-150-315/JU6H-UF54 Horizontal Split Case centrifugal pump set. Cast iron casing fitted with bronze impeller, steel shaft and soft packed sealing gland.

Suction 200mm, discharge 150mm both fitted with ANSI adaptors. Pump fitted with auto air vent. Long coupled through flexible coupling to a Clarke JU6H-UF54 heat exchanger cooled 24 volt electric start diesel engine developing 161kW at 2960rpm. All mounted on common base plate incorporated with 6 hour running capacity fuel tank.

Accessories

NFPA 20 engine controller in NEMA 4 enclosure with twin 12 volt battery charger thermostatically controlled anti-condensation heater.

Single wall construction wall mounting fuel tank, with air vent, set of fuel lines and fuel tank level indicator.

Jockey Pump

Model RPV18-7/7.5kW Vertical Multi-stage electric driven pump set.Pump casing, impellers, diffusers and shaft of stainless steel construction fitted with mechanical seal.

Suction and discharge branches flanged DN50. Close coupled to a 7.5kW IP55 Class F insulation electric motor suitable for a 380v-50hz-3ph AC supply. More over different types of fire extinguishers are being used by Oxychem like:

- AFFF Aqua Film Forming Foam

- CO_2 Carbon Dioxide
- DCP Dry Chemical Powder

Guard Room Building

1. (FAS) Fire Alarm System (Manual call point with Smoke detector)

2. 02 No's of DCP Fire Extinguishers with 0_2 sand bucket at main entrance gate

3. 02 No's of DCP Fire Extinguishers on the wall outside the building

Admin Building

1. (FAS) Fire Alarm System (Manual call point with Smoke detector)
2. 02 No's of DCP Fire Extinguishers on the wall outside the building
3. 02 No's of DCP Fire Extinguishers inside the building
4. 01 No's of DCP Fire Extinguishers at 2nd floor

Laboratory

1. (FAS) Fire Alarm System (Manual call point with Smoke detector)
2. 02 No's of DCP Fire Extinguishers inside the test performing area
3. 02 No's of DCP Fire Extinguishers on the wall inside the building

Blow Molding Area

1. 02 No's of DCP Fire Extinguishers on the wall outside the building

Engineering Work Shop Area

1. 02 No's of DCP Fire Extinguishers on the wall outside the entrance gate
2. 02 No's of DCP Fire Extinguishers on the wall back side the work shop

Ware House

1. 02 No's of DCP Fire Extinguishers on the wall outside the entrance gate
2. 02 No's of DCP Fire Extinguishers on the wall back side the work shop

Cafeteria

1. (FAS) Fire Alarm System (Manual call point with Smoke detector)
2. 02 No's of DCP Fire Extinguishers on the wall outside the entrance gate

Control Room Building

1. (FAS) Fire Alarm System (Manual call point with Smoke detector)
2. 02 No's of DCP Fire Extinguishers on the wall outside the cable laying room at front side
3. 01 No's of 50Kg Curt Trolley at entrance gate of cable laying room
4. 02 No's of DCP Fire Extinguishers on the wall outside the cable laying room at emergency gate
5. 02 No's of DCP Fire Extinguishers inside the building at entrance side at1st floor
6. 02 No's of DCP Fire Extinguishers at 1st floor at emergency gate

Sub Station Building

1. 02 No's of DCP & 02 No's of CO_2 inside the building

2. 02 No's DCP at the entrance gate of Cable Laying Room

3. 01 No's of 50Kg Curt Trolley at entrance gate of cable laying room

Hydrogen Plant

1. 02 No's of DCP and 02 sand buckets in front of reformer

2. 02 No's of DCP and 02 sand buckets at back side of the reformer

3. 02 No's of DCP and 02 sand buckets at natural gas compressor

4. 01 No's of DCP and 01 No's of Co_2 at top of reformer

Boiler

1. 02 No's of DCP and 02 sand buckets in front of boiler tank

2. 02 No's of DCP at back side of the boiler panel container

Demin Plant

1. 02 No's of DCP and 02 sand buckets in Demin plant area

Peroxide

1. 02 No's of DCP and 02 No's of sand buckets placed around the building

2. 03 No's of DCP at first floor

3. 02 No's of DCP at second floor

Concentration Unit

1. 02 No's of DCP and 02 No's of Sand buckets

2. 02 No's of DCP and 01 No's of CO_2

3. 02 No's of DCP at 1st Floor

4. 01 No's of CO_2 at 2nd floor

5. 01 No's of CO_2 at 3rd Floor

Filling Hall

1. 02 No's of DCP at entrance gate

Grid Station

1. 04 No's of Barrow type fire extinguishers

2. 02 No's of DCP 50kg curt Trolley

3. 04 No's of Foam type fire extinguisher 10 gallon

4. 08 No's of Foam Type fire extinguisher 10 liter

5. 02 No's of Co_2 MT5 Model

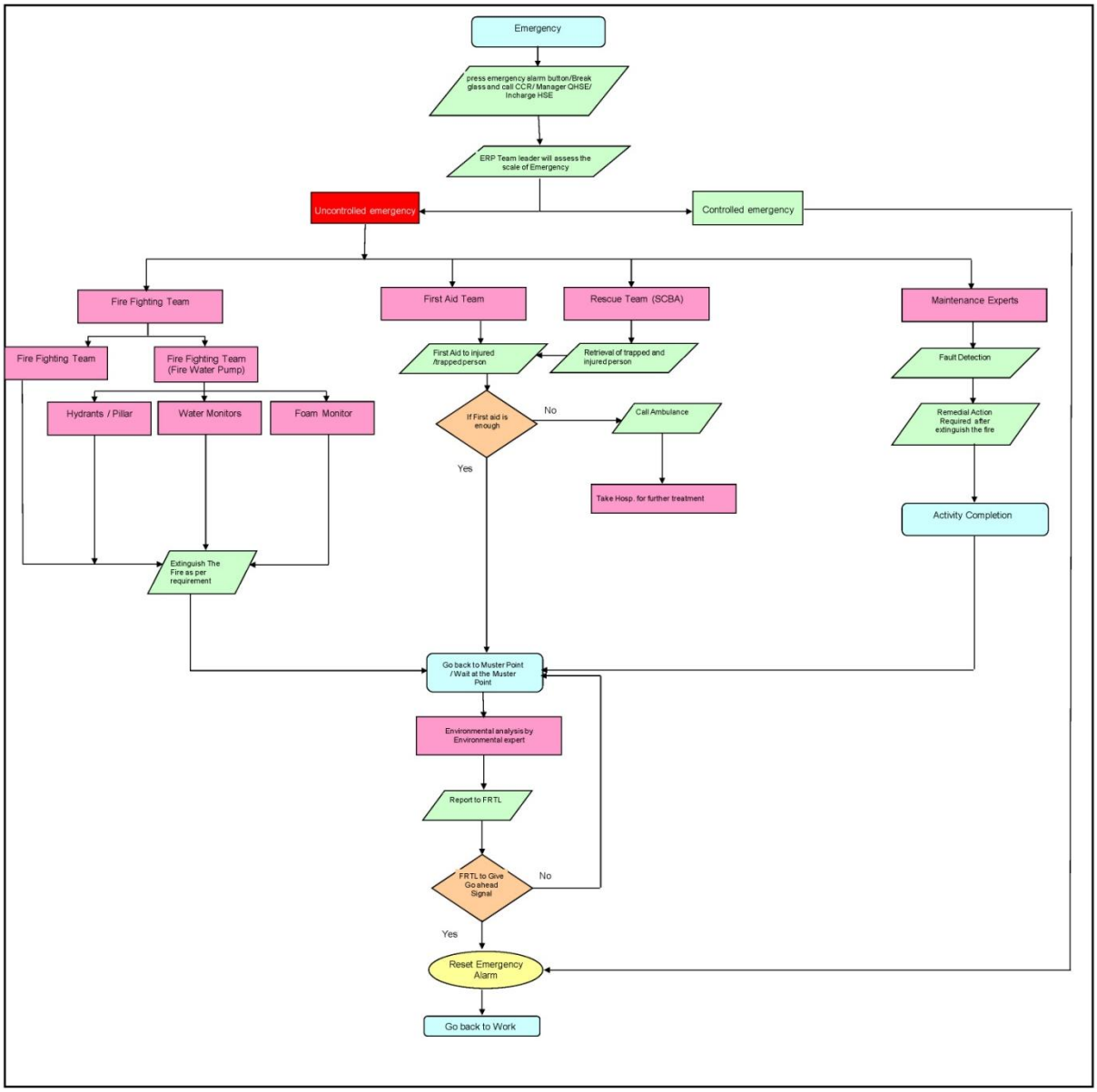

Fig. 16: Fire Emergency Plan of DOL Plant

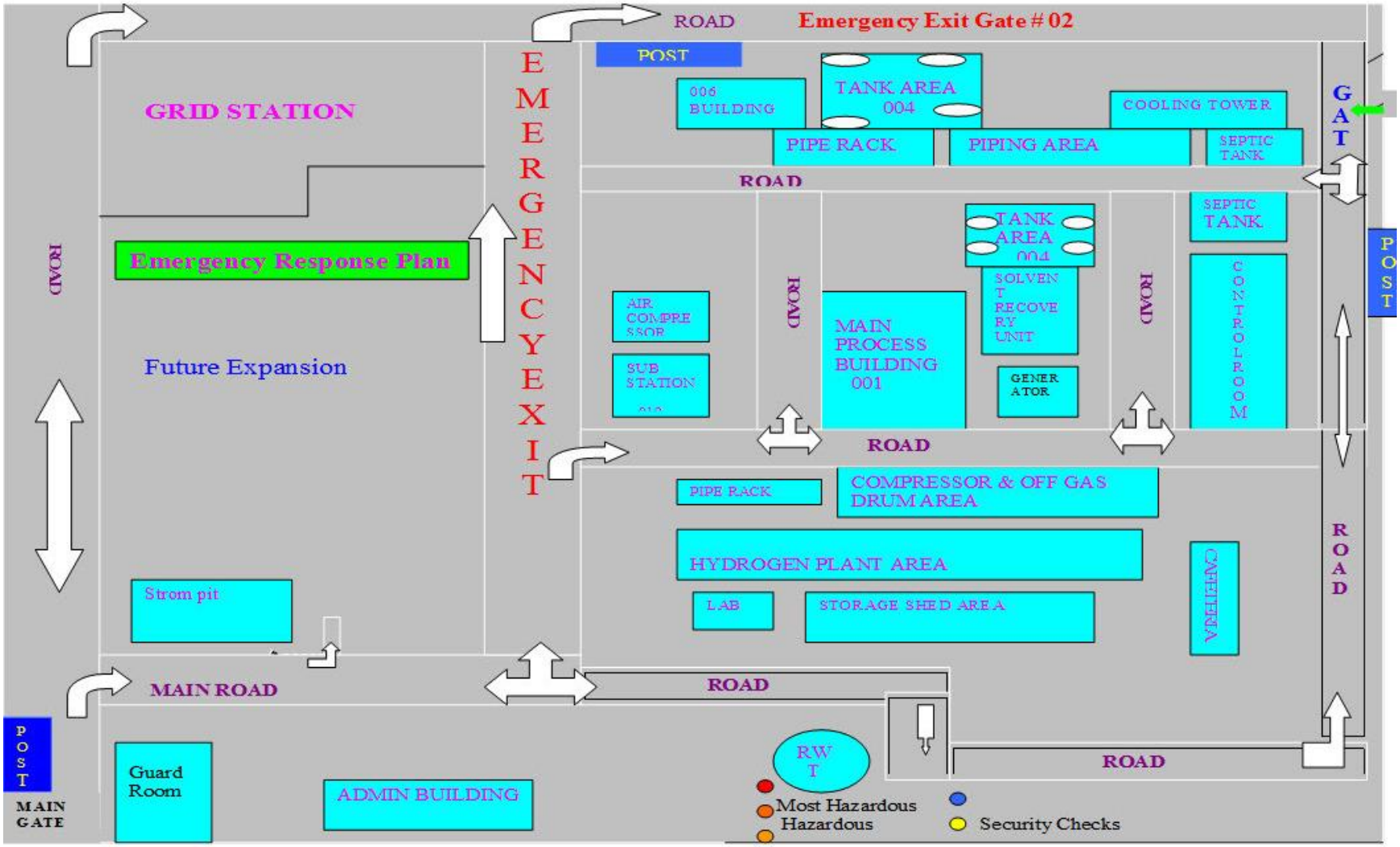

Fig. 17: Emergency Evacuation PLan of DOL

5.2.7. Procedure for Evaluation of compliance:

Purpose of this procedure is to establish and maintain arrangements to ensure the effective implementation and evaluate compliance periodically against the applicable legal and other requirements for DOL. QHSE manager is the owner of this procedure (details in appendix 1).

5.2.8. Procedure for Incident investigation:

This procedure is to improve the guidelines for recording of incidents, search for the direct and indirect causes of incidents identify the need for corrective action(s), recognize opportunities for preventive actions to avoid the recurrence and continually improve the HSE performance (details in appendix 1).

5.3. Additional plant specific Standard Operating Procedures (SOPs) of DOL:

These standard operating procedures are made by Descon Oxychem Limited according to their own specific plant requirements.

These include:

5.3.1. Procedure forMaster List of Safety Arrangements:

This SOP is made for safety programmes that include all the health and safety related actions that DOL has taken to avoid any kind of accidents. This SOP is updated ideally once a quarter and Safety-in-Charge is responsible for this procedure(details in appendix 2).

5.3.2. Procedure forPermit to Work:

This procedure is made for works that involve any kind of hazard. These permits are issued from QHSE department according to the nature of the work e.g. hot work permit and general safe work permit(details in appendix 2).

5.3.3. Procedure forSite Security:

This procedure is used to protect the property of DOL from fire & theft and to stop the unauthorized entry into the plant area. This procedure controls all kinds of security issues and is maintained by the QHSE manager (details in appendix 2).

5.3.4. Procedure forWork Place Safety:

This procedure is used to enhance safety of employees, contract men and visitors while working for the DOL plant and to provide them safe place to work (details in appendix 2).

5.3.5. Procedure forFirefighting Equipment Inspection:

At plant fire is one of the major hazards and different firefighting equipments are used against fire to minimize injury & property damage from fire e.g. Fire Extinguishers, Hydrants/Monitors and Fire Alarm System(details in appendix 2).

5.3.6. Procedure forFork Lift Operation:

To avoid any kind of accident the forklift operating procedure is used at DOL plant. It includes all safety actions that are necessary to take while operating forklift e.g. starting position, pickup position and travel through course etc. (details in appendix 2).

5.3.7. Procedure forLockout Tagout:

It is the procedure used during maintenance, repairing, cleaning, servicing, or adjusting of powered machinery or equipment in the plant so that all individuals in the factory are protected from accidental or unexpected activation of mechanical and or electrical equipment(details in appendix 2).

5.3.8. Procedure forActivity PPE Chart:

The purpose of this procedure is to use specific PPEs during performing activities that can cause health hazards. Different PPEs are used for different activities and awareness is necessary that how important is the use of PPEs while performing tasks (details in appendix 2).

5.3.9. Procedure forWaste Handling and Management:

Like other plants Descon also produces the chemical waste. This procedure is to identify as far as possible the expected waste, and describe their classification, storage, transport and disposal management requirements(details in appendix 2).

5.4. Gap Analysis of Integrated ISO 14001 and OHSAS 18001

Gap Analysis:

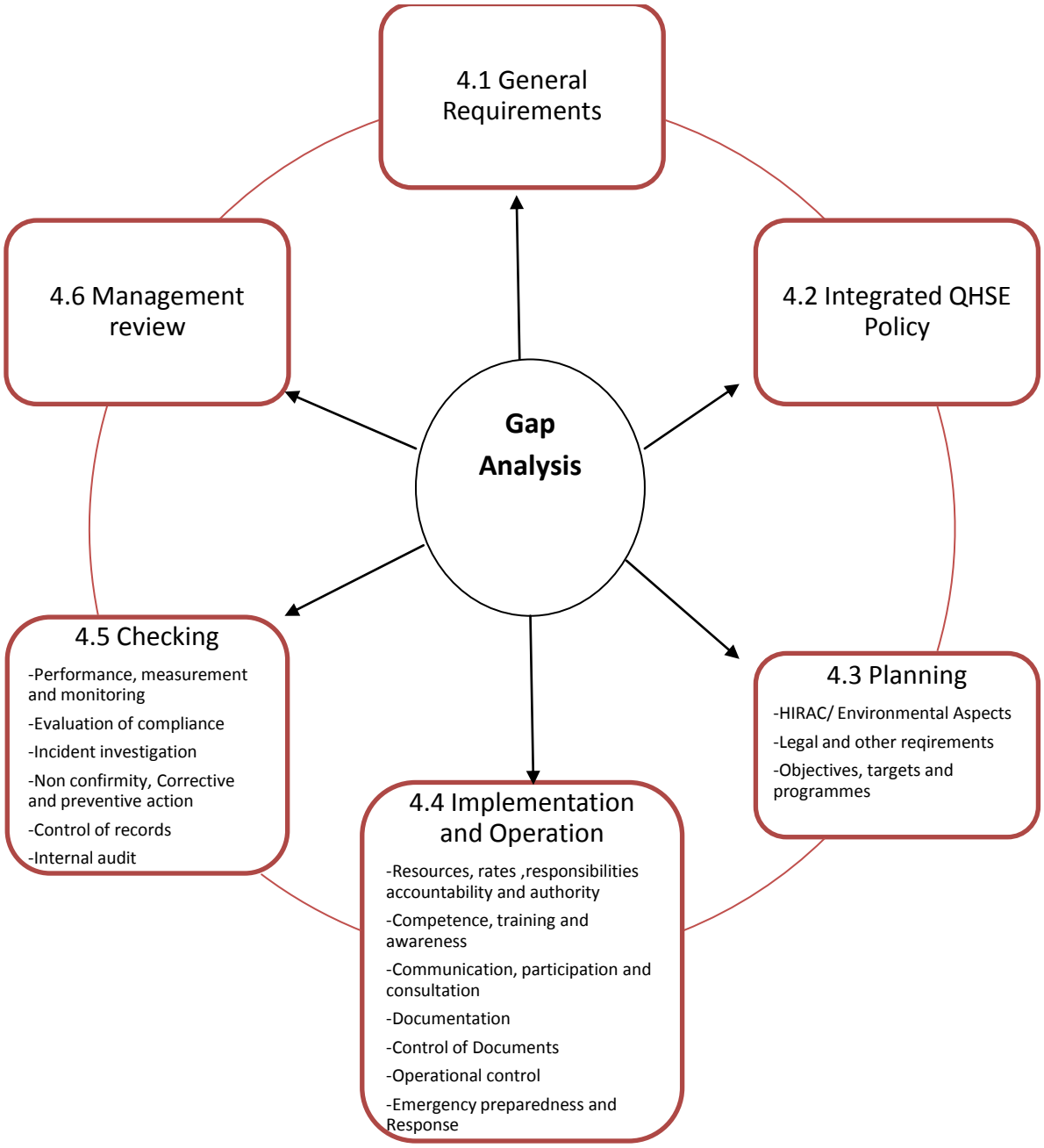

Fig. 18: Gap Analysis of Integrated ISO 14001 and OHSAS 18001

The gap analysis is the evaluation of the current status of environmental management and health and safety system activities in the organization and by identifying the current processes for managing environmental issues, including existing policies and procedures, roles and responsibilities, communication systems, record keeping and training programmes. The gap analysis of DOL plant was carried out with the help of detailed audit question (details in appendix 3).

4.1 General requirements

ISO 14001 and OHSAS 18001 have not been implemented as yet, but DOL is working to fulfill the requirements of the standards. They have planned to implement both the standards together as Integrated Management System. They have made integrated Standards Operating Procedures (SOPs) for both standards.

4.2 Integrated QHSE Policy

Quality, Health, Safety, and Environmental (QHSE) Policy

Every employee of Descon Chemicals Business Area (DCBA) ensures that Quality, Health, Safety and Environment remain our top business priority to achieve maximum satisfaction of all stakeholders.

We are committed to:

- Set clear objectives and targets at all levels of company to become one of the benchmarks in Quality, Health, Safety and Environment practices;

- Protect the health and safety of our people at all times and in all circumstances and eliminate HSE accidents and events;
- Plan for, respond to and recover from any emergency, crisis and business disruption;
- Minimize our impact on the environment through pollution prevention, reduction of natural resource consumption and emissions, and the reduction and recycling of waste;
- Monitor, evaluate and continually improve our QHSE performance through the definition of operational standards, training, assessment and audits;
- Complying with all applicable legal requirements and other requirements related to Company's aspects;
- Educate the employees by providing adequate resources, and technical, regulatory, operational and behavior based safety training focused on developing a culture of excellence;
- Hold contractors and third parties accountable for adhering to the Company's QHSE policy and procedures to ensure satisfactory safety and environmental performance;

The policy will be reviewed annually and if necessary revised to take into account any changes in the organizational structure or in the light of legislative changes. This policy statement will be made available to all employees and other interested parties".

_____

Chief Executive Officer

Rev. 03; Sep 12, 2011.

The company has not a single environmental policy or health and safety policy but it has the QHSE policy that addresses the quality, health and safety and environmental aspects of the company. The policy is committed to continual improvement. The policy also articulates the pollution prevention but it does not mention any types of pollution in it. Policy also has explicit commitments to comply with legal and other requirements. It also defines clear goals and objectives and has a clear relationship between its objectives and targets set by the organization with its policy. Policy is documented and approved by the top management and is communicated to all personnel within the company and external personnel. Policy is also available to the public through internet. But the policy is not posted on plant for the workers and in offices for the staff members. DOL has also smoking policy to provide guideline on smoking rules & regulation within the Premises of Plant (see in appendix 3).

4.3. Planning

The major aspects of the plant are wastewater, flue gases, noise level and waste. The quality, health, safety and environment department of Descon Oxychem is responsible to identify all the aspects and hazards related to its processes.Manager QHSE along with concerned I/C Section is responsible to identify all existing and potential hazards/aspects associated with each activity, product or service that have or can have a direct or indirect impact on the health and safety of workers or the natural environment. They have done all the HIRAC study in every area of the plant and have also identified the hazards control methods but they don't have the register of aspects and impacts in which they assemble all the documents. Still they are working on ISO 14001 and trying to reduce the level of their aspects according to the NEQS. Descon Oxychem

are fulfilling the legal requirement like NEQS, Factory Act 1934, Pakistan Nuclear Regulatory Authority, and other requirements including industrial laws e.g. Punjab industrial Act (PEPA, 1997). But they don't have the proper matrix or checklist system to identify legal and other requirements.

HSE department reviews and verifies objectives on quarterly basis. HSE objectives of Descon Oxychemare reviewed and verified during internal quality audits/Follow-up audits/ HSE audits and also during visits of Descon Business area. QHSE representative manager also verifies objectives and post status on the form. If the planned target dates of objectives could not be achieved then QHSE representative will discuss the matter with the process owner for analyzing the cause to take the necessary actions and agree to establish a new target date or redefine objectives. The progress of HSE objectives are also be discussed in the Executive Management Reviews Meetings. If required, the progress of objectives may be reviewed in the management meeting. But they don't have a clear timeline for their environmental objectives to achieve and also they don't have the standard operating procedure for their objectives and programmes.

4.4. Implementation and operation:

At Descon Oxychem the QHSE manager is the person who is responsible to communicate all the responsibilities and tasks to employees. The other person is I/C (Incharge) who is responsible to monitor that every person is fully committed to his work. The top management is weak in providing financial and human resources. And no standard operating procedure is present for resource, roles and responsibility. There are only two main persons in QHSE Department at plant who is handling all the issues. The QHSE manager is also the same for the Descon chemicals and this is the main reason that targets

are not achieved on time. More than that for implementation of integrated management system there is a need of skilled persons who can understand the integration process and there is a need of training for all the people who are already working on plant because a new technology/process is being implementing.

Induction is provided to newly hired as well as existing employees. Newly hired employees are to be oriented in relation to organization introduction, company policies and procedures by HR and QMS and integrated Management System functions by QHSE Department and job related information by concerned Head of department of immediate supervisor. Existing employees are to be given orientation in case of amendments in policies, procedures and working system of Department/Organization as well as awareness of new concepts and practices. Trainings are also conducted on emergency response procedure in the case of emergency situations. Emergency drills have already been conducted at plant for each department. Refresher sessions and new courses are also conducted from time to time for management employees on general and specific topics for ongoing learning. But no training was conducted for the implementation of the integrated management system.

Communication system at Descon Oxychem is based on two types i.e. the external and internal communication. Internal Communication includes Fax Distribution, Internal Memo that is also used to communicate different announcements or for providing information through e-mail.In case e-mail system is not working communication takes place through manual distribution.Computer Module(s), Meetings, Public Announcement, Training Notices, Posters or Slogans and telephone are also used. Descon conductsEnvironmental Survey through external parties biannually or at any otherdefined frequency. All the external communications between contractors, subcontractors and suppliers are done through defined channels i.e. Formal Letters,

Fax Messages, Telephone, E-mails and Forms. Organization doesn't have the procedure for the participation of workers in identifying health and safety issues and even in risk assessment. Workers were also not participating in making health and safety objectives. They don't have any awareness regarding health and safety issues. Only Health Safety and Environmental Incharge identify these issues and determine controls.

DOL is not ISO 14001 and OHSAS 18001 certified with yet. The documentation system is still in progress. They have their policy, training records, objectives and aspects in complete documentation form. But many of the other main elements of the environmental management system are not documented. They have not a proper procedure for documentation. They have the system in which for adequacy they approve the documents in advance. Recently they have developed a system in which they Review, update as necessary and re-approve the documents for the implementation of integrated management system.

"Operational controls are methods, systems, processes and equipment that safeguard the health, safety and environment. These include: Monitoring and control of air and liquid emissions, Solid Waste Management, Programs for conservation of energy and natural resources, Vehicle exhaust and Noise level controls, Control of suppliers / contractors, Maintenance programs of equipment and Work instructions for safe working on machines". Manager QHSE is in charge for categorizing operations and activities that are associated with significant health, safety and environmental hazards/aspects. Standard operating procedures of these operations define the operational control measures taken to control these activities. Descon has few SOPs related to these operations and many are still under review.

The organization has a very good emergency plan that is activated. There are four teams' first aid team, firefighting team, rescue team and maintenance team. They are properly trained for the emergency situation. Other than that the emergency drills of the whole plant are completed which were designed to provide participants with experience in their roles during real emergency situations, to increase the confidence of participants and to identify weaknesses in the emergency response planning. Comprehensive training sessions were also conducted for all personnel and they were briefed about the emergency alarms, emergency exits, Assembly points(muster points), safe routes etc. There is a very comprehensive emergency plan and fire alarm system in documented as well as in map form.

4.5.Checking:

Descon Oxychem doesn't have any procedure for monitoring of their activities and measuring performance. But they monitor and measure HSE performance on regular basis, and weekly review meetings are held with other managers, except that after two weeks all managers of each department including plant manager participate in safety walk in which they visit the whole plant and if they see any nonconformity corrective action is taken as appropriate to ensure the conformity.

Descon Oxychem limited has all health, safety and environmental requirements and their compliances are verified and reviewed in Management Review Meetings. "At plant Compliance assessments are accomplished through routine inspections to ensure that conditions and other regulatory requirements associated with DOL operations are met on a continuous basis.These inspections include, but are not limited to":

Table 4:Monitoring schedule of plant operations

Inspection / Activity	Frequency	Performer
Emission	Six monthly	Other Lab
Ambient air	Six monthly	Other Lab
Drinking water	Six monthly & as and when required	In House Lab
Effluent	Monthly	In House Lab
Noise	Yearly	In House Lab
Third Party Audit	Six monthly	Certification Body
HSE Department Audit	Quarterly	HSE Department

Descon Oxychem did not establish procedures and schedules to evaluate compliance with Other Requirements to which the organization subscribes.

At plant if an incident occurs, concerned I/C Section is responsible for taking remedial measures using the available resources and to inform the QHSE department then the QHSE Manager n HSE Incharge will prepare the incident report and present to the Manager. The QHSE Manager will review it and take remedial actions according to the situation. If any nonconformity occurs during any process the corrective action request is sent by the QHSE manager to the technical staff. The manager QHSE is responsible for corrective action request. Corrective actions will be taken and decisions made in HSE committee meeting. At DOL plant they have online CAPA system in which the request is sent to each and every related department including head office

and CEO. But there is no standard operating procedure set for corrective and preventive action plan and to control non conformity.

DOL does not have certified ISO 14001 and OHSAS 18001 yet, therefore there is no proper system of control of records. They have all the training reports, incident reports, and reports of tests of emergency preparedness records, audit results, reports of environmental aspects, significant aspects and impacts, reports of relevant legal and other requirements. There is no documented procedure established for identification, Storage, Retrieval, Protection, Retention time andDisposition of these documents.

DOL is working on both the standards (ISO 14001 and OHSAS 18001)to accomplish all the requirements. No internal audit has been carried out on the plant for environmental management system. There is no standard procedure for the schedule of conducting internal audits.

4.6. Management Review

Top management Reviews include assessing opportunities for improvement, the extent to which objectives and targets have been met, communications from external interested parties, including complaints, the need for changes and recommendations for improvement to implement the environmental management system and health and safety system at plant. But no procedure has yet been established for management review meetings.

5.5. Why DESCON OXYCHEM wants an Integrated Management System?

In today's world in the current economic situation each organization wants a green image and competitive advantage in the market. Only those companies who have the ability to adapt to the continually changing environment in which they operate will survive and remain in business. Now there is a growing trend towards integrated management system rather than separate standards that works separately. Many researchers studied IMS from various points of view including the level of integration, possibility of integration of environmental management system and health and safety management system and likely benefits of integrated management system. Descon Oxychem is certified for quality standard (ISO 9001) yet and is now moving towards the certification of health and safety standard (OHSAS 18001) and environmental management standard (14001) and in the end for the implementation of Integrated management system.

The implementation of the integrated management system is not an easy task. There are some driving forces that are involved in the implementation of IMS as well as there are barriers that delay the process of implementation of IMS.

5.5.1. Benefits/ Advantages of having an IMS in Descon Oxychem Limited:

Some of the benefitsthat Descon Oxychem expects from the IMS are:

1. Enhanced Image:

Desconis a dynamic group of companies which introduced a technology that is entirely new in Pakistan. This is an image builder.

2. Competitive advantage:

There are two industries in Pakistan which are manufacturing hydrogen peroxide one is Sitara Chemicals in Faisalabad and the other is the Descon Oxychem. Sitara chemicals is certified with ISO 9001 and ISO 14001 standards so by implementing and having IMS they would have a competitive advantage in the market.

3. Reduced duplication of work:

An IMS could help avoid duplication of work as there are many common elements in both the standards. Combining these common elementswill lead to clarity and reduce duplication of work.

4. Reduced management costs:

By combining both the standards into one system it will take less training time as compared to training for both the standards separately, it will lessen documentation and decrease auditing cost.

5. Improvement in work:

By focusing on only one integrated system, more balance and focus will be achieved. This will improve the quality of HSE.

6. More focused targets and objectives:

By having a single integrated system DOL will have discrete rather than overlapping targets and objectives.

There are some driving forces/ motivations promoting Descon Oxychem to adopt an IMS which are as follows:

- Pressure from suppliers and stakeholders (shareholders, groups)
- Customer pressure
- Nature of Industry i.e. hazardous nature of plant or product
- Requirements of Parent company
- Organizations self-defined objectives

5.5.2. Obstacles in implementing an IMS in Descon Oxychem Limited:

There are some obstacles/difficulties that Descon Oxychem is facing in the integration of Health, Safety and Environment (H, S & E):

1. Delay in Work:

The main obstacle in the implementation of the IMS at Descon Oxychem is delay in the process of completion of work for ISO 14001 and OHSAS 18001 certification. The main reason of delay is that the same procedures i.e. emergency drills, SOP and firefighting trainingsare carrying out on Descon chemicals and the QHSE manager and Incharge are the same for both the plants.

2. Different disciplines:

In Descon Oxychem there are different departments and their managers like Quality, Health, Safety and Environment (QHSE) Department, Production Department, TechnicalDepartment, Human resource Department, and Warehouse and dispatch area. For successful introduction of Integration Management system all departments should be fully involved and must be aware of

the process of integration. However some departments don't know the concept of integration.For instant ware house and dispatch area personnel's do not fully comprehend the concept of IMS.

3. Different Focuses and Objectives:

The QHSE department is divided into two sections i.e. Quality Assurance (QA) and Health, Safety and Environment (HSE). The manager for both the section is the same. Descon Oxychem is certified with the quality standard and now working for other two standards. They are working to integrate first the ISO 14001 and OHSAS 18001 and then integrate quality standard. In integration process sometimes the objective for quality and HSE objectives are neglected.

4. Lack of awareness and proper training:

For implementing IMS system into an organization all the employees should have proper training and education. Descon Oxychem have conducted emergency Drills and made teams for rescue purposes but for IMS implementation they don't have persons other than QHSE manager and HSE Incharge. All others are not well trained and don't have knowledge about the integration process.It isdifficult to educate and re-educate personnel and change their way of thinking.

5. Inadequate financial support:

Every organization has limited budget to spend on what is thought as non-productive work. Work on standards is going on both in the Descon Chemicals and Descon Oxychem at the same time. There is a financial constraint as the budget is limited, that is why the progress of integration is slow.

6. Inadequate human resources:

For introducing a new technology there should be a properly trained team that can handle all the issues and have complete information about IMS. At Descon there are only three persons in HSE department who are working for IMS i.e. the QHSE Manager, HSE Incharge and his Assistant. All other persons are not trained and have no knowledge regarding this new integrated system.

Chapter 6

CONCLUSION AND RECOMMENDATIONS

Following are some concluding points and some recommendations of this dissertation.

6.1. Conclusion:

This thesis is based on seven months' work in Descon Oxychem and another seven months on giving shape to proposed IMS. Descon Oxychem Ltd. is a medium size industry with approximately 180 employees and a production capacity of 22000 metric tons/year. The main product is hydrogen peroxide. In September 2011, Descon Oxychem Limited was certified with Quality standard, ISO 9001. However, Descon Oxychem is not yet certified for Occupational Health and Safety standard (OSHAS 18001) and Environmental Management System standard (ISO 14001). Descon Oxychem is now working on the Occupational Health and Safety standard (OHSAS 18001) and Environmental Management System standard (ISO 14001). This study is based on comprehensive exercise to introduce IMS in the unit. Descon Oxychem Limited has a target to implement both the Occupational Health and Safety standard (18001) and Environmental Management System standard (14001) together as IMS in Feb 2013.

IMS is a new tool that Descon Oxychem is going to implement. Company has made integrated SOPS for IMS and some of them are under progress. These SOPs are however, not implemented but are under review. Other than that Descon Oxychem has completed its emergency drills and firefighting trainings. Hazard Identification, risk assessment and control is completed in all the sections of the plant. But there are many gaps remaining in Environmental management system and Occupational Health and Safety system that need to be fulfilled. The management is fully

committed to introduce IMS but the problem of lack of resources is dominant and that is the main hurdle.This study presents an IMS which will hopefully be fully developed and introduced in Descon Oxychem Limited.

6.2. Recommendations:

Notwithstanding the presentation of IMS the Descon Oxychem needs to consider the following for implementing the IMS.

- For the development and implementation of IMS all the personnel's should have awareness and trainings regarding IMS.
- Worker's training and awareness programmes must be conducted on regular basis.
- DOL should focus on its objectives and meet the targets on time by setting its standard operating procedure (SOPs).
- HSE staff should not be the same for both Descon Oxychem and Descon Chemicals so that delay in implementing and handling of IMS can be avoided.
- The remaining SOPs should be completed and the ones completed should be implemented.
- Wastewater treatment plant must be installed and should be in running condition.

APPENDICES

Appendix 1

Standard Operating Procedures:

4.3.1. Procedure for Hazard & Aspect Identification, Risk Assessment & Control

1. PURPOSE

The purpose of this procedure is to provide a method and guidelines for identifying health, safety and environmental hazards/aspects, assessing associated risks/impacts and determining suitable control measures to prevent or reduce the likelihood of their occurrence and severity to an acceptable level.

2. SCOPE

This procedure is applicable to all departments/sections/workshops/offices of Descon Chemicals Limited & Descon Oxychem Limited.

3. ABBREVIATIONS/DEFINITIONS

HSE: Health, Safety and Environment

I/C: In-charge

Hazard: Source, situation or act with a potential for harm in terms of human injury or ill health or a combination of these.

Hazard/Aspect Identification: The process of determining what, where, when, why and how something wrong could happen.

Environmental Aspect: Element of an organization's activities, products or services that can interact with the environment

Environmental Impact: Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an environmental aspect

Risk: Potential outcome of a hazard. It is the possibility of injury, illness, damage or loss occurring as a result of a hazard

Risk/Impact Assessment: Overall process of estimating the magnitude of risk/impact and deciding whether or not the risk/impact is tolerable

Risk/Impact Control: The process by which the risks/impacts associated with each of the hazards/aspects in the workplace are controlled

Likelihood of Occurrence: The number of times a specific hazard/aspect may occur in a specific period of time.

Severity of Consequences: The level of harm caused by a specific hazard/aspect.

Personal Protective Equipments: Equipments used or worn to avoid different hazards.

4.0 PROCEDURE

Hazard/Aspect Identification

1. Manager QHSE along with concerned I/C Section will identify all existing and potential hazards/aspects associated with each activity, product or service that have or can have a direct or indirect impact on the health and safety of workers or the natural environment.

2. Concerned workers and contractors will also get involved in identifying their job/area related hazards/aspects, assessment of associated risks/impacts and determination of control measures.
3. Manager QHSE/ HSE Executive will document the findings on the Hazard/Aspect Identification, Risk/Impact Assessment and Control Form and maintain it. This document will be available with the concerned section/workshop/office also.
4. While identifying HSE hazards/aspects following considerations shall be taken into account:
    a) routine/planned and non-routine/new activities;
    b) activities of all persons having access to the workplace (including contractors and visitors);
    c) human behavior, capabilities and other human factors;
    d) identified hazards/aspects originating outside the workplace capable of adversely affecting the health and safety of persons or environment under the control of the organization;
    e) hazards/aspects created in the vicinity of the workplace by work –related activities under the control of the organization;
    f) infrastructure, equipment and materials at the workplace, whether provided by the organization or others;
    g) changes or proposed changes in the organization, its activities, products, services or materials;
    h) modifications to the HSE management system, including temporary changes, and their impacts on operations, processes, and activities;
    i) any applicable legal obligations relating to risk assessment and implementation of necessary controls;

j) the design of work areas, processes, installations, machinery/equipment, operating procedures and work organization, including their adaptation to human capabilities.

4. The list of hazards/aspects will be reviewed on bi-annual basis. However, in case of new installations/operations, a complete hazard/aspect identification and risk/impact assessment exercise may be required at any time.

5. The following activities shall assist in the hazard/aspects identification process.

Walk Around

Walking around the work place, which the hazard/aspects identification process is targeting, is an essential information gathering exercise even if the team or the individuals involved are familiar with the task. Observing how work is carried out will reveal valuable clues about the hazards involved.

Analyzing Available Information

To identify hazards/aspects, check all available information. Amongst the key sources of information which may assist in indicating how hazards/aspects have arisen in the past and are likely to happen again are incident reports, incident investigation reports, weekly/monthly HSE reports etc.

Using Checklists

Manager QHSE can also refer to a job/machinery/equipment specific checklist as an aid in identifying hazards/aspects.

Asking Questions

The following questions may also be used to identify hazards/aspects

a) What materials are involved- e.g. chemicals, metals, explosives, combustibles?

b) Are there any installation specific hazards/aspects- e.g. high voltage, pressure, toxic gases?

c) What tools and equipments will be used- e.g. welding sets, cranes, fork lifters?

d) Under what circumstances will the job be performed- e.g. day/night, adverse weather, simultaneously with other operations?

e) Are there any location related hazards/aspects- e.g. at height, confined space?

f) Will the job affect other people/facilities in adjacent area-

g) Are there any competence issues?

5. Risk Assessment

1. Assess the identified HSE hazards/aspects in terms of their Likelihood of occurrence and their Severity of consequence.
2. The Hazard/Aspect Identification, Risk/Impact Assessment and Control Form will provide a risk/impact level considering the following as in put.

    a) Likelihood of Occurrence is ranked as Almost Certain, Likely, Possible, Unlikely and Highly Unlikely.

    The following table explains the Likelihood Scale.

Table 1-Likelihood Scale

Likelihood Level	Descriptor	Description	Indicative Frequency
5	Almost Certain	Will certainly occur in most of the circumstances	Once every six months

4	Likely	Will probably occur in most circumstances	Once a year
3	Possible	Might occur at some time	Once every three years
2	Unlikely	May occur in exceptional circumstances	Once every fifteen years
1	Highly Unlikely	Have never heard of such happening	Once every 100 years

b) Severity of consequences is ranked varies depending on the nature of incidents. It is different for health, safety and environment related incident.

The table below explains various Severity Levels.

Table 2-Severity Scale

Severity Level	**Description**		
	People	**Equipment**	**Environment**
5	Multiple Fatalities	Extensive Damage	Massive Effect
4	Single Fatality	Major Damage	Major Effect
3	Major Health Effect/Injury	Localised Damage	Localised Effect
2	Minor Health Effect /Injury	Minor Damage	Minor Effect
1	Slight Health Effect /Injury	Slight Damage	Slight Effect

3. Once the Likelihood and Severity of consequences of hazards/aspects have been determined, the risk/impact level can be assessed by combining the two. All the risks/impacts can be

assigned a Risk/Impact Level of Low, Medium or High. A brief description of various risk/impact levels is given below.

Table 3-Risk Assessment Matrix

Severity	Consequences			Likelihood				
				1	**2**	**3**	**4**	**5**
	People	**Equipment**	**Environment**	Once Every 100 Years	Once Every Fifteen Years	Once Every Three Years	Once a Year	Once Every Six Months or More Frequently
1	Slight Health Effect or Injury	Slight Damage	Slight Effect	**1**	**2**	**3**	**4**	**5**
2	Minor Health Effect or Injury	Minor Damage	Minor Effect	**2**	**4**	**6**	**8**	**10**
3	Major Health	Localized Damage	Localized Effect	**3**	**6**	**9**	**12**	**15**

	Effect or Injury							
4	Single Fatality	Major Damage	Major Effect	**4**	**8**	**12**	**16**	**20**
5	Multiple Fatality	Extensive Damage	Massive Effect	**5**	**10**	**15**	**20**	**25**

Legend: 1~6 = Low Risk, 8~12 = Medium Risk, 15~25 = High Risk

6. Risk Control

The data collected during hazard/aspect identification and risk/impact assessment process will be shared with concerned department and control measures will be recommended.

1. The following hierarchy will be used to control the risks.
   a) Elimination
   b) Substitution
   c) Engineering Controls
   d) Signage/warning and/or Administrative Controls
   e) Personal Protective Equipments
2. If the risk/impact is High or Medium, Manager QHSE, HSE Executive and I/C Section will identify the measures that can reduce the risk to as low as reasonably practicable. This is known as the residual risk. The residual risk can be in the range of Low to Medium, however if it is in the High region, alternative method to complete the job will be investigated.

3. For Medium risks/impacts, HSE Executive and I/C Section will take effective control measures within a week. Interim controls may be put in place as precautionary measure.
4. Low risks/impacts will be controlled by I/C Section following routine practices. HSE Executive will get involved where required.
5. Once the control measures have been recommended, HSE Executive will follow up for their in time implementation and measure their effectiveness.
6. HSE Executive will maintain all relevant record.

4.3.2 Legal and other requirements

Purpose

This procedure defines the mechanism for identifying, accessing and maintaining current legal and other requirements and regulations to Descon Oxychem Limited and for monitoring, access to up-to-date editions of these requirements.

Scope

This procedure covers all areas and activities of DOL. This procedure coveres laws, regulations, and other requiremnents established at the federal, provincial and local level that apply to the EMS aspects of DOL activities.

References

OHSAS 18001:2007 Clause 4.3.2

ISO 14001:2004 Clause 4.3.2

Environmental Protection Act EPA 2001

National Environmental Quality Standards (NEQS)

Pakistan Nuclear Regulatory Authority (PNRA)

Factories Act 1934 (Chapter 3)

Responsibilities

MR IMS is the owner of this procedure.

Departmental In charges are responsible for the implementation of this procedure.

Procedure

MR is responsible for tracking applicable laws and regulations, identifying those related to the DOL activities. He is also responsible for evaluating the potential impacts of these laws and regulations on the organization and its activities.

MR employs a variety of techniques and information sources to track identify and evaluate applicable laws and regulations. These includes, but not limited to:

a) Communication with federal and provincial regulatory agencies.
b) Periodic HSE refresher trainings.

MR monitors these information sources on regular basis to ensure that new issues are identified on timely basis.

MR disseminates information on applicable laws and regulations (and their potential impacts on DOL activities) to appropriate personnel.

MR complies and maintains copies of significant applicable EMS related laws and regulations and enlist as legal document and updates it as required.

4.4.2 Competence, training and awareness:

Purpose:

(1.1) To establish a system that ensures opportunities for all employees to learn and acquire necessary skills, knowledge and abilities for fulfilling the job requirements.

Scope:

(1.2) This procedure applies to all the regular as well as the contractual employees of **Descon Oxychem limited**

Definitions:

(3.1) CEO = Chief Executive Officer

(3.2) HR = Human Resources

(3.3) QHSE = Quality, Health, Safety & Environment

(3.4) HOD = Head of Department

(3.5) QMS = Quality Management System

Responsibilities:

(4.1) CEO

Overall responsibility for training and allocation of funds

(4.2) HR

To facilitate identification, Training needs analysis, Planning, implementation & record maintenance of training activities.

(4.3) HOD:

For Training need identification, planning/scheduling & evaluation of training.

(4.4) QHSE:

To assist in coordination with HOD, follow-ups & arranging in house trainings.

Procedure:

(5.1) Orientation is provided to newly hired as well as existing employees.

a. Newly hired employees are to be oriented related to organization introduction, company policies & procedures by HR & QMS and integrated Management System functions by QHSE Department and job related information by concerned Head of department of immediate supervisor.

b. Existing employees are to be given orientation in case of amendments in policies, procedures and working system of Department/Organization as well as awareness of new concept and practices.

c. General orientation is arranged for particular department on required basis both for new and existing employees.

d. Refresher session will conducted for management employees on general & specific topics for ongoing learning. These sessions will be offered from time to time.

(5.2) Training needs are mainly extracted from performance appraisals at different period of time.

(5.3) In case of any further requirement, separate Training Need Identification Form ( ) is also filled up by the immediate supervisor & Head of department.

(5.4) Training need may be identified in three categories namely: Generalized, On Job Training and professionals.

a. **Generalized Trainings** are identified for those areas that generally boost up the proficiency level of the job.

b. **Professional Trainings** are identified for particular professional requirements to enhance the related job knowledge, exposure and expertise.

c. **On Job Training** are identified to train employee for specific functions and to be provided directly on job by any senior co-worker, immediate supervisor or any other experienced employee assigned by Head of Department.

(5.5) Identified training needs are discussed with concerned Head of Department / Immediate supervisor (if required) and finalized remarks are recorded by HR.

(5.6) **Consolidated List of Training Needs** for all departments is to be maintained and update on monthly basis by HR & QHSE based on external or internal training.

(5.7) *On job Training Schedule* is set for planning of dates By Head of Department out for all Training. Follow up of OJT schedule and its implementation is to be monitored by HR & QHSE.

(5.8) *Generalized and professional Trainings* are segregated for conduction through in-house or outside course contents as well as trainers. Institutions are to be reviewed by CEO& HOD.

(5.9) **Training plan** is separately prepared for *On Job Training, Generalized* and *Professional Trainings* on quarterly basis & to be approved by CEO During the whole period. Training Plan will be updated on system with respect to any

updating in trainings (highlighted separately). Final copy of training plan with the reflection of actual implementation will be taken at the end of period.

(5.10) Employees attending the Professional and Generalized Training would be encouraged to transfer their learning to other individuals.

(5.11) For *Professional, Generalized* and *On Job Trainings,* QHSE and concerned Head of Department is intimated through email by HR for the nomination of trainees for particular training.

(5.12) **Orientation** is prepared and maintained showing details of all the orientation that are given in a particular period of time.

(5.13) **Orientation & Training Record** is maintained for every employee separately showing details of all Training/Orientation that has been attended by him/her.

(5.14) Effectiveness of training is measured through Evaluation Forms

4.4.3 Communication, participation and consultation:

Purpose:

To ensure effective:

(1.1) Internal communication between the various levels and functions of the organization.

(1.2) Receiving, documenting and responding to relevant communication from external parties.

Scope:

(1.3) This procedure covers all areas and activities of Descon Oxychem Limited that needs communication between internal and external locations/parties.

Definition:

(1.4) DOL = Descon Oxychem Limited

(1.5) HR = Human Resource

(1.6) IMS = Integrated Management System

(1.7) HSE = Health Safety & Environment

Procedure:

Internal Communication:-

Fax Distribution:

(a) Admin. Personnel send & receive the faxes and makes entry in register.

(b) Admin. Personnel distribute the fax to concerned personnel/department and take the receiving signature on register.

Internal Memo:

(a) Internal Memo is also used to communicate different announcement / information through e-mail; in case e-mail system is not working then communication takes place through manual distribution.

Computer Module(s):

(a) Application Modules/ERP is used by departments to communicate different information/ data.

E-Mail:

(a) E-mails are also used for internal communication. E-Mail facility is also used to distribute soft copy of different documents. E-Mail record highlighting the name of concerned personnel, distribution date & time is maintained and would be considered as acknowledged copy.

Meetings:

(a) Planned & unplanned meetings are also used to discuss different issues.

Public Announcement:

(a) Public announcement is used to convey immediate message.

Training Notices:

(a) HR issues training notices to selected participants for communicating training schedule.

General Notices / Posters / Slogans:

(a) General Notices / Posters / Slogans are also used for Internal Communication.

Telephonic

(a) It is the primary medium for communication between departments and locations.

External Communication

Environmental Survey from all external parties and neighboring industries will be conducted biannually or any **defined frequency**.

All the external communication between contractors, subcontractors and suppliers are done through following defined channels.

- Formal Letters
- Fax Messages
- Telephone
- E-mails
- Forms

Any update or change in environmental legislation and HSE regulation are communicated through above defined channels.

External communication log of Environmental and HSE issues are collected by F-IMS-01 and maintained by MR or his representative.

The requirement of the Integrated Management System (IMS) is communicated to all staff including subcontractor, contractor and outsource through above enlisted channels.

4.4.6 Operational control

Purpose

The purpose of this procedure is to provide for a system and instructions, and to assign responsibilities for controlling those operations and activities that are associated with significant health, safety and environmental hazards/aspects.

Scope

This procedure is applicable to all activities, products and services carried out/produced/offered by any department/section/office of Descon Chemicals Limited & Descon Oxychem Limited.

Procedure

Operational Controls

The planning and carrying out of operations and activities will be in such a way that they are conducted under specified conditions. Operational controls may be documented through the use of work instructions, operational procedures or manual codes.

Operational controls are methods, systems, processes and equipment that safeguard the health, safety and environment. These include:

- Monitoring and control of air and liquid emissions
- Solid Waste Management
- Programs for conservation of energy and natural resources
- Vehicle exhaust and Noise level controls
- Control of suppliers / contractors

- Maintenance programs of equipment
- Work instructions for safe working on machines.

Examples of operational controls used in the department include guidance handbooks, training, the use of computer systems that direct activities, etc.

Identification and Development of Operational Controls

1. Manager QHSE is responsible for identifying operations and activities that are associated with significant health, safety and environmental hazards/aspects.
2. Section In charge conducting operations and activities associated with significant HSE hazards/aspects are responsible for planning these operations, and for ensuring that they are carried out under specified and controlled conditions. Assess the effectiveness of these controls in terms of their accuracy and control.
3. The SOPs related to these activities define the operational control measures taken to control these activities.
4. Manager QHSE along with Section In-charge evaluates the need for implementation of relevant operational controls for operations and activities associated with significant health, safety and environmental hazards/ aspects. Following issues are considered in evaluating the need:
    - Severity of potential risk/impact;
    - Legal and regulatory requirements;
    - History of related HSE incidents;
    - Relevance to the HSE policy, objectives, and targets.

5. HSE Executive will document required operational controls with Section In-charge on Operational Control Form and maintain it. This document will be available with the concerned section/workshop/office also.
6. Inspection and/or maintenance programs will be developed and implemented for equipment, machines, and systems associated with significant hazards/aspects. The following issues will be considered in identifying relevant equipment and developing inspection and maintenance programs:
    - Severity of potential health, safety and environmental impact/risk that would be caused by breakdown or malfunction of the machine or system;
    - Whether the equipment or system is used in the emergency preparedness and response program;
    - Whether the equipment or system is an operational control used to prevent or reduce the impact of HSE incident;
    - Manufacturer's maintenance recommendations;
7. Suppliers/contractors whose activities can create a significant health, safety and environmental hazard/aspect or who are involved in disposal of waste will be monitored and controlled. Where required, company's HSE policy and procedures will be communicated to them to promote health, safety and environmental awareness and implement operational controls.
8. Operational controls must be approved by the concerned manager or floor management working over the operation or activity.

4.4.7 Emergency preparedness and response:

Purpose:

The purpose of Emergency Response Plan is to develop a structured document specifying hydrogen peroxide plant and sequence of actions for effective response in case of an emergency to prevent/minimize human injury, damage to company assets and environmental degradation.

Abbreviations / Definition

CEO: Chief Executive Officer

HOD: Head of Department

QHSE: Quality, Health, Safety and Environment

ERP: Emergency Response Plan

FRTL: Field Response Team Leader

Scope

This Emergency Response Plan is applicable in future.

Role and Responsibilities:

Field Response Team Leader (FRTL):

• HOD shall be responsible for the position of FRTL. He shall carry overall responsibility for plant emergency response execution and will co-ordinate to CEO

Key responsibilities shall include:

• Providing leadership and direction in the event of emergency.

• Ensuring that appropriate task force teams are defined and prepared for various emergency scenarios.

Muster Coordinator:

• I/C HSE shall be responsible for the position of Muster Coordinator.

• I/C HSE will assess the scale of emergency and issue the directions to the emergency response team (if declared and notified Already) for mobilization.

• Ensure the consistency in communication with the team leader for instructions till the end of emergency.

• He will ask QHSE Manager for mobilization of additional resources if required to adequately deal with the situation.

• Liaise with plant supervision to withdraw the work permits.

• Ensure all escape routes and assembly areas are clearly marked by respective safety signs in the field as indicated on the site plan

• Ensure arrangements for head counting in the assembly area.

• Identification and training of emergency team along with team leader.

• Setting up the schedule for emergency and evacuation drills.

• Schedule of inspection for firefighting and other emergency equipment.

• He shall be responsible for the coordination of muster checkers.

• He shall receive the head count from muster stations.

1. Provide the following details:

2. Location of the Incident

3. Natures of incident e.g. fire, number of injuries, etc.

Muster Checkers:

Muster Checkers with coordination of Area supervisors are responsible for maintaining a current list of personnel under their area of responsibility. When an Emergency alarm is sounded, the area supervisor / muster checker shall check that all personnel are present within his area. In the event that an individual have not been accounted for at their respective muster station, the muster checker shall notify plant Muster coordinator immediately. The muster checker shall also communicate with FRTL. All muster checkers shall remain in contact on mobiles/radio until emergency is over.

Para Medic / First Aid Team:

The Para Medic shall report immediately to muster point and be ready and available to respond for any emergency situation / event that may arise. Additional assistance will be contacted as per list of emergency numbers annexure (A). First Aid team shall include those persons who must be trained first aider and they must have their own first aid boxes to deal any emergency. For rescue team see annexure 'B'.

Fire Team:

Fire team should be responsible to overcome any fire emergency. All members of fire team must be trained fire fighters and know how to deal different types of fires. For fire team, see annexure "C"

Emergency:

May be defined as a sudden event causing or having the potential to cause serious human injury and /or damage to the company assets and /or environmental degradation at large magnitude.Typical Emergency includes, Medical, Fire/ Explosion, accidental leakages of poisonous gases / Emergencies: Combustible gases, accidental releases of combustible or other

hazardous substances, accidental leakages of fluid from pressurized vessel, Accident, Natural Disaster, Sabotage, Strikes, War, Epidemic

Training:

Training of workforce to develop awareness regarding probable emergency situations and their expected response to deal with emergencies and come out of such situation as quickly as possible. Emergency evacuation routes and gathering area will be clearly defined and communicated to all. Employees from different departments will be voluntary taken and trained as per need. Boards shall be displayed at conspicuous locations to guide people during emergencies. Plant layout plan will be attached with ERP.

Emergency Drills:

Emergency drills will be conducted regularly (Quarterly basis) in order to assess the effectiveness of ERP and preparedness of workforce to handle emergencies and to make workforce realize their roles and responsibilities during emergency.

Corrective Actions:

Any discrepancy observed during emergency will be reported to HOD and he will communicate it to concerning HODs keeping CEO in loop.

Corrective actions will be taken and decisions made in HSE committee meeting. Recommendations for amendments in ERP will be given.

Revision of ERP:

ERP will be revised on regular basis in order to incorporate any change in system and any recommendation from HSE committee. Revised copies of ERP will be circulated and provided where needed.

Field Response Team Organization:

Action during Emergency:

- During emergency all personnel shall vacate the work place. Before leaving, each person shall ensure that the area is as safe as possible by running machines. External help will be required by muster coordinator Responsible persons shall take the lead to handle emergency before external help arrives. Plant will be handed over to emergency team on their arrival. All personnel shall muster at the declared assembly points. The designated members of the HSE team shall provide guidance and assistance to reach the assembly points.

Fighting the Emergency (Fire):

- After the emergency has been declared, following teams would be performing their duties accordingly

1- Firefighting Team

Firefighting team will comprise of:

a) Fire Extinguisher team:

This team will use extinguisher to kill the fire as per its type.

b) Fire Fighting Team (Fire Water Pump):

This team will work in three different modes.

- Hydrants / Pillar Hydrants

This team will use Hydrants and pillar hydrants

- Water Monitors

7 bar Water monitors will be used by this team

- Foam Monitor (AFFF)

This team will use this equipment to kill the fire. With water and 3% Aqueous Film Forming Foam.

2- First Aid Team:

First aid team will treat the victim and take to the hospital if necessary.

3- Rescue Team:

Rescue team will have Self Contains Breathing Apparatus, and will retrieve the trapped and injured person and transfer them to the first aid team.

4- Maintenance Experts:

Maintenance expert's team will detect the fault and will do the remedial action immediately after the fire extinguished.

Every supervisor shall ensure the following:

• All work is stopped at once.

• All equipment is shut down and put in a safe place.

• All men are evacuated to a pre-determined assembly points in an orderly manner.

• Advise security to open the main gate for emergency vehicles.

• A roll call is taken and every man is accounted for, awaiting further instructions

• Keep the zone, affected by the emergency, clear and remove any vehicles that could cause a restriction to the emergency team

Reporting:

- All muster checkers will report to muster coordinator by Mobile.
- Muster coordinator will report to FRTL by Mobile.
- After working 1800 hrs the working supervisor will be muster coordinator.

Communication During emergency:

Supervisor / lead man or any other will inform HSE office by phone/mobile.

- Complete Information about incident
- Location of Incident
- Nature of Incident

Para-medic will move with the ambulance immediately towards the Plant if required.

I/C HSE will inform to HOD immediately about emergency and ask for external help.

List of emergency Numbers is attached as Annexure "A"

General Hospital	042-9264091-8
Mayo Hospital	042-9211100
Services Hospital	042-9203402-25
Jinah Hospital	042-9231400
Ganga Ram Hospital	042-9200572-9
Punjab Institute of cardiology	042-9203051-6
Fatima Blood Bank	042-5863950
Edhi Control	115
Fire Brigade	16
Rescue Force	1122
Bomb Disposal	042-9212111
Police	15
Sarwar Hospital	03009461962(DrShahid)
Sarwar Hospital	03334342808(Aaquib)

Annexure B First Aid Team

Sr.No Name Department

01. Imran Butt Production

02. M.Asif Production

03. Muhammad Aslam Store

04. Hafiz Arsalan Production

05. AqibHussain Mechanical

06. Asif QHSE

07. RaziUllah QHSE

08. Irshad Mechanical

Annexure C Fire Fighting Team

Sr.No Name Department

01. Abu Huraira E&i

02. Zubair Anwar

03. Umar Hamid Production

04. Nasir Abbas

05. Rawaiz Khan Mechanical

06. Zulfiqar Ali QHSE

07. Faisal Bilal

08. Zahoor Ahmad

09. Basharat Ali Production

10. RanaRaza

Annexure D Rescue Team

Sr.No Name Department

01. Muhammad Nauman

02. Muhammad Imran

03. M.Boota E&i

04. MubeenJamshed QHSE

05. Gulzar AhmadTechnical

06. Muhammad Arshad

07. Khushnood

08. Mehmood Khan Mechanical

Annexure E Maintenance Team

Sr.No	Name	Department
1.	AhsanTaqweem	Technical
2.	Hassan Imran	Technical
3.	AqibHussain	Mechanical
4.	Zulfiqar Ali	QHSE
5.	M.Afzal	E&i
6.	TahirRasheed	QHSE
7.	Imran Saleem	Mechanical
8.	Mr. Naeem Anwar	E&i

4.5.2 Evaluation of compliance:

Purpose

To establish and maintain arrangements to ensure the effective implementation and evaluate compliance periodically against the applicable legal requirements (Environmental)

Scope

This procedure covers identifying, correcting and preventing regulatory violations associated with the laws, regulations, and other requirements established at the federal and local levels that apply to all areas and activities of DOL.

Responsibilities

QHSE Manager is the owner of this procedure.

MR is responsible for the implementation of this procedure

Procedure

Compliance Assessments

Compliance assessments are accomplished through routine inspections to ensure that conditions and other regulatory requirements associated with DOL operations are met on a continuous basis.

These inspections include, but are not limited to:

Inspection/Activity	Frequency	Performer
Emission	Six monthly	
Ambient air	Six monthly	
Drinking water	Six monthly & as and when required	In House Lab
Effluent	Monthly	In House Lab
Noise	Yearly	In House Lab
Third Party Audit	Six monthly	Certification Body
HSE Department Audit	Quarterly	HSE Department

Review of Compliance

All quality, health, safety & environmental requirements and their compliances are verified and reviewed in Management Review Meetings. If any need to amend the legal requirements is observed then MR is responsible to take actions for the implementation of amendments in the laws.

Periodic regulatory inspections are conducted to ensure DOL is meeting the minimum guidelines defined in the laws and regulations associated with the DOL operations.

Correction of Deficiencies

MR is responsible for correcting all deficiencies identified through either internal or external inspections, HSE audits, or as a result of new or modified regulations or any change in activities or purchase of new equipment.

4.5.3.1 Incident investigation:

Purpose

The purpose of this procedure is to develop guidelines for recording of incidents, seek out the direct and indirect causes of incidents, identify the need for corrective action(s), identify opportunities for preventive actions to avoid the recurrence and continually improve the HSE performance.

Scope

This standard operating procedure is applicable to all departments of Descon Chemicals Limited & Descon Oxychem Limited.

Abbreviations and Definitions

HSE Health, Safety and Environment Department

I/C In-charge

Incident: Work-related event(s) in which an injury or ill health or fatality occurred or could have occurred.

Accident: An incident which has given rise to injury, ill health or fatality.

Near Miss: An incident where no injury, ill health or fatality occurs.

Ill health: Identifiable, adverse physical or mental condition arising from and/or made worse by a work activity and/or work-related situation.

Lost Time Injury (LTI): Any work–related injury that causes the employee's absence from scheduled work for one day (or shift) or more excluding the day of injury

Restricted Work Injury (RWI): When as a result of a work-related injury, health care professional recommends keeping an employee away from doing the routine functions of his or her job or from working the full workday that the employee would have been scheduled to work before the injury or illness occurred.

Medical Treatment (MT): Significant work related injuries beyond first aid that are diagnosed and / or treated by a physician or other licensed health care professional. These include any work related case involving a fracture or cracked bone, or a punctured eardrum etc.

First Aid (FA): Immediate help given to a victim of injury or illness by a bystander until appropriate medical help arrives or the victim is seen by a healthcare provider.

Procedure

Incident Recording

1. Anybody who notices a near miss can report the same using Near Miss Report and will recommend corrective/preventive actions. Near Miss Report can be submitted to HSE Executive at any time. Manager QHSE will review the case and adequacy of recommended actions, and will add his input, if required. HSE Executive will get these actions implemented by responsible person(s) and verify their effectiveness. After verification by HSE Executive, Manager QHSE will close out this report. HSE Executive will maintain the record of all such reports.
2. If an incident occurs, concerned I/C Section will take remedial measures using the available resources and shall inform QHSE department.
3. As soon as Manager QHSE comes to know about the incident, he/she will send HSE Executive to visit the incident area and collect first hand information about the incident.

4. If the incident results into a bodily injury, ill health, property loss or leads to a case of environmental pollution, I/C Section will prepare the Incident Report and submit it to HSE office within 24 hours. Incident report may be prepared using either English or Urdu language.
5. First aid cases will be recorded at First Aid Point. The sections where trained first aiders are present and first aid boxes are available, first aid cases will be recorded on First Aid Record Sheet.
6. I/C Section will contact HSE office if he has any difficulty in preparing the incident report on the specified format.
7. After submission of incident report, Manager QHSE will review it and write down his remarks. If Manager QHSE is dissatisfied with the remedial measures taken, he may ask for more effective corrective/preventive action(s).
8. Finally, concerned Plant Manager will review the incident report, write down his remarks and will recommend incident investigation, if required.
9. Manager QHSE will dispatch a copy of completed incident report to concerned Manager and I/C Section for necessary actions, if recommended. For incidents related to administrative/disciplinary affairs, the report will also be shared with Manager Administration.

Incident Investigation

1. In case of a fatality, lost time injury, major property loss or major environmental pollution case; Plant Manager shall recommend incident investigation and incident investigation team will be formed within 24 hours by Manager QHSE.

2. Investigation team will start its work within 24 hours after the formation of team, with an aim to identify the need for corrective action(s) and/or opportunity for preventive action(s).
3. The investigation team will gather information about the initial facts, which contributed to the incident. They will gather and record all the facts, which may be of interest in determining causes. They will further get the statements from the people involved or injured and witness(s).
4. The investigation team shall search out the root cause(s) and calculate direct and indirect incident costs including the potential cost involved in corrective/preventive action(s).
5. Based upon the root causes of incident, investigation team shall recommend corrective/preventive action(s) with fixed responsibilities and target dates to avoid the incident in future.
6. The investigation team will submit Incident Investigation Report within three working days after investigation is started.
7. Manager QHSE will review the recommended measures and if found satisfactory, approve the same. Otherwise, he/she, along with the investigation team, will recommend more effective measure(s).
8. Manager QHSE will get it reviewed by concerned Manager and Plant Manager. All the reviewers shall confer their remarks too.
9. In order to ensure prompt implementation of recommended measures, follow up will be carried out jointly by HSE Executive and a member of investigation team.
10. HSE Executive will inform Manager QHSE for any delay/interruption regarding implementation of recommended measures. Manager QHSE will discuss the matter with concerned authorities to get measures implemented.

11. After verification of implementation and effectiveness of measures taken, Manager QHSE will close the matter.
12. A copy of the report will be forwarded to Plant Manager, and for administrative/disciplinary matters, to Manager Administration also, for information.
13. HSE Executive will maintain all incident related records.

Incident Analysis

1. Manager QHSE will analyze incident data on monthly basis.
2. Incident analysis will include but not limited to find out time loss, identification of common causes of incidents, areas/activities with maximum number of incidents and common nature of incidents.
3. Based on this analysis Manager QHSE will recommend effective preventive actions to reduce accident rate and continually improve HSE performance and will also identify the need for job specific/area specific training(s), if required.

Appendix 2

Additional plant specific SOPs:

1) Master List of Safety Arrangements:

Purpose:

a) To prepare individual lists related to safety programs

b) To prepare a master list and update it periodically (ideally once a quarter).

Individual Lists Related to Safety Programs

- List of trained & certified fire fighters (names & departments)
- List of trained & certified first-aiders (names & departments)
- List of locations where first aid box is available
- List of items in first aid box
- List of Safety Committee members
- List of safety trainers
- List of Fire extinguishers (ID, type & location)
- List of fire alarm points.
- List of fire hydrant points & hose boxes
- List of ladders
- List of staircases
- List of equipments governed by lockout tag out procedure.
- List of Hazardous Chemicals (name, storage location, quantity)

- List of identified emergencies.
- List of electrical earth pits at site (with layout).
- List of safety showers & eye wash points (with locations)
- List MCCs (with locations)
- List of Emergency Services (as per Emergency response plan)

Procedure:

- Safety-in-Charge is responsible for this procedure.
- Prepare the individual lists.
- Maintain them in a master file.
- Review & update every list once a quarter.

2) Permit to Work:

Purpose:

- To Establish & maintain a safe work permit system for jobs involving major hazards.
- To minimize accidents by defining safety controls for potentially hazardous jobs.

Why Safe Work Permits?

a) Certain jobs pose hazards. Accidents can happen while doing these jobs.

b) Performing these jobs needs little caution & care.

c) If we identify the hazards & define controls for minimizing them, accidents will remain away from us.

d) Hence these jobs should be brought under the previews of Safe Work Permit System.

e) In simple words, it means that -

(i) Certain jobs will require that a Safe Work Permit be issued by a qualified individual.

(ii) And the controls defined in the Permit shall be followed by the job performers.

(iii) Permits shall be issued to specific persons for specific time period & for specific job

How does the Permit System work?

1. A job is taken up by the permit recipient, Work Supervisor & his operators.

2. Check whether the job falls in the preview of Safe Work Permit System.

3. If "No", you do not need a Permit.

4. If "Yes", you need a Permit.

5. Refer the table provided & identify which Permit you need.

6. Make the job location ready.

7. (Refer the checklist).

8. Permit recipient takes permit from HSE department fills it and takes safety clearance.

9. Safety officer inspects the location. If he is satisfied with the safety arrangements, he agrees to issue a permit.

10. Safety representative may ask for additional safety requirements to fulfill (depending on his evaluation of job, site & other conditions), which he will enter into the Permit.

11. After safety clearance permit recipient takes permit to issuing authority. Who signs and release the permit for job.

12. Permit is then prepared in three copies.

a. Original copy will remain with issuing authority.

b. Second copy will be given to executer.

c. Third Copy will be displayed on PTW Board

13. Original of permit is kept open in the issuing authority's office.

14. Permit recipient explains the Permit conditions to operators at the work site.

15. Work is then executed by Work Supervisor & operators in line with the safety precautions stated in the Permit.

16. Safety Rep visits the work site during conduct of work, inspects safety performance & signs the permit with his remarks.

17. Job is completed. Permit recipient returns his copy and PTW copy to issuer.

(If job is not completed on the same day, the Permit is terminated & a new Permit is made on the next day)

18. Issuing authority closes the permit with his remarks in coordination with safety authority

19. All copies will be returned to concerned departments

20. The Safe Work Permits are audited once every 3 months.

Records:

1. Review of Permit system
2. Hot work permit
3. General safe work permit

3) Site Security:

Purpose:

The purpose of this specification is to describe the primary functions in security necessary for the prevention of loss of equipment, materials etc. due to carelessness, negligence, vandalism and pilfering.

Scopes:

This specification defines the rules, regulations and responsibilities which must be implemented in order to effectively control security operations on the plant. The main objective of security is to protect the property from fire & theft and to stop the unauthorized entry in to the specified area. The company's security rules and regulation will be incorporated to the maximum possible extent in to the job plant security rules as per company policy

Procedure and Responsibilities:

Responsibilities

The QHSE Manager will be responsible for implementing the Security Plan, monitoring and supervising its implementation and administering the subsequent operations.

1.Security Organization

Security guards will be placed on all check posts (inside the facility and all access roads and at the main gate) for patrolling. They will report to security supervisor officer.

2. Entrances and Boundaries

• Boundary fencing must be sound and effective Barbour type fencing is recommended; in addition to its other properties it allows maximum visibility. External fences shall be at least 4 feet high and have a 45o hangover with at least three strands of barbed wire.

• The Security Officer shall be responsible for making regular inspections of all boundary fences to check for any possible break. Repair must be carried out on emergency basis, if reported /observed.

3. Identification of Employees

Personal ID Cards

• Descon Oxychem and sub-contractor employees working on plant will be issued plant identity cards on completion of the HSE induction course as per DOL requirement and company procedures.

• All employees on plant must carry their plant identity card at all times, Noncompliance with this rule can exclude the person from the plant until the identity card is produced.

• The Admin / HSE at plant reserves the right to check any issued plant identification cards at any time.

• When a person leaves the plant on termination or transfer he must return the plant identity card to I/C Admin office. Loss of identity card is to be reported.

4. Timekeeping

It is the responsibility of the plant management to control the timekeeping of all employees in accordance with the rules.

5. Visitors Procedure

• The temporary visitors will be provided with the visitor's card after registration of their name, reason for visit and the National ID Card Number with respect to the company. The visitor card will be signed of and returned to the gate at the end of visit. A responsible person will accompany visitors all times on plant until or unless they are properly inducted and issued with a full identity card. Plant visit will not be allowed without required PPE's.

• Visitors to subcontractors will only be allowed on plant with prior approval of the DOL management after providing the appropriate Personnel Protective Equipment.

• The Security Guard will ensure that all visitors are made aware of any smoking regulations, which are in force on site and of fire and emergency evacuation procedures and HSE regulations.

6. Suspicious Person

Following procedure must be adopted in case of suspicious person

• Report to the security officer of any suspicious person who loiters around the gate area or outside the walls / fence or inside the plant.

• Take down his/her details i.e. dress, appearance, height etc.

• Be suspicious of anyone who starts a friendly conversation and ask about any security measures in place.

• This not includes place of work but socially as well.

• Do not chat with unknown and give out details of where and who work for.

• Report any incident involving any of the above.

7. Gate Control

• No movement will be allowed for security reasons unless authorized by site management or there is an emergency. Security guards must escort the movement.

• No material will be allowed to IN / OUT without proper Inward / Outward gate passes.

8. Vehicles Entering Site

• The Vehicle entry Permit for all the vehicles required at plant will be issued in accordance with DOL procedure and this will be placed in a prominent location of the vehicles. Whereas, the visitor's vehicles and vehicles performing temporarily at site, the security supervisor will issue a temporary vehicle pass after permission from competent authority.

• The Security Guard is responsible for completing the Vehicle Entry Log Book/Form for all vehicles entering and leaving the plant.

• Drivers of all delivery and collection vehicles must remain with their vehicles whilst they are within the vicinity.

• The Security Guard must check all contractors, vehicles leaving the plant and when such vehicles contain materials and/or equipment, an appropriately signed Authorization to Remove Material Form must be produced before exit is allowed.

• Car parking for DOL and sub-contractors employee vehicles should be at their designated parking area.

• The DOL representative reserves the right to conduct search on any vehicles at plant site.

9. Escort Guards

Fully Armed Escort guards will be provided in areas mentioned above and as per requirement and nature of activity.

10. Prohibited Items

The possession of the following items on site is forbidden. Nobody will be allowed to carry any one of these articles.

• Any purpose made weapon

• Firearms

• Illegal drugs/ Alcohol

• Intoxicants

11. Storage of Materials

Receipt of all deliveries of materials and equipment to the site is the responsibility of the store department. Consideration shall be given to the security of all items of value to prevent their unauthorized removal.

12. Cash on Site

DOL and its sub-contractors employee's wages are the responsibility of the concerned accordingly. All necessary arrangements will be made in this regard to arrange the payment to staff in due course of time. Cash must be properly locked and kept at minimum level possible.

13. Notice Board

The important matters and authoritative instructions by Admin and plant HSE will be conveyed to security staff through notice board.

14. Reporting of Losses

Every incident involving loss or theft must be reported immediately to the respective line supervisor who will inform to I/C HSE. The management must commence enquiry through committee of I/C Admin, I/C HSE and investigate such losses as soon as possible. I/C Administration will (with the approval of the Top Management) inform the local police if required.

The report should include the following details:

- The nature of the loss, place and circumstances of the occurrence and the exact date and time
- A detailed description of the items missing, quoting where applicable, plant numbers, registration numbers and any relevant information, which will assist in identifying the equipment, involved.

15. Personal Property

Care must be given to employee's personal property. Contractors are responsible for providing adequate lock-up facilities for employees.

16. Bomb Threat / Blast

The safety of lives comes before the safety of materials.

In the event of bomb threat and bomb blast, follow the following security incident checklist.

• Immediately inform the concerned agencies (Bomb Disposal, Police, Ambulance, fire Brigade), vacate the area as quickly as possible.

• Barricade the area and count the workforce.

• Human life saving is the priority, help those that has a chance of survival first, i.e. body with a missing head does not need to be attended.

• Do not corrupt the scene, i.e. use one route in the blast area and the same route out (mark the route later with tape), do not pick up pieces of debris/human remains unless it is hindering a casualty evacuation.

• Only move casualties if they can walk don't drag any injured person if it is only going to increase their suffering or worsen condition.

• The only exception to this if there is a suspected secondary device or if the casualty is near fire, i.e. further risk.

• Ask any survivor what the source of the bomb was i.e. if it was a briefcase, parcel or bag etc.

• In the event that you have to evacuate the area due to suspected secondary device or fire, then find a safe behind hard cover, check that area first for any suspicious objects/device. Once it is clear then gives the all clear to the casualties and staff.

• Communicate with the control room / Security Supervisor for the best route in for the paramedics i.e. as near they can get to the casualties but away from any suspected secondary device or fire.

• Be aware that both you and casualties will most likely be in stock, carry out your duties to the beat of your ability and try and remain calm. Medical help will arrive as soon as possible.

• Give Police a guide as to what is the safest direction to approach from.

• If there are casualties then try and get them out of danger and provide first aid. HSE will handle casualties as per HSE plan.

• Where feasible get a position where the incoming reaction force will see you, be prepared to give the reaction force Head Guard and quick verbal brief.

17. Mob / Riots

• Local Police will be called in immediately by the Admin / I/C Security or Security Room. District Administration and other concerned authorities will be informed simultaneously.

• If the life of the staff and employees is in danger of death or serious injury, the threat will be responded to, on the order from management / I/C Security.

• Peaceful and direct means will be used by Admin I/C Security to cool down and halt the mob at the gate. The I/C Admin / Security Supervisor will hold negotiations with the mob and every effort will be made to satisfy the genuine grievances of the mob.

• If mob is not armed with weapons and is trying to break-in, security officer/Head guard of the security control room will warn the mob in local language / Urdu “Halt and cease movement, otherwise forceful means will be used by force and armed guards to stop the entry”.

• The situation will be monitored and if need be support will be sought from District Administration and Local Police by Admin / I/C Security.

• Every effort will be made to protect the personnel and assets of company.

• To put pressure on the mob/crowd, aerial firing may be ordered with the permission from the management.

• Other posts will be informed about the situation to remain “standby” to reach immediately on the scene to quell the mob / rioter on the orders from Management / I/C Security or Security Supervisor.

18. Pets

DOL and its sub-contractor personnel are not allowed to keep pets or other animals on the site.

4) Work Place Safety:

What Is Workplace Safety?

Workplace safety is about preventing injury and illness to employees, contract men and visitors in the workplace. Hence, it's about protecting the organization's most valuable asset and its workers.

Job Safety Analysis

To make the workplace safer, the organization has to acknowledge which potential health and safety hazards are present.

The organization has to determine *where* and *what* and *how* a worker is likely to become injured or ill. It starts with analyzing individual work areas for hazards.

Generally following hazards are seen in the factory & office environment:

- chemical (toxic, flammable, corrosive, explosive)
- electrical (shock/short circuit, fire, static, loss of power)
- ergonomics (strain, human error)
- excavation (collapse)
- explosion (chemical reaction, over pressurization)
- fall (slip/trip from heights or walking on uneven surfaces)
- fire / heat (burns to skin and other organs)
- mechanical (vibration, body part exposed to damage)
- noise (hearing damage, inability to communicate, stress)

- radiation (X-rays, UV rays, Lasers)
- struck by (falling objects and projectiles hit a person & injure body)
- struck against (person hitting an object / machine & getting injuries)
- temperature extreme (heat stress, exhaustion, hypothermia)
- visibility (lack of lighting or obstructed vision that results in error or injury)
- weather phenomena (snow, rain, wind, ice that increases or creates a hazard)

Workplace safety program

The policy, procedures & training used by the organization to enhance safety of employees, contract men & visitors while working for the organization are considered part of a workplace safety program.

Workplace safety programs aim at

- promoting and rewarding safe practices at work
- reducing injuries and illnesses at work
- eliminating fatalities at work

Workplace injury and illness prevention

Work-related injury and illness prevention falls into eight categories:

- engineering controls
- initiative controls
- personal protective equipment controls
- written procedures and safe work practices
- exposure time limitations

- monitor and use of hazardous materials
- alarms, signs and warnings
- Training.

Workplace safety initiatives can be as simple as –

- closing and locking the front door
- replacing burned out lights
- closing drawers before walking away from the desk or file cabinet
- knowing and using proper lifting techniques
- providing adjustable workstations
- eliminating repetitive motion
- Using the proper tool for the job in an appropriate fashion.

Create ownership for the program

Workers are affected not only by their own actions but also by the actions of their co-workers. Hence safety becomes a group activity &the owes is with the group. The responsibility / ownership for a safety program of the group should be clearly assigned to one person in the group acting as group leader for that particular safety program.

Measure performance

In safety and health, continuous improvement involves seeking better ways to work, measuring performance and reporting against set targets. It is also about systematically evaluating compliance with procedures, standards and regulations, understanding the causes of incidents and injuries; and openly acknowledging and promptly correcting any deficiencies.

Performance measurement can be:

- reduction in lost-time injury frequency
- reduction in medical treatment injury frequency (beyond first aid care)
- reduction in sick days used
- lower workers' compensation costs
- lower medical benefits payments (doctor's visits, prescription drugs)

Procedure:

This procedure is to be used for those jobs that pose hazards or have encountered incidents / near-miss & you do not have an SOP for the job.

- Identify the job involving major hazards.
- Do a jobs hazard analysis.
- Make a workplace safety program for the job.
- Assign ownership of the program to a person.
- Implement the safety program.
- Measure performance of the safety program.
- Once the safety program is imbibed, convert it into a SOP

5) Firefighting Equipment Inspection

Purpose:

1. To insure that the devices will work properly when needed, minimizing injury & property damage from fire.
2. Inspecting frequency : Once a month

Procedure:

1. The QHSE department maintains a spreadsheet named "Fire Extinguishers Inspection Report/ Water Hydrants, Pillar Hydrants, Water/ Foam monitors, Hose Pipes/Hose reel boxes/ Fire Alarming System.

2. Spreadsheet is pasted on the notice board HSE personnel inspects equipments and signs on the spread sheet in every shift.

3. After one month when format is filled spread sheet is filed in the record

4. The Safety-in-charge checks for the completeness of the scope of work.

How to Inspect:

Fire Extinguishers

1. Ensure access to the extinguisher is not blocked

2. The pressure should be within the recommended level on extinguishers equipped with a gauge. The needle should be in the green zone. If the needle is not in **green zone,** the extinguisher requires professional maintenance and this should be noted on the inspection report.

3. Verify the locking pin is intact and the tamper seal is not broken.

4. Visually inspect the hose and nozzle to ensure they are in good condition.

5. Visually inspect the extinguisher for dents, leaks, rust, chemical deposits or other signs of abuse / wear and note any findings on the inspection report. If the extinguisher is damaged or needs recharging, remove it from service and note this on the inspection report.

6. Fire extinguishers must be pressure tested (a process called hydrostatic testing) every six years to ensure the cylinder is safe to use.

Hydrants/Monitors

1- Visual inspection of hydrants/monitors
2- Check leakages
3- Check operating system/parameters
4- Visual inspection of hose reels/hose pipes, jet nozzles
5- Check availability of foam AFFF
6- Check water supply/ pressure from main fire water pump
7- Ensure firefighting pump is in operable condition

Fire Alarm System

1- Visual inspection of all MCPs (manual call points), smoke detectors, Horn strobes, Hooter, control panels
2- Check the integrity of fire alarming system after 04 months by operating them

Training and Record Keeping

1. Fire extinguisher inspection record.
2. Monitors/Hydrants/FAS inspection record

6) Fork Lift Operation:

Purpose:

To define checks for safe forklift operation

Procedure

1) Display the following board in forklift operating area.

"Causes of Accident of Forklift".
• Excessive speed.
• Not looking in the direction of travel.
• Carrying / lifting passengers.
• Poor stacking procedures.
• Poor forklift maintenance.
• Inadequate operator training.
• Exceeding the rated capacity of the forklift.
• Travelling with the load rose.
• Getting on and getting off a forklift.

2) Only trained & certified operators shall operate the forklift.

3) Display the maintenance schedule of forklift at appropriate location & update it.

4) Perform daily checks before starting the forklift.

Daily Checklist for Forklift

A. Start Position

1. Ensure that the forklift is clean.
2. Check engine oil level.
3. Check battery water level &Sp gravity.
4. Check tyre pressure.
5. Check transmission oil level.
6. Check functioning of accessories viz. horn, reverse horn, headlights, tail lights, parking lights etc.
7. Ensure forklift is in neutral gear position.
8. Ensure handbrake / Parking brake is in position.
9. Ensure forks are able to lift up to maximum height limit and in good working condition. Also check the fork tilting operation without any jerks.
10. Check steer-wheels are straight.
11. Ensure forklift front way is clear and un-obstructed.
12. Ensure forklift makes smooth start without jerks.
13. Ensure the battery charging terminals are removed & Battery charger is switched **off**.
14. Ensure that tyre condition is good enough.

B. Pick-Up Position

1. Forks must not scrape the ground while entering pallet.
2. Positioning of forks inside the pallet must be even & proper.
3. Load lifting / lowering should be smooth & without any jerks.
4. Ensure that the fork smoothly tilts after lifting load a little.
5. Ensure that the noise of engine & emission from exhaust is under control.

C. Travel through Course — Forward And Reverse

1. Forks / Mast should not hit walls, columns etc.
2. Never do Jerky driving.
3. Do not put hands or legs outside body of machine.
4. Use brakes & not the inch-brake pedal, particularly on ramp.
5. Never use Parking brakes for normal braking operation.
6. Ensure that the Brakes are operating properly while taking a reverse.

7) Lockout Tagout:

Policy

a) Any individual engaging in the maintenance, repairing, cleaning, servicing, or adjusting of powered machinery, or equipment in the plant will abide by the procedures outlined in this document.

b) Lockout is a first means of protection. Warning tags only supplement the use of locks. Tags alone may be used only when the application of a lock is not practically feasible and with approval of the appropriate supervisor.

Purpose

To ensure that all individuals in the factory are protected from accidental or unexpected activation of mechanical and or electrical equipment during maintenance, repairing, cleaning, servicing, or adjusting of machinery or equipment.

Definitions

	Term used	**Definition**
a)	Lockout	The practice of using keyed devices ("locks") to prevent the unwanted activation of mechanical or electrical equipment.
b)	Tagout	The practice of using tags in conjunction with locks to increase the visibility and awareness that the equipment is not to be energized or activated until such devices are removed.

		Tag out devices will be of the non-reusable type, attachable by hand, self-locking and non-releasable with a minimum unlocking strength of no less than 50 pounds.
c)	Activation Energization	To set machinery into motion by starting, switching or otherwise engaging power sources for such equipment. To provide a flow of electricity or complete a circuit that is the main power source for the machinery / equipment.
d)	Energy Control procedures	Use of lockout / tag out equipment to ensure safe work practices.

Responsibilities of Safety-In-Charge

a. Provide annual training to concerned employees on lockout/ tag out procedures.
b. Inspect a sample lock-out / tag-out activity at least once every a quarter.
c. Inspection must be carried out by persons other than those employees directly utilizing lock-out tag-out procedures.

Specific Procedures

1. Preparation for Lockout / Tagout

Maintain a file of equipment, machinery, and operations that require the use of lockout / tag out procedures. The file will include the location, description, power source, and primary hazards of equipment / machinery, a list of the primary operators / maintenance personnel, and a list of lockout / tag out equipment that is used and maintained on site.

2. Sequence of Lockout Or Tagout System Procedure

a) Notify affected employees that a lockout or tag out system is going to be utilized and the reason therefore. The authorized employee shall know the type and magnitude of energy that the machine or equipment utilizes and shall understand the hazards thereof.

b) If the machine or equipment is operating, shut it down by the normal stopping procedure (depress stop button, open toggle switch, etc.).

c) Operate the switch, valve, or other energy isolating device(s) so that the equipment is isolated from it energy source(s). Stored energy (such as that in springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down, etc.

d) Lockout / Tagout the energy isolating devices with assigned individual lock(s) or tag(s). (Put the lock / tag on the power switch).

e) After ensuring that no personnel are exposed and as a check on having disconnected the energy sources, operate the push button or other normal operating controls to make certain the equipment will not operate.

CAUTION: Return operating control(s) to neutral or off position after the test.

f) The equipment is now locked out or tagged out.

3. Restoring Machines or Equipment To Normal Operations

a) After the servicing and/or maintenance is complete and equipment is ready for normal production operations, check the area around the machines or equipment to ensure that no one is exposed.

b) After all tools have been removed from the machine or equipment, guards have been reinstalled and employees are in the clear, remove all lockout or tag out devices. Operate the energy isolating devices to restore energy to the machine or equipment.

4. Procedure Involving More Than One Person

In the preceding steps, if more than one individual is required to lockout or tag out equipment, each shall place his / her own personal lockout / tag out device on the energy isolating device(s).

5. Temporary Removal of Lockout / Tagout Devices

a) In situations where lockout / tag out devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequence of actions will be followed:
b) Remove non-essential items and ensure that machine or equipment components are operationally intact.
c) Notify affected employees that lockout / tag out devices have been removed and ensure that all employees have been safely positioned in the area.
d) Have employees who applied the lockout / tag out devices remove the lockout / tag out devices.
e) Energize and proceed with testing or positioning.
f) De-energize all systems and reapply energy control measure i.e. the locks & tags.

8) Activity PPE Chart:

Purpose:

To define Personal Protective Equipments to be used while performing activities that pose safety& health hazards to operators.

Procedure:

1. Before starting a job / activity, refer to the Activity – PPE Chart and identify the associate hazard & the PPE to be used.
2. Wear the selected PPE throughout the job / activity.
3. Report to the I/C HSE if anyone is not using PPEs.

Eye And Face Protection Selection Chart		
Source / Activity	***Hazard***	***Protection***
Impact: Grinding, machining, masonry work, drilling, powered fastening, riveting and sanding.	Flying fragments, objects, chips and particles.	Spectacles with side protection, goggles, and/or face shields.
Heat : Welding	Hot sparks.	Goggles, spectacles with side protection. For severe exposure use face-shields.
	High temperature exposure.	Screen face-shields, reflective face-shields.

Charging powders Cleaning with air	Dust.	Goggles.
Welding – Electric Arc	Optical Radiation	Welding helmets or shields. Typical shades: 10-14.
Welding - Gas	Optical Radiation	Welding goggles or face-shields. Typical shades: gas welding 4-8, cutting 3-6, brazing 3-4.
Cutting, Torch Brazing, Torch Soldering	Optical Radiation	Spectacles or welding face-shield. Typical shades: 1.5-3.
Lasers	Thermal exposure, acoustic, photochemical	Protective eyewear with an optical density for the specific application. Refer to the laser manufacturer's operations manual
Chemicals: chemicals handling, transferring, storage.	Splash	Goggles, eyecups, face-shields. See Material Safety Data Sheet for appropriate eye and face protection.

	Vapor and Gas Exposures	Goggles must be non-ventilated. See Material Safety Data Sheet for appropriate eye and face protection.

Foot Protection Selection Chart		
Source / Activity	***Hazard***	***Protection***
Impact: carrying or shifting heavy materials. Falling objects.	Lifting hard edge objects, weighing 10 pounds or more, at waist level should be considered a hazard.	Safety shoes or boots complying.
Compression: Manual and powered material handling equipment, bulk rolls and heavy tools.	Rolling or pinching equipment and objects.	Safety shoes or boots complying.
Construction and demolition activities.	Stepping on nails, tacks, screws, large staples, scrap metal or glass.	Safety shoes or boots with puncture resistant soles.
Electrical : Installation and maintenance of electrical	Electrical shock and	Electrical insulating safety

equipment	electrocution.	shoes.
Chemical: chemicals handling and transferring, storage.	Splash - skin burns and absorption toxicity.	Impervious rubber boot or bootie covering the shoe. Pant leg or lab coat should pass over top of boot/shoe to prevent chemical from entering.

Head Protection Selection Chart		
Source / Activity	***Hazard***	***Protection***
Impact / Penetration : Construction, repair, demolition and working in plant	Overhead hazards, Falling objects.	Type A, B, C Protective Helmets.
Electrical: Electrical utility installation and repair.	Electrical shock and electrocution.	Class A Protective Helmets (Impact/penetration protection and proof tested to 2,200 volts).
		Class B Protective Helmets (Impact/penetration, protection, and proof tested to 20,000 volts).

Entanglement: working with rotating machinery.	Hair becoming entangled in moving parts.	Caps or other protective hair coverings.

Hand Protection Selection Chart		
Source / Activity	***Hazard***	***Protection***
Sharp tools / materials: Cutting, dissecting, handling sharp objects.	Lacerations from blades, knives, glass, sheet metal. Splinters from rough lumber. Severe abrasions.	Leather, wire mesh or stitch gloves, cut-resistant rubber gloves.
Heat: Cooking, welding, soldering, brazing, steam line / furnace repair, autoclaves.	Thermal Heat / Burns.	Leather gloves, flame-retardant gauntlet gloves, chemical treated cloth gloves.
Extreme cold: Handling cold materials, Dry ice.	Frostbite.	Permeable or impervious non-insulated gloves, permeable or impervious insulated gloves.
Electrical: Electrical utility installation and	Electrical shock and electrocution.	Rubber insulated voltage rated gloves, other gloves rated for

repair.		electrical work.
Chemical: chemicals handling and transferring.	Causing dry skin, dermatitis, burns, irritation or ulceration	Gloves composed of chemically resistant material. Refer to the Material Safety Data Sheet

Hearing Protection Selection Chart		
Source / Activity	***Hazard***	***Protection***
Noisy Equipment: High speed tools, Compressors, DG, Blowers, Boilers.	Noise induced hearing loss.	Ear plugs, ear muffs with the appropriate Noise Reduction Rating (NRR).

Respiratory Protective Selection Chart		
Source / Activity	***Hazard***	***Protection***
Activities creating dusts, mist, fumes and vapors.	Oxygen deficient atmospheres, irritants, carcinogens, sensitizers and other health effects.	Air respirators and air-purifying respirators (half and full face).

9) Contractor Safety:

Purpose:

a) To ensure the contract jobs are conducted with required safety conditions & incidents are prevented.

b) "Incident Free Environment" compliance is done with contractor's safety.

c) "Zero Harm Environment" will be established by contractor's safety assurance.

Procedure:

Selection of contractor

a. Safety & health performance will be one of the key criteria for selecting a contractor. Contractor's agreement approval will base on HSE implementation.
b. The Responsible HSE personnel shall give all necessary information regarding the contract works to be undertaken to the contractor & contractor's supervisor.
c. The Responsible HSE personnel in the field will discuss with the contractor & his supervisor about the safety precautions to be taken before, during & after the conduct of the job on the field.
d. The safety precautions shall be recorded & agreed upon by the contractor & the responsible officer.
e. The contractor will assure to abide by standards of HSE.
f. Vendor assessment form will be filled out by vendors and this is a mandatory requirement

Preparation prior to commencement of work

Prior to the commencement of any work:

a. The responsible HSE personnel will brief the contract supervisor & contract men about the job to be done & the safety precautions to be taken.HSE personnel will brief the concerned supervisor and workers about JSA (Job safety analysis).
b. The Responsible HSE personnel will inform the contract-men about the evacuation procedure in case of emergency.
c. The contractor's supervisor will obtain the necessary "Safe Work Permits".
d. PPE's is necessary for all contractors. In case of unavailability of any of the PPE's required for job or mentioned in work permit, contractor will have to provide to workers
e. In case of hot work permit or some critical activity to be performed like work at height, contractor's workers have to take training.

Conduct of work

a. The contract supervisor shall ensure that the "Safe Work Permit" requirements are met.
b. The contract supervisor shall ensure that the contract men are wearing the necessary personal protective equipment during conduct of work.
c. The contract supervisor shall ensure that the agreed safety precautions have been taken.
d. The contract supervisor shall ensure adequate supervision for the work.
e. The responsible HSE personnel will intermittently visit the job site & inspect the safety conditions during the conduct of the job.

f. The responsible HSE personnel will make suggestions if required & record them on the Work Permit.

After the work is over:

a. The contract supervisor shall clear the job area & offer it for inspection to the responsible HSE personnel.

b. The contract supervisor shall close the "Safe Work Permits" taken for the job.

c. The responsible HSE personnel shall record his observations for improvement & take them up during reviews.

10) Waste Handling and Management:

Purpose & Scope

1. The purpose of this framework is to:

- Identify as for as possible the expected waste, and describe their classification, storage, transport and disposal management requirements.
- To ensure that waste have been manage in accordance with disposal method scheme
- To ensure no environment risk effect to the local community.
- Safe recycling via approved vendors (scrap dealer) of recyclable waste.
- Appropriately containerized. Labeled and stored in accordance with all regulatory Requirement

2.Health Safety & Environmental Requirements:

The following requirements relate to waste generation at the plant:

- The plant shall not discharge chemicals such as corrosive, toxic or flammable solutions without treatment.
- When handling waste chemicals for treatment and or disposal to third party facilities, all handling, storage and labelling requirements, as outlined on prescribed procedures shall be observed.

3. Classification of Solid & Liquid Waste

Waste	**Disposal**
-Food Waste -Paper -Non Recyclable wood/Packing - Medical Waste Syringes, glass bottles, soiled bandages, expired drugs, dressings	Incineration; Low temperature burning, brick lined pit.
-Product and chemical containers (Including partially full)	Return to Vendor
-Wood -Packaging -Metals/Pipes/Scrap metal -Recyclable plastic cans -Cable drum -Broken crockery, Plastic goods and Metallic Equipment	Recycling (via approved Vendors)

-Chemical containers (crushed) -Other hazardous waste (Chemical waste like catalyst after processing) -Contaminated soil (chemical) -Grease trap sludge	Approved Hazardous Waste Disposal Vendors

4. Liquid Waste

Waste Generated	Disposal
Waste Oil (i.e. collected from different machinery, lubricants and Kitchen waste)	All waste oil stores in Store Area will be sold to different contractors according to suitable price.
Sewerage	Septic tank to storm pit

5**.** Waste Minimization

Environmental impact can be minimized by ensuring that the materials are used efficiently and are not disposed of unnecessarily. By reusing materials or having them recycled, the impacts can be minimized further.

As indicated in HSE Management Standards, waste control and management should follow the hierarchy of waste control:

1. **Elimination** (don't generate the waste in the first place)

2. **Reduction** (minimize the waste, e.g. minimize packaging, substitute with environment friendly materials e.g. replace polythene bags with paper or cardboard bags/ containers where possible)

3. **Re-use and recycling**

4. **Treatment** (convert the waste into something less environmentally or personally hazardous e.g. dilution or chemical treatment of hazardous chemicals prior to disposal to minimize its negative effects to the environment and people).

5. **Disposal**

Waste reduction, reuse and recycling opportunities should be identified wherever possible and initiatives from plant personnel may provide the most effective minimization strategies.

6. Waste Elimination and Reduction

The volume of waste produced should be reduced through:

- Purchase of materials in bulk.
- Use of reusable rather than disposable containers.
- Avoiding purchase of goods with excessive packaging.
- Avoiding wastage of materials.
- Better handling and storage practices to prevent damage.

6.1 Reuse

Wherever possible items should be reused rather than discarded, eg:

- Reuse of containers such as bins.

- Recovery and reuse of refrigerants during maintenance.
- Handle and store packaging material in way so that others if sold can reuse it at plant Materials that can be reused should be segregated from the waste stream, cleaned and repaired prior to storage for future reuse. However, containers of hazardous chemicals (e.g. fumigation chemicals) if not required at plant – may be damaged prior to disposal or as advised in the MSDS or as per procedure (if any).

6.2 Recycling

A number of discarded materials can be recycled rather than disposed off. These should be segregated within the waste stream and stored separately.

Recyclable materials include:

- All metals.
- Plastics.
- Paper.
- Waste oil.

6.3 Treatment and Disposal

Treatment and disposal of waste is dealt in Waste Minimization.

6. Waste Segregation

7. Wide ranges of solid wastes are generated by the activities undertaken at the plant. These wastes require different disposal options, from basic land filling to reprocessing for recycling or specialized waste disposal such as incineration.

By effectively segregating waste types on site we can:

- Avoid contaminating “clean” waste with contaminated or hazardous materials.
- Minimize the quantities (and hence cost) of waste requiring specialized disposal.
- Ensure that the waste disposal option is suited to the waste type.
- Minimize the potential for environmental damage at the waste disposal plant.
- Minimize the potential for safety incidents..
- Collect chemical or technical laboratory waste separately from all other plant waste as it must possess hazards having potential which can lead to accidental harmful effects.
- .Have more scope for developing on-plant management systems

Waste segregation is achieved by using specific skips, or other containers, for the different wastes. Segregation should commence at the waste production source and be maintained through on site transport and at the designated storage area.

All waste bins shall be clearly labeled for use with particular wastes. This should include both written instructions, use of symbols and color coding (see table below)

Waste should be kept away from useable material e.g. waste lubricant barrels should be well labeled and stored away from lubricants storage area, to prevent mixing.

Recyclable material should be placed in bins according to recycler’s requirement.

Each department has to emphasize to focus on following dos & donts to improve and maintain the standards of housekeeping in their respected areas:

DO:

1. Identify what materials are **required** at workplace.

2. Remove those materials which are **not required** at workplace.
3. Assess the "**not required**" material & decide on disposal or on storage at a different location.
4. Assign the responsibility of cleanliness of work areas to identified employees.
5. Keep the workplace free of accumulated combustible materials and waste.
6. Ensure that exits and aisles are clear of obstructions.
7. Place all trash and scrap in proper waste containers.
8. Keep oily rags in covered metal containers.
9. Dispose off hazardous materials in approved marked containers.
10. Store equipment and materials in their assigned location.
11. Schedule to clean air vents and filters to maintain ventilation efficiency.
12. Ensure that heavy machines / equipments are located on a firm foundation.
13. Ensure that boxes, drums, and tins are properly stacked.
14. Clean up tools and unused materials before leaving the job site.
15. Report hazards such as uneven boards, cracks, burnt-out lights.
16. Bundle hoses and cables when not in use.
17. Place empty containers and pallets in designated locations.
18. Decide how much flammable materials are needed at job site & keep only that much amount at sob site.
19. Conduct a housekeeping audit at pre-decided frequency. Ideal: once every month.
20. Schedule particularly housekeeping day at plant.

DO NOT:

1. Do not pile material around fire extinguishers or safety showers.

2. Do not leave clean-up to last few minutes of shift or day.
3. Do not clean equipment without "locking out."
4. Do not blow off dust with compressed air. Use a vacuum or brush.
5. Do not collect broken glass and metal straps in plastic bags.
6. Do not use bare hands when collecting waste. Wear gloves.
7. Do not place materials on stairs.
8. Do not ignore the safety signs & cautions boards.

All plant personnel involved in waste generating activities shall identify and segregate wastes according to the above.

If assistance is required in either determining the waste classification or analytical requirements, **contact HSE Team.**

8. Waste Containment and Storage

All plant personnel involved in the handling and storage of waste materials shall ensure that for:

- All waste receptacles containing liquid waste materials shall be stored in a suitable spill containment facility.
- All waste containers and bins should have lids and these should be kept closed at all times in order to minimize odor and prevent wastes being blown out.
- The containers should be watertight, with the use of lids being essential during periods of rainfall.
- Lubricant waste can be recycled, therefore care should be taken for its storage and handling, so that it does not get contaminated or mix with water or other materials e.g. paper,

cardboard etc. Lubricants should be stored separately according to its type/ specification.

9. Non Hazardous (General Wastes and Putrescible Waste)

Municipal wastes shall be deposited in the appropriate bins. The local municipal landfill; does not have the capability to recycle batteries, metals, polythene and plastics.

10. Hazardous (Prescribed) Wastes

Storage of waste materials including liquid prescribed waste, which have a Dangerous Goods Classification, shall be in accordance with the relevant regulatory guidelines or plant procedures.

- All prescribed wastes are segregated according to waste description.
- Containers and parts of containers (including closures), which may be in direct contact with the contents of the container, shall be chemically compatible (refer to the material containment requirements as documented on the MSDS (as appropriate). They must also be fit for the transport of the waste and should not leak or allow contents to spill.
- Packages should prior to storage and handling, be inspected to ensure they are kept in suitable containers, which may likely impair the performance.
- When filling the packages with liquid, sufficient care should be taken to ensure leakage does not occur during transport, or permanent distortion does not occur due to expansion of the liquid.
- **Note**: Where the waste material is recognized as **dangerous goods**, packaging requirements shall be established via the chemical MSDS (material compatibility) or chemical characterization of "solid waste cocktails" (as appropriate) or plant procedure (if available).

- Materials, such as large amounts of contaminated soil, where it is not feasible to containerize in drums, should be placed in lined area.
- Contact the HSE Team if assistance is required in determining appropriate waste containment receptacles.

11. Labeling

Plant personnel involved in the handling of waste materials should ensure that labels on containers used for the storage of waste materials should contain the following information:

- Description of waste.
- Dangerous goods class, packaging group and Hazchem (Hazardous Chemical code) (as appropriate).

Materials Coordinator shall ensure that the details for waste materials generated at the plant are maintained current.

Where the identity of chemicals/waste chemicals is known but the label identifying the chemical has deteriorated and the chemical cannot be readily identified, the Material Coordinator should replace with an interim label. Supplier details are provided on the Chemical Material Safety Data Sheet (MSDS).

12. Waste Handling

All waste should be handled with care and appropriate protective equipment worn as required. Used chemical containers should be handled in the same manner as full containers as there may be an increased chance of chemical spillage.

When handling and storing waste chemicals, the requirements of the Material Safety Data Sheets (MSDS) shall be observed.

13. Waste Disposal

Waste is to be transported to suitable disposal and transfer plant. All wastes should be disposed off in an environmentally available and acceptable fashion.

13.1 Use of PPE**:**

PPE must be worn (depending upon the type of hazards) while handling waste. Refer to MSDS or contact HSE Team where special PPE is required to minimize the risk level. It should be noted that solid waste could have physical as well as chemical or biological hazards.

All PPE should be in good condition, fit for purpose and maintained where required in accordance with manufacturer and/ or legislative requirements.

14. Liquid Waste Management & Disposal

Liquid waste materials will fall into one of the following categories:

Municipal waste;

- Prescribed liquid waste.

For Liquid waste materials:

Where liquid contaminant concentrations meet or fall below NEQS limits, liquid wastes can be discharged into the municipal waste Sewer.

Where onsite treatment will reduce levels to meet NEQS requirements, the liquid waste should be treated on plant, NEQS acceptance criteria established and disposed to the Municipal sewer.

Where on plant treatment will reduce levels to meet WHO agricultural standards, such treated water can be consumed in the plantation/ green areas at plant.

Where on plant treatment will not result in a lowering of liquid waste contaminants, selection of a third party liquid treatment facility to accept the waste shall be established.

Where Liquid Wastes does not comply with regulatory requirements, it shall not be disposed to landfill.

Wastewaters in the form of sewage and grey waters are treated and disposed off on plant. All other liquid wastes however are disposed off plant, according to agreed and documented procedure.

Appendix 3

Audit Questions For Integrated (ISO 14001 and OHSAS 18001) Management System

(4.2) Policy Statement:

1. Has executive management defined and signed the organization's Integrated Policy?

2. Appropriate to the nature of the organization's activities, products and/or services?

3. Is the policy appropriate to the organization's scale?

4. Is there a commitment to prevention of pollution?

5. Is there a commitment to continual improvement?

6. Is there a commitment to comply with all appropriate environmental laws and regulations?

7. Is there a commitment to comply with voluntary requirements to which the organization subscribes?

8. Does it provide a framework for establishing Integrated Objectives?

9. Is there a process to review Integrated Objectives?

10. Is it documented?

11. Is it implemented?

12. Do all employees know how their job function relates to the Policy?

13. Is it available to the public?

(4.3.1) Hazard & Aspect Identification, Risk Assessment & Control:

14. Has the organization developed a procedure(s) to identify the Health and Safety Hazards and Environmental Aspects of its activities, products and/or services that it can control and over which it can be expected to have an influence?

15. Does the procedure include the evaluation of non-routine conditions?

16. Does the organization utilize and improve this procedure(s)?

17. Has the organization utilized the procedure(s) to determine which of its health and safety hazards and environmental aspects have, or can have, significant impacts on the environment?

18. Is the information relative to the health and safety hazards and environmental aspects kept up to date? And how does the organization document and keep the results of the identification of hazards, risk assessment and determination of controls up-to- date.

(4.3.2) Legal and Other Requirements:

19. Has the organization developed a procedure to identify applicable environmental and health and safety legal and regulatory requirements?

20. Has the organization developed a procedure to identify any voluntary requirement to which it subscribes?

21. Does the organization have a procedure to insure completeness and availability of the required documents?

22. Is the information relative to Legal and Other Requirements kept up to date?

(4.3.3) Environmental Objective and Target:

23. Did the organization utilize the following when established its objectives andtargets:

a. legal and other requirements?

b. significant health and safety hazards and environmental aspects?

c. commitment to prevention of pollution?

d. prevention of ill health and injury?

e. views of interested parties?

24. Are there appropriate objectives and targets for every level of the organization?

25. Are the objectives and targets consistent with the Integrated Policy statement?

26. Are the objectives and targets documented?

27. Has the organization established programs for meeting its environmental and health and safety objectives and targets?

28. Has responsibility been assigned at all appropriate levels of the organization?

29. Has a schedule(s) been established to meet all of the targets?

30. Have the appropriate "mechanisms" been supplied?

31. Is the environmental and health and safety management programs followed within the organization?

32. Utilizing the principle of continual improvement does the organization modify as necessary its environmental and health and safety management programs?

(4.4.1) Structure and Responsibility:

33. Has the organization defined the roles, responsibilities, and authorities of its employees with respect to the integrated management system?

34. Have the above been documented and communicated?

35. Have the following resources been provided to implement and maintain the system?

a. human resources (manpower),

b. special skills,

c. technology, and

d. financial resources.

36. Has a management representative been appointed?

37. Does the management representative have the following defined role:

a. establishing ISO 14001 and OHSAS 18001 requirements,

b. determining whether ISO 14001 and OHSAS 18001 requirements have been implemented,

c. determining whether the ISO 14001and OHSAS 18001 conformance is maintained,

d. reporting to top management on conformance and continual improvement.

(4.4.2) Training, Awareness and Competence:

38. Has the organization defined its training needs?

39. Has the entire organization been provided baseline training related to the following?

a. importance of the EMS and OHS,

b. roles within organization related to the EMS and OHS,

c. consequences of deviating from the EMS and OHS.

40. Does the organization require and provide training for those positions that could have a significant impact on the environment based upon education and experience?

41. Does the organization require and provide training with respect to emergency preparedness and response?

42. Has the organization developed competency standards?

(4.4.3) Communication:

43. Does the organization have an internal communication process for the integrated management system?

44. Does the organization have a process in place for receiving and responding to "relevant" external communications?

45. Has the organization decided whether it will communicate to external parties' information with respect to its significant environmental aspects and health and safety hazards?

46. If the organization has decided not to communicate information to external parties with respect to its significant environmental aspects and hazards, has it established a record of that decision?

(4.4.4) Integrated management system documentation:

47. Has the organization documented information that describes the foundation elements of the integrated management system and how they interact?

48. Does the documented information reference all the necessary supporting information?

(4.4.5) Document control:

49. Has the organization established procedures for controlling all of the documents required by the standard?

50. Does the procedure insure that all the documents can be located at the necessary workstations?

51. Are the following items addressed on each controlled document:

a. revision number

b. authorized signature

c. date of issuance

d. readily identified.

52. Does the organization maintain a current master list of authorized documents?

53. Does the organization maintain a process of removing out of date documents?

(4.4.6) Operational control:

54. Has the organization identified its operations that are associated with its Significant Environmental Aspects and hazards?

55. Has the organization developed procedures and operational criteria, including maintenance, that address those operations?

56. Does the organization communicate relevant portions of its integrated management system to suppliers and contractors who have the potential to interact with its Significant Environmental Aspects and occupational health and safety hazards?

(4.4.7) Emergency preparedness and response:

57. Has the organization evaluated its operations with respect to potential emergency situations and accidents?

58. Has the organization developed procedures to respond to such potential emergency situations and accidents?

59. Does the organization periodically test the procedures?

(4.5.1) Monitoring and measurement:

60. Does the organization have documented procedures to monitor and measure on a set frequency the characteristics of its operation that are related to the significant environmental aspects and hazards?

61. Does the organization have proper calibration procedures to insure that measurements are accurate and reproducible?

62. Does the organization have a documented procedure with a set frequency to evaluate compliance with applicable environmental and health and safety laws and regulations?

63. Does the organization record and maintain the above information?

(4.5.2) Nonconformance and corrective and preventative action:

64. Does the organization have an established procedure for defining responsibility and authority for:

a. investigating nonconformance?

b. initiating mitigation activities?

c. performing corrective action?

d. completing preventative action?

65. Does the organization modify existing procedure when appropriate to prevent nonoccurrence?

(4.5.3) Records:

66. Has the organization established record retention procedures?

67. Do these procedures address record identification, maintenance and retention?

68. Does the organization include all the records necessary to support the integrated management system within the records retention procedures?

a. legal and other requirements?

b. permits?

c. environmental aspects and impacts and occupation health and safety hazards?

d. environmental and health and safety trainings?

e. inspection and calibration records?

f. monitoring data?

g. nonconformance information?

h. environmental and health and safety audits?

i. management reviews?

j. emergency preparedness?

(4.5.4) Internal audits:

69. Has the organization established a program and procedure for an integrated management system audit?

70. Are the program and procedure designed to:

a. determine conformance to the IMS?

b. provide reports to top management?

71. Does program recognize the need for increased audit frequency for areas of the IMS with previous nonconformance?

72. Does the program require competency of the auditors?

(4.6) Management review:

73. Does the organization's top management routinely review the IMS for effectiveness?

74. Is there a set schedule for the reviews?

75. Are the management reviews documented?

76. Does the review information include:

a. compliance information based upon applicable health and safety and environmental laws, regulations and permits?

b. internal audit reports?

c. reports on the achievement of Targets?

d. information related to changing environmental aspects and hazards?

e. summaries of internal and external communications related to the IMS?

77. Does management include in the review the concept of continual improvement?

78. Does the management review focus on potential modifications to the Integrated Policy statement and its Objectives?

Smoking Policy:

Objective:

The objective of this policy is to provide guideline on Smoking Rules & Regulation within the Premises of Descon Oxychem Limited (DOL) Plant.

Scope:

The policy is applicable to all employees, permanent or non-permanent, visitors, vendors, drivers of vehicles and contracted labour.

Responsibilities:

Everyone in general and Head of Departments in particular are responsible to ensure implementation of this policy.

Procedure:

1- Declaration of smoking area (s) is planned by Plant Manager in consultation with QHSE Manager and IR & Admin Manager.

2- Smoking is strictly prohibited at any other place except at designated smoking points. Walking smoking is also strictly prohibited.

3- Manager IR & Admin will ensure that smoking areas are established and properly labeled. Manager QHSE will inspect these areas as per HSE view point.

4- Smoking is strictly not allowed in any office within the boundaries of DOL plant.

5- No person is allowed to carry cigarettes, matchbox, lighter or articles of similar nature within the non-smoking zone. It is the duty of security staff to ensure that no one is carrying such item within non-smoking zones.

6- It will be the responsibility of every one to properly dispose off the cigarettes. All smokers must ensure that cigarette butts are thrown only in the ashtrays and should not be thrown in the surrounding.

7- Administration department must ensure the availability of proper furniture, ashtrays and electric lighter at smoking points. Administration will ensure for daily housekeeping of smoking area.

8- In canteen/kitchen areas use of gas lighter or matchboxes are not allowed. Matchboxes are replaced with spark igniters.

9- Smoking in shift vans is not allowed.

10- It will be the responsibility of administration & security staff to communicate the smoking policy to all the visitors & vendors entering at plant premises.

11- It will be the responsibility of administration & logistics team to communicate this policy to the drivers of vehicles.

12- Anyone observing smoking activity in a non-smoking area is required to immediately stop the individual(s) involved and report the matter to the concerned Supervisor and QHSE staff.

13- Violation of this policy can lead to a severe disciplinary action as defined in the three strike policy of the company.

14- Manager QHSE will maintain the list of regular smokers and will ensure for proper communication of this policy to them.

Prepared by	**Reviewed by**	**Approved by**
_____	_____	_____
Manager QHSE	IR & Admin Manager	Plant Manager DOL

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