SEA (INDIA)

INDIAN SAFETY ENGINEER

QUARTERLY JOURNAL OF SAFETY ENGINEERS ASSOCIATION

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September 2010 batch of NEBOSH

The September 2010, International General Certifcate Course of NEBOSH was inaugurated by Dr Vijayalakshmi Thanasekaraan, Head of Clinical Services, Dept of Pulmonology, Sri Ramachandra University, Porur on August 26th 2010.

September 2010 batch NEBOSH candidates along with Faculties.

Inside....

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NEBOSH Course Update

The International General Certificate Course of NEBOSH, UK was held at Sri Ramachandra University, Porur. The contact classes were held from August 26th to September 5th and the examinations were conducted on September 8th and 9th of 2010. As planned 20 candidates attended the contact classes, as usual , class tests and model examinations were conducted in addition to tutorial classes and it was very much appreciated by the candidates. The results are expected by November 14, 2010.

The next examination is scheduled on Wednesday, 8th December 2010 for which admissions have been completed. SEA India encourages its members and other safety professionals to pursue this course to enhance their professional knowledge and career prospects. All those aspiring to join this course can contact the Secretary by mail, info@seaindia.org for getting admission.

FROM THE DESK OF PRESIDENT

Dear Members,

First Meeting of the Executive Committee was held on 10th July 2010. Most of the members attended the meeting and have shown their zeal to take more responsibilities and contribute to the cause of the association. Specific responsibilities were assigned to the members.

SEA website, www.seaindia.org is given a new look, but only needs to be updated. The service provider is advised to periodically update.

Our new office is now fully equipped with computer, telephone, internet and other infrastructure. All our Executive Committee Meetings in the recent past were held only at the new office. Library at the office premises is set up and members are advised to visit the office and make use of the library. Members who have surplus reading materiel can donate their books for the benefit of other members.

Our journal "Indian safety Engineer" for the second quarter 2010 was released in time and hopefully the next issue will reach you soon and well in time. Congratulations to the Editorial Board who are keen to maintain the schedule.

Next Technical Meet is being scheduled in October 2010 and the circulars should reach you shortly.

Another batch of Nebosh IGC course was successfully conducted in September 2010 and looking at the confidence level of the students, we can reasonably expect better results this time. Enrollment for the next batch of the course in December 2010 is almost completed.

The committee is committed to continue their unstinted services and at the same time look forward to the support and participation of members.

Best Wishes!

S. Ulaganathan
President, SEA India

GUIDANCE ON HAZARD CONTROL IN THE USE OF SOLVENTS

(Continued from previous issue)

Local Exhaust Ventilation

In order to ensure the highest efficiency of capture, the hood should be as close as possible to the pointof emission of hazardous vapours. The main advantage of the LES is that it requires less airflow than the dilution ventilation for the similar application. However, the LES is slightly more difficult to design relative to dilution ventilation. The hood and capture point must be properly designed with emphasis on shape and position. Similarly, the duct and the fan must be designed appropriately to draw thedesired volume of air to remove the contaminants. While designing a LES, it should be ensured that the contaminants are removed to a safe place to prevent the spread of hazardous exposure conditions. If the contaminated air from the LES is let into the workplaces, a suitable purifying device should be installed or the air should be treated to avoid further hazard as in the case of LEV.

Good Housekeeping

Engineering controls do not provide a complete protection against hazards in certain cases. Although good engineering control measures are in place, comprehensive hygiene practices are required to keep the contaminants under control. It is important that a company emphasizes good housekeeping practices regularly in order to prevent accidents, reduce operation and handling time, improve health and hygiene, use of available space in the workplace effectively and reduce disposal cost.

Good housekeeping practices that can be implemented through various initiatives are as follows:

Labeling

Chemical labeling practice must be improved to communicate the hazardous nature of the solvent used in the process. Labeling should be practiced in accordance to the Globally Harmonized System.

The following practices should be considered while communicating the hazard nature.

- Labeling the containers with key information (Flammability, Health Risks, etc.)
- Preparing the labels in local language
- Labels with contain hazard symbols

Storage

Safe storage is an important stage of the chemical life cycle. Any chemical storage facility should meet certain level of standard irrespective of size and scale of operation. This section provides basic instruction for chemical storage that may be required to meet the expected standards. These include

1. Proper layout of chemical store.

a. The storage room should be separated from production areas, sources of ignition such as electrical panel and transformers.

b. The chemical store should have adequate (minimum two) emergency exits (doors and windows).

c. The pathway should be enough for comfortable movement of forklift or trolley

d. The entry and exit should be kept free of obstacles.

e. The store room should be provided with ramp facilities for the easy transport of chemicals.

f. The floor of the store room must be even and should be non permeable to prevent soil contamination resulting from chemical spill.

g. The store should have chemical drain system that is connected to the waste treatment facility.

Organization

a. An inventory of chemicals in the store.

b. Categorizing the chemicals depending on the hazardous nature (use MSDS).

c. Storing the chemicals not directly on the floor.

d. Separating the incompatible chemicals.

e. Keeping the heavy/bulky/liquid substances at the bottom and small containers or lighter containers at the top of the shelf.

Chemical labeling

a. Label should have text or pictorial presentation of hazards.

b. Labeling should be done in accordance with Globally Harmonized System of Classificationand Labeling of Chemicals (GHS).

Safety systems

a. Restricted access to the chemical store.

b. Keeping the chemical store room under lock and key access or swipe card access.

c. Fire extinguishers placed in accessible locations.

d. Electrical switches, boxes, fittings should be flame and explosion proof.

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Guidance on ....

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e. Controlling the environmental conditions such as temperature, humidity and air velocity by providing natural or mechanical ventilation.

f. Providing openings at floor level to dilute heavy chemical substances that have high specific gravity.

g. Installing emergency shower or eye wash facility inside the chemical store.

h. First aid box with complete set of medicines and accessories.

Check the Safety Systems at periodic intervals

Sign boards

a. Display of 'Restricted Entry' sign board at the entrance of the store.

b. Emergency Exit sign boards should be clearly visible and should be in bilingual.

c. "No Smoking" sign board both inside and outside the store room.

d. Sign boards of personal protective equipments should be displayed and should be specified to the task carried.

Requirements:

- Inspection of storage area and drain at periodic intervals to maintain them in good condition.
- Always using standard storage shelves with side shield.
- Corrosive chemicals should be stored in corrosion proof shelves.
- Secure the storage shelf to the wall to prevent from fall during earthquake, shocks, tremors andvibrations.
- Inspecting for damaged containers and replace them immediately if noticed.
- Returning the expired chemicals to the manufacturer or dispose according to the manufacturer protocol or standard procedures.
- Ensuring the safety systems are not bypassed.
- Providing sufficient and appropriate personal protective equipment.
- Adequate number of firefighting equipment should be made available to the capacity of the storage facility and should be in working condition.
- At least, one fire-fighting equipment should be placed outside the storage facility to gain inside access during fire.
- Elimination of all ignition sources inside the chemical store.
- Emergency shower or the eye wash facility must be in working condition. Draining the stagnant water periodically from the pipe to avoid biologically contaminated water coming in contact with the body or eye.
- Periodical replacement of expired medicines in the first aid box.
- Providing separate welfare room for having lunch.
- Training to employees in safe handling of chemicals.

Standards & Regulations:

- Refer IS: 5571-2000, Guide for Selection of electrical quipment for hazardous areas.
- Refer IS: 7724-1975 for Specificiations for Sand-filled Protection of Electrical Equipment for use in Explosive Atmospheres.
- Manufacture, Storage and Import of Hazardous Chemicals Rules (1989), for list of hazardous chemicals and threshold quantities for storage.

Clean up procedures

Use of lubricating oils and greases is essential in industrial process. During use, spills can happen during the transfer from one container to another, or on the machine. Generally solvents are used to clean the spilled or leaked oils and dirt on the machine. Certain dusts generated during the process deposited on the machine are also cleaned using solvents. The dust and dirt remains on machine would pose a substantial risk to the employees' exposure in addition to the exposure that occurs from use of cleaning solvents. Regular cleanup procedures, would therefore, reduce the use of chemicals for cleaning, thus reducing the exposures. Chemical spill occurs during cleaning and this is an additional hazard in the workplace. Hence, the following should be practiced to minimize the employees' exposure as well as the environment contamination. The following should be considered as good practices:

- Removal of dust and dirt regularly from the machines and floors
- Regular clean up during the shift and day-to-day cleanup
- Ensuring spill control programme to prevent health and environmental risks
- Following proper waste disposal protocols
- Periodical maintenance of the equipments and accessories

Training

The purpose of the training is to communicate to the worker about the harmful nature of the chemical substances they are handling. Safe

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Guidance on ....

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handling of chemicals encompasses several aspects amongst whichfew are more critical to communicate to the employees for effective use and management. For effective management of chemicals, the employees should be provided periodical training in the areas mentioned below:

- Recognizing and understanding the hazardous nature of the chemicals
- Importance of Material Safety Data Sheet (MSDS)
- Good house keeping
- Proper handling of chemicals
- Handling the chemical spills and proper disposal methods
- Managing the emergency situations - First aid, handling fire extinguishers, communications.
- Checking the functioning of pollution control systems.
- Incident or failure reporting systems
- PPE - use, storage, cleaning and maintenance

Whenever a worker is involved in new process or handling new chemical substances, adequate training should be provided before involved in new tasks. Induction training should be made mandatory for newly employed workers. For detailed information on good housekeeping refer GTZ's 'Chemical Management Guide' at www.chemicalmanagement.org.

Personal hygiene practice

Exposure to chemical substances does not necessarily arise from handling chemical substances during the work process, but also from poor hygiene practices of the employees. Exposures can significantly be reduced by means of following a simple cost effective personal hygiene measures. Some common personal hygiene practices are:

- Keeping the hands clean while working
- Trimming the nails periodically to avoid contaminant deposits
- Avoiding working with open wounds
- Washing the hands before eating
- Use of detergents for washing hands
- Avoiding smoking and eating at workplaces
- Cleaning the personal protective equipments and storing it in proper place
- Not reusing the disposable articles (PPEs)
- Wearing clean work clothes
- Changing the work clothes before leaving the workplace
- Having shower at the end of the shift (to reduce the dermal exposures and minimize the transportation of the contaminants home)

(Concluded)

Courtesy: SRU - EHE Department

SAFE HANDLING OF BATTERY

Battery powered equipments are commonly used in the modern operations. Battery power has many advantages depending on the usage. In recent years, hundreds of accidents have occurred resulting in serious burn injuries. Many of these accidents have occurred during charging, installing, removing or maintaining the battery. All these accidents are preventable if proper preventive measures had been followed.

Battery contains acid and can explode and/ or catch fire. In the event of a battery explosion or fire, acid and fumes are released. When the acid contacts the skin, extremely painful burns and scarring result. When breathed, the lungs are burnt from the toxic chemicals present in fumes. Blindness is likely to occur if this acid spills on the eye. These physical injuries are mostly irreversible. Therefore, when working with batteries, it is important to prevent exposure by wearing suitable Personal Protective Equipment (PPE).

When batteries are being charged, explosive gases are produced. Heat and sparks can ignite these gases causing a fire or explosion. All smoking, open flames and spark producing items such as grinders, welders or electrical equipment, should be kept well clear of batteries.

Surface leakage is a condition caused when dust mixes with the electrolyte on the battery, creating a low resistance path. This low resistance path can " SHORT" the battery. A shorted battery is likely to cause fire. Batteries should be kept only in places, free from excessive dust so as to insure against shorting.

Accidents and Injuries involving batteries are always Preventable.■

WORKPLACE LEAD EXPOSURE STILL A PROBLEM

Exposure to lead occurs in at least 120 different occupations. Overexposure to lead can result in serious illness and death.

A study conducted in USA over several years reveals that Lead exposure continues to be a risk for workers in the United States; the same may be the case in India too.

Although the rate of lead exposure dropped in USA between 2004 and 2005, it climbed 3 percentage points between 2005 and 2007 to 7.4 cases per 100,000 adults. The majority of adults with elevated blood-lead levels were employed in manufacturing, construction, and mining.

To reverse the trend, the researchers suggest strengthening existing efforts, including:

- Employer-maintained worker-protection programs
- Programs such as Adult Blood Lead Epidemiology and Surveillance that tracks lab-reported elevated lead levels
- National emphasis program to reduce lead exposure
- Research and interventions by worker-affiliated organizations
- Public education to prevent non occupational exposures

How Lead Affects Health

Lead is a toxic substance that can be absorbed into the body by inhalation (breathing) and ingestion (eating). Except for certain organic lead compounds, lead is not absorbed through the skin.

When lead is airborne as a dust, fumes, or mist, it can be inhaled and absorbed through the lungs and upper respiratory tract. Inhalation of airborne lead is generally the most common source of occupational lead exposure.

Ingestion is possible, but less likely. For example, an employee who handles food, cigarettes, chewing tobacco, or makeup that have lead in them, or touch them with hands contaminated with lead, could end up swallowing enough lead to make him or her sick.

A significant portion of the lead that a worker inhales or ingests gets into the blood stream. Once in the blood stream, lead is circulated throughout the body and stored in various organs and body tissue. Some of this lead is quickly filtered out of the body and excreted, but the rest remains in the blood and in other tissue.

As exposure to lead continues, the amount stored in the body will increase if a worker is absorbing more lead than the body is excreting. Even though the worker may not be aware of any immediate symptoms, this lead stored in tissues can slowly cause irreversible damage—first to individual cells, then to organs and whole body systems.

Symptoms of Overexposure

Short-term, or acute, exposure to high concentrations of lead can cause immediate serious health effects or even kill a worker within just a few days after exposure. Such exposures are fortunately rare.

Much more common is long-term, or chronic, exposure to small amounts of lead. Chronic exposure occurs over a period of years and can result in anemia, kidney disease, and damage to nervous and reproductive systems.

Common symptoms of chronic overexposure to lead include:

- Loss of appetite
- Metallic taste in the mouth
- Anxiety and nervous irritability
- Nausea
- Pallor
- Paleness
- Excessive fatigue
- Weakness
- Insomnia
- Headache
- Muscle and joint pain or soreness
- Fine tremors
- Numbness
- Dizziness

Employees who may be exposed to lead on the job are to be instructed to watch for and report any symptoms immediately. ■

COMBUSTIBLE DUST EXPLOSIONS

Combustible dusts are fine particles that present an explosion hazard when suspended in air in certain conditions. A dust explosion can be catastrophic and cause employee deaths, injuries, and destruction of entire buildings. In many combustible dust accidents, employers and employees were unaware that a hazard even existed. It is important to determine if your company has this hazard, and if you do, you must take action now to prevent tragic consequences.

How Dust Explosions Occur

In addition to the familiar fire triangle of oxygen, heat, and fuel (the dust), dispersion of dust particles in sufficient quantity and concentration can cause rapid combustion known as a deflagration. If the event is confined by an enclosure such as a building, room, vessel, or process equipment, the resulting pressure rise may cause an explosion. These five factors (oxygen, heat, fuel, dispersion, and confinement) are known as the "Dust Explosion Pentagon". If one element of the pentagon is missing, an explosion cannot occur.

Catastrophic Secondary Explosions

An initial (primary) explosion in processing equipment or in an area where fugitive dust has accumulated may dislodge more accumulated dust into the air, or damage a containment system (such as a duct, vessel, or collector). As a result, if ignited, the additional dust dispersed into the air may cause one or more secondary explosions. These can be far more destructive than a primary explosion due to the increased quantity and concentration of dispersed combustible dust. Many deaths in past accidents, as well as other damage, have been caused by secondary explosions.

Industries at Risk

Combustible dust explosion hazards exist in a variety of industries, including: agriculture, chemicals, food (e.g., candy, sugar, spice, starch, flour, feed), grain, fertilizer, tobacco, plastics, wood, forest, paper, pulp, rubber, furniture, textiles, pesticides, pharmaceuticals, tire and rubber manufacturing, dyes, coal, metal processing (e.g., aluminum, chromium, iron, magnesium, and zinc), recycling operations, and fossil fuel power generation (coal).

Prevention of Dust Explosions

To identify factors that may contribute to a explosion, a thorough hazard assessment of the following is recommended.

- All materials handled;
- All operations including byproducts;
- All spaces (including hidden ones); and
- All potential ignition sources.

Dust Control Recommendations

- Implement a hazardous dust inspection, testing, housekeeping, and control program;
- Use proper dust collection systems and filters;
- Minimize the escape of dust from process equipment or ventilation systems;
- Use surfaces that minimize dust accumulation and facilitate cleaning;
- Provide access to all hidden areas to permit inspection;
- Inspect for dust residues in open and hidden areas at regular intervals;
- If ignition sources are present, use cleaning methods that do not generate dust clouds;
- Use only vacuum cleaners approved for dust collection; and
- Locate relief valves away from dust deposits.

Ignition Control Recommendations

- Use appropriate electrical equipment and wiring methods;
- Control static electricity, including bonding of equipment to ground;
- Control smoking, open flames, and sparks;
- Control mechanical sparks and friction;
- Use separator devices to remove foreign materials capable of igniting combustibles from process materials;
- Separate heated surfaces from dusts;
- Separate heating systems from dusts;
- Select and use industrial trucks properly;
- Use cartridge activated tools properly; and
- Use an equipment preventive maintenance program.

Injury and Damage Control Methods

- Separation of the hazard (isolate with distance);
- Segregation of the hazard (isolate with a barrier);
- Deflagration isolation/venting;
- Pressure relief venting for equipment;
- Direct vents away from work areas;
- Specialized fire suppression systems;
- Explosion protection systems;
- Develop an emergency action plan; and
- Maintain emergency exit routes.

PERFORMANCE BASED SAFETY

While companies need to continually improve on product quality and reduce costs and cycle times, their efforts to improve workplace safety cannot be isolated. Workplace safety directly impacts the success of a company. Neglecting safety issues can eventually hinder a company's growth and success.

Every organisation aims to provide a safe and productive work environment to all its employees through its safety initiatives. Behaviour based safety process is one such initiative. Behavior based safety initiatives aim at minimising the number of injuries in a workplace by addressing individual behaviour, besides considering the working conditions.

Nevertheless, with numerous ways and methods emerging to implement behaviour-based safety, the process has become more complicated. A behaviour based safety process can be implemented by following certain programs that closely fit a company's culture. However, such safety programs chosen based on the behaviour of individuals and company culture may not always be successful.

In order to overcome the drawbacks of behaviour based safety approach companies began to seek other injury reduction processes. This led to the emergence of performance based safety concept.

The performance based safety approach addresses individual performances, instead of focusing on their behaviour as in the behaviour based safety approach. Performance based safety has been observed to successfully work with various management styles and corporate cultures.

What exactly is performance-based safety?

Performance safety is a process that involves detailed review of performance areas like worker, machine, and the environment. This is done to ensure continuous improvement of safe production practices. In other words, performance safety can be defined as a process of reviewing various operations, procedures, and practices by observing and analysing the tasks involved in each of the areas.

Performance safety is a three-phase process

A performance based safety process comprises of three phases, namely

- **Practices:** It refers to the choices made by the workers in performing the assigned tasks.
- **Procedures:** The overall method adopted to perform a given task.
- **Processes:** It refers to the end result of all the operations carried out, end products, and quality control.

For better understanding let us consider the following example, which clearly illustrates the process of performance safety in progress.

Let us suppose there is an unsafe condition in the installation of new equipment at a site. The plant manager, a production foreman, a production crew member, a safety professional, and the construction foreman responsible for equipment installation at the site are summoned. They exchange ideas to come out with solutions as to how the task has to be performed (procedures involved), how the task is actually performed by the worker (practices), and how the result of a task affects the overall end result and other tasks that follow (process).

These formulated procedures help identify the hazards involved in a project and also provide means of eliminating such hazards. It is then the duty of the workers to follow these procedures to ensure safe performance. These procedures that involve different activities or operations follow a systematic order so as to optimise the end result.

Why should performance safety be implemented?

Implementing performance based safety approach enables companies to achieve zero injuries or accidents. It promotes individual and team involvement to proactively eliminate hazards and the consequent injuries or accidents. Another important feature of the performance based safety approach that drives companies' world over to implement it is that it promotes positive changes within the organisation or processes involved to attain optimal performance. Every worker should aim at maintaining optimal performance by following the prescribed safety measures, instead of focusing on maximum performance.

The following example illustrates this fact.

Let us suppose that a worker has to enter a tunnel to unclog material that is getting stuck at a transfer point in a conveyer line. A safety professional is required to minimise hazards that the worker would be exposed to while performing this task. However, by examining the overall process it can be understood that the material could have been getting clogged because there is a possibility that it is too large, compared to what the transfer point was designed to handle.

Hence, it follows that the material had to be crushed to the designated size before it reaches the transfer point. At this stage, one could have addressed in specific issue of transfer point redesign, but that would have helped correct the symptom only and not cure the disease. Crushing the material to the right size helps solve the problem completely. Thus, employee exposure to noise, dust, and tunnel hazards could be avoided.

Workers should not compromise on safety to achieve maximum performance of the equipment. If they had to do so, they should rather focus at achieving optimal performance levels at safe standards. ■

IN THE NEWS

Government of Tamilnadu Notification

After preliminary notification, The Government of Tamilnadu has confirmed certain amendments in the Tamilnadu Factories Rules 1950.

As per the new amendment, Qualification, Experience of competent persons and the facilities to be available at his command has been prescribed in the existing Schedule under Rule 2A of the Tamilnadu Factories Rules 1950 for the purpose of recognizing competency in respect of the following:

- Testing and Examination of safety belts under Rule 61A
- Examination and Testing of Ovens and Driers under Rule 61B
- Testing of Heater coil and Testing of Thermic fluid under Rule 61P
- Examination of Instruments and Safety device; Testing, Examination and Repair of Plants and Equipments; Entry into or work in Confined Space; Testing and Examination of Plant and Equipment made from Reinforced Plastics; under Rule 95 Schedule XVI.

118 hospitalized after gas leak

One Hundred and Eighteen people, including four firemen and a police constable, were hospitalized after they inhaled chlorine gas that leaked from a cylinder in a Port Trust godown. The site was cordoned off and the people in the vicinity were evacuated.

Five of the 141 cylinders lying in the hazardous goods storage facility contained liquid chlorine. The other 136 were empty. All the five cylinders have been neutralized. The gas leak was reported from the Port Trust premises.

The affected people complained of giddiness, vomiting and burning sensation in the eyes and throat and on the skin. Seven were admitted in the Critical Care Unit and they were suffering from Mild Acute Respiratory Distress Syndrome (ARDS).

According to a release issued by the Port Trust, the cylinders were imported in 1997, but the importer had not taken delivery. There are standard procedures to dispose of hazardous cargo, but permission had to be taken from many agencies. It seems permission from one of the agencies was pending on condition of anonymity and in the mean time the incident has taken place.

Ammonia Gas Leak

Leakage of Ammonia gas from an ice factory created panic among the people. About a dozen factory workers fell unconscious following the gas leak.They were immediately taken to near by hospital and they became normal after treatment.

The police and the Fire Service personnel rushed to the spot and evacuated the residents from the near by areas. After about Two hours, the authorities managed to plug the leak.

The Fire Brigade sources said, malfunctioning of a Safety Valve due to increasing pressure on the pipe line caused the leakage.

IN THE NEWS

Madras High Court orders closure of Copper Smelting Plant

The Madras High Court ordered immediate closure of the copper smelting plant set up by Sterlite Industries (India) Ltd. owing to voluminous material available on record about the negative impact of the running of the industry at the place and in the manner it is being run.

"The materials on record show that the continuing air pollution being caused by the noxious effluents discharged is having a more devastating effect on the people living in the surroundings. There has been unabated pollution by the company, which should be stopped at least now so as to protect the mother nature from being tarred," the judges have observed.

While the company wanted the court to take into consideration a "favourable" report submitted by National Environmental Engineering Research Institute (NEERI)in 2003, the judges said a subsequent report by NEERI in 2005 was clear that the waste from the company had high concentration of heavy metals, arsenic and fluorides.

"The pathetic condition that has been recorded by NEERI in its report is that the plant site itself is severely polluted and the ground samples present levels of arsenic which indicate that the whole site may be classified as Hazardous waste according to the Indian Standards," they have said.

The ground water samples taken in the vicinity of the deposit site had shown elevated values of Copper, Chrome and Arsenic.

However, the Supreme Court of India has stayed the order of the High Court, pending disposal of the petition filed by the company.

CASE STUDY

CASE STUDY 1:

ELECTRICAL FITTER SURVIVED AFTER BURNS

A factory was provided with 11 KV electric control panel in the receiving station with 11 KV busbar on the top and generator busbar at the bottom. Two change over switches were provided with two safety coils individually to prevent breaker movement when the supply is on. In the course of time the safety coils became weak and new coils were ordered for replacement.

Oneday, when there was no power from EB, a team of electrical engineers along with one electrical fitter followed the LOTO procedure and changed one coil only.

On another day, which was Sunday, the electrical fitter was was asked to clean the filter by his mechanical supervisor. As he completed the cleaning work so early, he started changing the second coils also without even informing the mechanical supervisor. He opened the back panel and inserted his right hand near the 11 KV busbar and loosened the bolt of the safety coil.

Suddenly an electric flash occurred burning his right hand and right side of his face. All switch gears of EB lines went off and hearing the noise, the mechanical supervisor rushed to the spot and rescued the electrical fitter. Luckily the fitter survived as he was wearing safety shoes but he was hospitalized for more than 30 days.

Cause of the accident: The fitter was not aware of the presence of magnetic flux around the 11 KV busbar.

The fitter was not aware of the LOTO procedure to be followed to undertake this type of risky work.

The fitter has taken up the work out of curiosity without authority.

The control panel cover is not provided with a limit switch to cut off power to prevent inadvertent contact with live electric busbar.

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Case Study ....

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CASE STUDY 2:

NITROGEN PLANT EXPLOSION

A common method of production of Oxygen and Nitrogen is liquefaction of air. Air is compressed, expanded and cooled via Joule-Thompson effect, and recompressed and expanded again and recooled and so forth until air is liquefied. Since Nitrogen boils at a lower temperature than oxygen, the Nitrogen can be distilled off the liquid air ,recompressed and re-liquefied. An oxygen rich phase is left in the distillation column. Since the Joule –Thompson effect depends on the expanding air doing some work, a turbine type expander is used. As it is a rotating machinery lubrication is essential. A Seal Gas system is provided to prevent the lubricating oil from contaminating the process stream.

A nitrogen plant, serving a large chemical complex tripped and went into automatic shut down. When such trip occurs, the plant begins to draw Nitrogen from liquid Nitrogen reserves. Liquid nitrogen is heated in vapourisers to produce higher pressure nitrogen gas. Under normal conditions, a check valve prevents Nitrogen gas (created from vapourisers) from flowing back into liquefied air distillation column. In the present case , the check valve was faulty and the nitrogen gas from vapouriser flowed back into the distillation column and forced the Oxygen-rich liquid air in the bottom of the column into the turbine expander. The back flow pressure was greater than the gas-seal pressure, oxygen rich liquid and/or air flowed past the seal and entered into the oil sump . This created an explosive mixture of combustible oil and oxygen rich liquid air. Since the gas entering the sump was cold, the oil became cold and viscous. An operator turned on the oil sump heater in an attempt to warm up the oil. The oil sump exploded and two workers were seriously injured.

A HAZOP study, through competent people, would have identified the "more pressure in the gas seal system" due to passing of check valve and suggested control measures.

CASE STUDY 3:

FOUR EMPLOYEES EXPOSED TO H_2S

Incident Description: Four employees were exposed to H_2S while draining a transfer line inside a pit. The pit is approximately 12 feet deep (confined space).

Outcome: Three fatalities and one serious injury. The injured person was taken to hospital where he was treated, recovered and subsequently discharged from the hospital.

Immediate Causes:

- Violation of Procedure (PTW & Confined Space Entry Certificate).
- Breathing apparatus was not used and personal H_2S detector was switched off.
- Exposure to lethal concentration of H_2S in confined space.

Root Causes:

- Inadequate identification of job hazards.
- Inadequate reinforcement of procedures.
- Inadequate Identification of Training Needs.
- Inadequate reinforcement of critical safe behavior.
- Inadequate Guards &Warning Systems.
- Non issue of H_2S detectors to all personnel including helpers working in H_2S exposed areas.
- Lack of training to all workers for performing their assigned tasks.

Remedial measures:

In addition to the Root causes, the following also may be considered to avoid such incidences.

- Establish Access Control on all confined spaces with effective markings, signs & tagging; and locking, where applicable.
- Ensure PTW is issued based on task risk assessment (TRA) and the high risk TRA has been endorsed by a competent safety professional.
- Confined space entries cannot be made unless the competent safety professional has signed off the Confined Space Entry Certificate and he has reviewed the emergency plan
- Organise confined space entry training course for all who are likely to be engaged in this type of work. ■

PLASTICS AND INSULATING MATERIALS – CONTAINING THE RISK IN HAZARDOUS AREAS

Traditionally, flammable liquids have been transported in metal drums and the need to earth these during filling and emptying operations, in order to prevent the build up of static electricity, is generally well known. Likewise, powders were often stored in paper sacks or fiber kegs, which allow a reasonable degree of static dissipation.

Over the past few years, the need to improve efficiency has often led to materials being stored and moved in larger bulk. Today, it is quite common for liquids to be transported in 1000-liter containers, and powders in 1 tonne bags, both of which are approximately 1 meter cubed. These larger containers are generally produced from moulded plastic, as with IBCs (Intermediate Bulk Containers), and polypropylene fabric in the case of FIBCs (Flexible Intermediate Bulk Containers). Often pipes used to transfer these products are lined with plastic or PTFE, for corrosion resistance, hygiene or avoidance of contamination. This use of insulating materials presents three areas of risk in flammable atmospheres:

1) The liquid or powder in the container is likely to have built up an electro-static charge during the transfer operation, and even a conductive material will retain its charge, as the container or pipe will prevent it from flowing back to earth. This could lead to a static discharge from the surface of the material if, for example, it was approached by an earthed container for sampling.

2) An insulating container will gather charge during filling, in a similar manner to an unearthed metal one. When the electro-static field reaches the breakdown strength of air, a brush discharge could occur at the container surface. Whilst likely to be less energetic than a spark from unearthed metal, it will still ignite many solvent vapours and occasionally, certain dust clouds, particularly the low MIE powders used in modern pharmaceutical operations.

3) The container could allow metal parts, such as its tap, to become isolated conductors, which could give rise to energetic spark discharges. Even a tool placed on top of a plastic IBC could become charged and spark to the unit's metal strengthening frame. Large plastic containers can also cause a charge to be induced on nearby objects or personnel. This is particularly true of insulating FIBCs.

Ensuring Safety – Controlling the Risk

Owing to developments in materials technology, it is now possible to obtain plastic kegs, large IBCs, FIBCs and pipe grounding paddles, specifically designed for use in hazardous areas. Large plastic IBCs are now available with a complete steel shroud, in addition to their strengthening cage, which will prevent discharges from their surface, providing they have been suitably earthed using a discharge lead and clamp. They also have a conductive valve, protruding into the liquid, to give a static dissipation path. Using a different approach, but giving a similar result, kegs are now being produced from plastics that contain a conductive substance, usually carbon. These should have an electrical resistance of less than $1 \times 10 \hat{} 8$ ohms, and are designed to dissipate static electricity. This will prevent the risk of brush discharges from their surface, and will give a path for electrical discharge of their contents. In all cases, these type of containers should be suitably earthed using either a discharge lead, clamp, or in the case of the kegs, by being in contact with an earthed metal plate. FIBCs have now been categorised into four

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categories, A, B, C and D by the Swiss Institute of Safety and Security. The type C variety contains thin conductive strips spaced closely together in the polypropylene weave. All these strips are interconnected at the seams, and via the lifting handles and a labeled earthing point. These conductive parts will carry away any static electricity on the surface of the bag, and provide a path to dissipate static electricity from the powders within. Type C bags have been proved to be safe for use in flammable atmospheres, providing they have been earthed using a suitable discharge lead and clamp, such as the special FIBC clamp. A common worry with these bags is the uncertainty of whether or not an earth has actually been achieved, and a solution to this problem has been found in the Cenelectrex Earth-Rite FIBC system, which was specially designed to work with static-dissipative plastics, including type C FIBCs. Besides monitoring the earth, this system has the added benefit of ensuring that the correct type of FIBC or plastic liner is being used, and importantly, that it is working within its specification. If a pipeline is made from insulating plastic or lined metal, its contents will be prevented from dissipating static electricity through the pipe wall and back to earth. However, by introducing a static-dissipative Grounding Paddle between each flange connection, with an external bond to the grounded metal pipe or other suitable earth, static dissipation paths along the length of the pipe are provided. A complete range of Grounding Paddles is now available for many pipe diameters to ensure that the contents of lined pipes can dissipate their static, whilst moving along the pipe. ■

GENERAL HEALTH TIPS

- Exercise regularly
- Maintain ideal body weight
- Stop smoking if you are a smoker
- Take right diet

Diet for Cardio-Vascular Diseases

- Avoid butter, ghee and Vanaspathi
- Include more of vegetables and fruits in the diet
- Skimmed milk can be used rather than whole milk
- Fish can be substituted instead of high-fat meats
- Legumes like beans, peas and lentils are good sources of protein with no cholesterol
- Soyabeans can be substituted for animal protein
- Choose oils like Olive oil, Sunflower oil for cooking

Diet for Diabetes

- Avoid sugar, sugar added products and coconut in your diet
- Avoid high fat and deep fried items
- Avoid high calorie fruits like banana, jack fruit, sapota, mango and grapes
- Energy and proprietory drinks like coca-cola, pepsi & fanta etc should be avoided
- Eat smaller, more frequent meals throughout the day, include fibre in the diet (green leafy vegetables and whole grams)

Diet for Hypertension

- Salt and salt added products like pickles, chips, papads and dry fish should be avoided
- Deep fried items and coconut added products should be avoided
- Energy and proprietory drinks like coca-cola, pepsi & fanta etc should be avoided
- Do not add extra salt to your food
- Read food labels to check the amount of sodium in prepared foods
- Follow a low fat and low salt diet. ■

THERMAL OXIDIZER

A thermal oxidizer (or thermal oxidiser) is a process unit for air pollution control in many chemical plants that decomposes hazardous gases at a high temperature and releases them into the atmosphere.

Principle

Thermal Oxidizers are typically used to destroy Hazardous Air Pollutants (HAPs) and Volatile Organic Compounds (VOCs) from industrial air streams. These pollutants are generally hyrdocarbon based and when destroyed via thermal combustion they are chemically changed to form CO_2 and H_2O.

Regenerative thermal oxidizer (RTO)

One of today's most widely accepted air pollution control technologies across the industry is a Regenerative Thermal Oxidizer, commonly referred to as a RTO. They are very versatile and extremely efficient –energy recovery efficiency can reach 95%. This is achieved through the storage of heat by dense ceramic stoneware. Regenerative Thermal Oxidizers are ideal in low VOC concentrations with larger process requirements. Systems can be used during long continuous 24 hour operations.

There are currently many Regenerative Thermal Oxidizers on the market with the capabitlity of 99+% Volatile Organic Compound (VOC) destruction efficiencies. The ceramic heat exchanger(s) can be designed for thermal efficiencies as high as 97+%. Regenerative Thermal Oxidizers can be designed with multiple hot gas bypass systems, bake-out cycles, re-circulation heat exchangers and O_2 monitoring to reduce carbon monoxide and nitrous oxide. Many environmental agencies are requiring O_2 continuous monitoing for the control of these secondary gases. Higher VOC streams allow the RTO to operate at reduced or zero fuel usage, which makes these systems ideal for certain plant operations.

Regenerative catalytic oxidizer (RCO)

In some applications, the use of Catalyst with the ceramic media helps allow oxidation at reduced temperatures. This can result in even lower operating costs compared to a Regenerative Thermal Oxidizer.

Ventilation air methane thermal oxidizer (VAMTOX)

Ventilation Air Methane Thermal Oxidizers are used to destroy Ventilation Air Methane from underground shafts that provide exhaust for underground mining workers. Methane pollutants are hydrocarbon based and when destroyed via thermal combustion are chemically altered to form CO_2 and H_2O which is 19 times less destructive to the ozone layer than methane emissions. Mining concentrations of ventilation air exhausts are very dilute typically below 1% and often below 0.5%. VamTox units have a system of valves and dampers that direct the methane flow across the ceramic bed. On system start up the system preheats and raises the temperature of the heat exchange material in the oxidizer bed to or above the auto-oxidation temperature of ventilation air methane (1,000°C or 1,832°F), at which the preheating system is turned off and methane process flow is initiated. Then the ventilation air methane reaches the preheated bed, releasing the heat of combustion. This heat is transferred to the bed, thereby maintaining its temperature at or above the temperature necessary to support auto-thermal operation.

Thermal recuperative oxidizer

A less commonly used thermal oxidizer technology is a thermal recuperative oxidizer. Thermal recuperative oxidizers have a primary and/or secondary heat exchanger within the system. A primary heat exchanger preheats the incoming dirty air by recuperating heat from the exiting clean air. This is done by a shell and tube heat exchanger or a plate-type exchanger. As the incoming air passes on one side of the metal tube or plate, hot clean air from the combustion chamber passes on the other side of the tube or plate and heat is transferred to the incoming air through the process of conduction using the metal as the medium of heat transfer. In a secondary heat exchanger the same concept applies for heat transfer, but the air being heated by the outgoing clean process stream is being returned to another part of the plant – perhaps back to the process.

Catalytic oxidizer

Catalytic oxidation occurs through a chemical reaction between the

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SAFETY PRECAUTIONS IN HEAT TREATING OPERATIONS

Heat treating operations require a quench as an integral part of the process. Liquid quenches normally involve the use of mineral oils, water based solutions or molten salt. Less severe quenches use circulated gas or forced air, or involve cooling in still air.

Queching operations pose various health hazards. These include working in high temperatures and the risk of fire or explosion. The properties of the quenchants, the design, construction, location, control, monitoring and maintenance of the furnace are to be considered to minimize these risks.

Quenching operations are often followed by a degreasing with chlorinated solvents or water soluble compounds.

Safety precautions to be followed during a heat- treating operation:

- Wear a face shield , safety glasses, gloves and heat resistant protective clothing when working with hot metal. Quench oils may be very hot (above 100° C) and oil temperature increases during quenching. Splashes or skin contact cause burns. Avoid skin contact with oils by using gloves and protective clothing.
- Check that all safety devices , such as automatic shut – off valves, air switches and exhaust fans are working properly before lighting the furnace.
- Ensure that quenching areas have enough ventilation to keep oil mists at recommended levels.
- Follow the manufacturers instructions when lighting the furnace.
- Stand to one side when lighting a gas or oil-fired furnace.
- Ensure that water does not contaminate the quenching oil. Any moisture which comes in contact with the oil can cause an explosion.
- Use the proper tongs for the job and make sure the tongs are dry before removing any work from a liquid carburizing pot.
- Ensure that a suitable bacterial inhibitor or fungicide has been added to the quenching liquid.
- Cover quench tanks when not in use.
- Clean up oil spills and leaks immediately using a non-flammable absorbant.
- Keep work areas , jigs, baskets and tools free from oil contamination where possible.
- Wash hands thoroughly after work, at breaks (particularly meal times), before staring other tasks, or before using the toilet.
- Obtain first aid for all cuts and abrasions. Protect them from contamination by using suitable dressings.
- Obtain medical attention when suffering from, or suspecting , skin truble.

Things to be avoided doing:

- Do not inhale the fumes from a molten carburizing salt bath. During the carburizing process, carbon monoxide is generated. Ensure that this area is well ventilated. These molten salt baths may contain potassium or sodium cyanide, a deadly poison. Handle the salt mixture with caution and watch for contamination from carburized metal pieces.
- Do not wear oil-soaked clothing or put oily rags in your pockets.
- Do not bring food or drink into areas where quench oils are stored or used.
- Do not wear or take oil-contaminated clothing or equipment into areas where food or drink are consumed.

Thermal ....

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VOC hydrocarbon molecules and a precious-metal catalyst bed that is internal to the oxidizer system. A catalyst is a substance that is used to accelerate the rate of a chemical reaction, allowing the reaction to occur in a normal temperature range of 550°F - 650°F (275°C to 350°C).

Direct fired thermal oxidizer - afterburner

A direct-fired oxidizer is the simplest technology of thermal oxidation. A process stream is introduced into a firing box through or near the burner and enough residence time is provided to get the desired destruction removal efficiency (DRE) of the VOCs. Also called afterburners, these systems are the least capital intensive, but when applied incorrectly, the operating costs can be devastating because there is no form of heat recovery. These are best applied where there is a very high concentration of VOCs to act as the fuel source (instead of natural gas or oil) for complete combustion at the targeted operating temperature.

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