SEA (INDIA)

INDIAN SAFETY ENGINEER

QUARTERLY JOURNAL OF SAFETY ENGINEERS ASSOCIATION

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FROM THE DESK OF PRESIDENT

Dear Members,

During the IV Quarter 2011, our 56th Executive Committee meeting was held on 15-10-2011 and the 29th Technical Meet was held on 18-12-2011. Our journal "Indian safety Engineer" for the third quarter 2011 was released and hopefully the next issue will also reach you soon.

Mumbai Chapter of SEA had their quarterly technical meet and the third Executive Committee meeting held on 26-11-2011. Their membership drive in the region continues very actively. Guidelines for the formation and functioning of SEA Chapters at different locations are being developed and soon will be finalized and put into use.

I am happy to share with you all that some of the leading safety professionals in Vadodhara (Baroda) in Gujarat state have come forward to initiate steps in forming a SEA Chapter. Vadodhara being an industrial hub in the state has many safety engineers willing to network among the fellow professionals and they find forming a SEA Chapter will benefit them. Let us wish them good luck.

Another recent activity is that SEA has joined hands with Automobile Association of South India (AASI) in observing "Road Safety Week" during the first week of January 2012. AASI is also planning to develop a "Federation of Associations to promote Road Safety" and has extended invitation for SEA to consider becoming a member of it.

SEA (India) website, www.seaindia.org is now being viewed by more personnel than before and their feedbacks received are encouraging. Presently the site is due for updating and this will be completed shortly. Recommend to your professional colleagues to view the site and advise them to use the links provided for enrolling as members or for applying for Nebosh course. Service providers may choose to advertise their products / services using an exclusive weblink provided in the site.

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SEA India wishes A HAPPY AND SAFE

Inside....

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Enrollment for two groups of Nebosh IGC course are in progress for the tenth batch of classes to be conducted by SEA. The examinations for this batch are scheduled in March 2012. New revised syllabus introduced by NEBOSH, UK will be followed from now on.

As you know SEA has started extending their services to the engineering colleges in giving an insight to safety engineering for their students, before they come out of the college as young engineers.

Members are encouraged to use the Safety Library set up at SEA office for developing their knowledge and skills and to use the SEA India Group mail forum for effective networking.

Members may contribute their mite towards "Road Safety Week" during the first week of January and on the "National Safety Day " to be observed on 4th March 2012.

With Best Wishes for a Happy, Prosperous and Safe New Year!

S. Ulaganathan

President, SEA India

NEBOSH Course Update

The Tenth International General Certificate Course of NEBOSH is scheduled to commence on Thursday, 23rd February, 2012 for which admission is nearing completion. As more number of safety professionals are aspiring to join this course, we are making arrangements to have TWO batches, this time.

NEBOSH has revised the syllabus for this course from January 2012 onwards, the course materials have also been prepared strictly in accordance with new syllabus and sent to all the admitted candidates.

The examination will be conducted on March 7th and 8th 2012 at Sri Ramachandra University.

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 are requested to contact the Secretary, SEA India by mail: info@seaindia.org for getting admission.

29TH PROFESSIONAL DEVELOPMENT PROGRAMME

Twenty Nineth Professional Development programme was held on Sunday, 18th December 2011 at Chennai.

Dr. T. Kumaran, Senior Medical Officer, Delphi-TVS, Chennai delivered the talk on "Orientation to Occupational Health".

The meet was followed by lunch and presentation of certificate to the participants and a gift to the lucky winner among the participants.

Large number of SEA members participated and enriched their knowledge.

The salient topics discussed in the programme is given below for the sake of SEA India members who could not attend the programme.

Definition of Occupational Health

"The promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations - total health of all at work".

Occupational Health Hazards

A. Chemical B. Biological
C. Mechanical D. Psychosocial
E. Physical

- **Heat Balance & Heat Stress**
  1) Prickly heat
  2 Heat cramps
  3) Heat exhaustion
  4) Heat stroke

Decomposition illness problems of changes in barometric pressure

- Type I & Type II
- Dysbaric oesteonecrosis
- Sclerotic changes
- Aseptic necrosis

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Ioninizing radiation

1. Cosmic rays; 2. Gamma rays; 3. X-rays (all with wavelengths of less than 100 nm).

Non-ioninizing radiation

1) Ultraviolet rays (200–400 nm)
2) Visible light (400-700 nm)
3) infrared (700 nm – 1 mm)
4) microwave (1 mm – 1 m)
5) radio waves (1 m – 1 Km)

Vibration

- Whole body vibration[2–1000 HZ]
- Segmental vibration [white fingers 40 – 300 HZ].

Electricity

1. Ventricular fibrillation.
2. Cardiac arrest
3. Extensive burns of the skin
4. Haemoglobin uria
5. Myoglobin uria
6. Fits, head ache, Parkinsonism

Dusts (Pneumoconiosis)

Inorganic Dust:

Silica – Silicosis
Coal Dust – Anthracosis
Asbestos – Asbestosis

Organic Dusts:

Cane Fiber – Bagassosis (Bronchi gets affected)
Cotton dust – Byssinosis (In Textile industries)
Tobacco – Tobaccosis, Lung Cancer
Grain Dust – Farmer's Lungs

Chemical Hazards

Carbon compounds & other toxic substances

- Aliphatic compounds
  - Methane alcohol
  - Tetra chloro ethane
  - Carbon tetra chloride
  - Tri chloro ethane
  - Tri chloro ethylene
- Aromatic compounds
  - Benzene
  - Toluene
  - Xylene
  - Nitro benzene
- Central nervous system
- Reneal system
- Liver
- Haemopoietic system

Pesticides gases & prevention of poisoning by chemicals

- Organo phosphorous compounds.
- Organo chlorine compounds
- Synthetic pyrethroids
- Carbametes

Acute poisoning – Neuropathy
Liver cancer – Ataxia

Gases

- **Simple Asphyxiants**

- Inert gases
- Nitrogen
- Carbon-di- oxide
- Nitrogen-di-oxide

- **Chemical Asphyxiants**

- Carbon monoxide
- Hydrogen cyanide
- Hydrogen sulphide

Chemical Hazards – Gases

* Simple Asphyxiants: Carbon di oxide, methane, hydrogen.
* Simple Asphyxiants: Carbon monoxide Cyanide, Hydrogen sulphide.
* Irritant gases: Ammonia, Chlorine, sulphur di oxide.
* Systemic Poision: Carbon di sulphide.

Mechanical Hazards:

Injuries:

1. Falls 2. Cuts 3. Abrasions 4. Concussions 5. Contusions etc.

Occupational skin problems

1) Allergic contact dermatitis
2) Irritant contact dermatitis

International Agency for Research on Cancer (IARC)

- Group–1 (Carcinogenic to human).
- Group–2 A (Probably carcinogenic to human).
- Group–2 B (Possibly carcinogenic to human).
- Group–3 (Not classifiable as to its carcinogenic to human).

List of notifiable diseases as per Factories Act, 1948

1. Lead Poisoning, including poisoning by any preparation or compound of lead or their sequelae.
2. Lead tetra - ethyl poisoning.
3. Phosphorus poisoning or its sequelae.
4. Mercury poisoning or its sequelae.
5. Manganese poisoning or its sequelae.
6. Arsenic poisoning or its sequelae.
7. Poisoning by nitrous fumes.
8. Carbon bisulphide poisoning.
9. Benzene poisoning, including poisoning by any of its homologous, their nitro or amino derivatives or its sequelae.
10. Chrome ulceration or its sequelae.
11. Anthrax.
12. Silicosis.
13. Poisoning by halogens or halogens derivatives of the

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PROTECTION AGAINST ELECTRICAL HAZARDS

Most electrical accidents result from one of the following three factors:

- unsafe equipment or installation,
- unsafe environment, or
- unsafe work practices.

Some ways to prevent these accidents are through the use of insulation, guarding, grounding, electrical protective devices, and safe work practices.

What protection does insulation provide?

Insulators such as glass, mica, rubber, or plastic used to coat metals and other conductors help stop or reduce the flow of electrical current. This helps prevent shock, fires, and short circuits. To be effective, the insulation must be suitable for the voltage used and conditions such as temperature and other environmental factors like moisture, oil, gasoline, corrosive fumes, or other substances that could cause the insulator to fail.

How do you identify different types of insulation?

Insulation on conductors is often color coded. Insulated equipment grounding conductors usually are either solid green or green with yellow stripes. Insulation covering grounded conductors is generally white or gray. Ungrounded conductors, or "hot wires," often are black or red, although they may be any color other than green, white, or gray. Before connecting electrical equipment to a power source, it is a good idea to check the insulation for any exposed wires for possible defects. Insulation covering flexible cords such as extension cords is particularly vulnerable to damage.

What is guarding and what protection does it offer?

Guarding involves locating or enclosing electric equipment to make sure people don't accidentally come into contact with its live parts. Effective guarding requires equipment with exposed parts operating at 50 volts or more to be placed where it is accessible only to authorized people qualified to work with it. Recommended locations are a room, vault, or similar enclosure; a balcony, gallery, or elevated platform; or a site elevated 8 feet (2.44 meters) or more above the floor. Sturdy, permanent screens also can serve as effective guards.

Conspicuous signs must be posted at the entrances to electrical rooms and similarly guarded locations to alert people to the electrical hazard and to forbid entry to unauthorized people. Signs may contain the word "Danger," "Warning" or "Caution," and beneath that, appropriate concise wording that alerts people to the hazard or gives an instruction, such as "Danger/ High Voltage/Keep Out."

What is grounding and what protection does it offer?

"Grounding" a tool or electrical system means intentionally creating a low-resistance path that

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hydrocarbons of the aliphatic series.

14. Pathological manifestations due to:
    (a) radium or other radio - active substances ;
    (b) X-Rays.
15. Primary epitheliomatous cancer of the skin.
16. Toxic anaemia.
17. Toxic jaundice due to poisoning substances.
18. Oil acne or dermatitis due to mineral oils and compounds containing mineral oil base.
19. Byssionosis.
20. Asbestosis.
21. Occupational or contact dermatitis caused by direct contact with chemicals and paints. These are of two types, that is, primary irritants and allergic sensitizers.
22. Noise induced hearing loss (exposure to high noise levels).
23. Beryllium poisoning.
24. Carbon monoxide poisoning.
25. Coal miners' pneumoconiosis.
26. Phosgene poisoning.
27. Occupational cancer.
28. Isocyanides poisoning.
29. Toxic nephritis. ■

Protection against....

(Contd. from previous page)

connects to the earth.

This prevents the buildup of voltages that could cause an electrical accident.

Grounding is normally a secondary protective measure to protect against electric shock. It does not guarantee that you won't get a shock or be injured or killed by an electrical current. It will, however, substantially reduce the risk, especially when used in combination with other safety measures.

A service or system ground is designed primarily to protect machines, tools, and insulation against damage.

One wire, called the "neutral" or "grounded" conductor, is grounded. In an ordinary low-voltage circuit, the white or gray wire is grounded at the generator or transformer and at the building's service entrance.

An equipment ground helps protect the equipment operator. It furnishes a second path for the current to pass through from the tool or machine to the ground.

This additional ground safeguards the operator if a malfunction causes the tool's metal frame to become energized. The resulting flow of current may activate the circuit protection devices.

What are circuit protection devices and how do they work?

Circuit protection devices limit or stop the flow of current automatically in the event of a ground fault, overload, or short circuit in the wiring system. Well-known examples of these devices are fuses, circuit breakers, ground-fault circuit interrupters, and arc-fault circuit interrupters.

Fuses and circuit breakers open or break the circuit automatically when too much current flows through them.

When that happens, fuses melt and circuit breakers trip the circuit open. Fuses and circuit breakers are designed to protect conductors and equipment. They prevent wires and other components from overheating and open the circuit when there is a risk of a ground fault.

Ground-fault circuit interrupters, or GFCIs, are used in wet locations, construction sites, and other high-risk areas.

These devices interrupt the flow of electricity within as little as 1/40 of a second to prevent electrocution. GFCIs compare the amount of current going into electric equipment with the amount of current returning from it along the circuit conductors. If the difference exceeds 5 milliamperes, the device automatically shuts off the electric power.

Arc-fault devices provide protection from the effects of arc-faults by recognizing characteristics unique to arcing and by functioning to deenergize the circuit when an arc-fault is detected.

What work practices help protect you against electrical hazards?

Electrical accidents are largely preventable through safe work practices. Examples of these practices include the following:

- deenergizing electric equipment before inspection or repair,
- keeping electric tools properly maintained,
- exercising caution when working near energized lines,

and

- using appropriate protective equipment.

How can you protect yourself against metal parts that become energized?

A break in an electric tool's or machine's insulation can cause its metal parts to become "hot" or energized, meaning that they conduct electricity. Touching these energized parts can result in an electrical shock, burn, or electrocution. The best way to protect yourself when using electrical tools or machines is to establish a low-resistance path from the device's metallic case to the ground. This requires an equipment grounding conductor, a low-resistance wire that directs unwanted current directly to the ground. A properly installed grounding conductor has a low resistance to ground and greatly reduces the amount of current that passes through your body.

Cord and plug equipment with a three-prong plug is a common example of equipment incorporating this ground conductor.

Another form of protection is to use listed or labeled portable tools and appliances protected by an approved system of double insulation or its equivalent. Where such a system is employed, it must be marked distinctively to indicate that the tool or appliance uses an

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Protection against....

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approved double insulation system.

How can you prevent an accidental or unexpected equipment startup?

Proper lockout/tagout procedures protect you from the dangers of the accidental or unexpected startup of electrical equipment and are required for general industry by OSHA Standard 1910.333, "Selection and Use of Work Practices."

Requirements for construction applications are in 29 CFR 1926.417, Lockout and Tagging of Circuits. These procedures ensure that electrical equipment is deenergized before it is repaired or inspected and protects you against electrocution or shock.

The first step before beginning any inspection or repair job is to turn the current off at the switch box and padlock the switch in the OFF position. This applies even on so-called low-voltage circuits. Securely tagging the switch or controls of the machine or equipment being locked out of service clarifies to everyone in the area which equipment or circuits are being inspected or repaired.

Only qualified electricians who have been trained in safe lockout procedures should maintain electrical equipment.

No two of the locks used should match, and each key should fit just one lock. In addition, one individual lock and key should be issued to each maintenance worker authorized to lock out and tag the equipment. All employees who repair a given piece of equipment should lock out its switch with an individual lock. Only authorized workers should be permitted to remove it.

How can you protect yourself from overhead power lines?

Before working under or near overhead power lines, ensure that you maintain a safe distance to the lines and, for very high-voltage lines, ground any equipment such as cranes that can become energized. If working on power lines, ensure that the lines have been deenergized and grounded by the owner or operator of the lines. Other protective measures like guarding or insulating the lines help prevent accidental contact.

Employees, unqualified to work with electricity, as well as mechanical equipment, should remain at least 10 feet (3.05 meters) away from overhead power lines. If the voltage is more than 50,000 volts, the clearance increases by 4 inches (10 centimeters) for each additional 10,000 volts.

When mechanical equipment is operated near overhead lines, employees standing on the ground should avoid contact with the equipment unless it is located outside the danger zone. When factoring the safe standoff distance, be sure to consider the equipment's maximum reach.

What protection does personal equipment offer?

Employees who work directly with electricity should use the personal protective equipment required for the jobs they perform. This equipment may include rubber insulating gloves, hoods, sleeves, matting, blankets, line hose, and industrial protective helmets designed to reduce electric shock hazard. All help to reduce the risk of electrical accidents.

What role do tools play?

Appropriate and properly maintained tools help protect workers against electric hazards. It's important to maintain tools regularly because it prevents them from deteriorating and becoming dangerous. Check each tool before using it. If you find a defect, immediately remove it from service and tag it so no one will use it until it has been repaired or replaced.

When using a tool to handle energized conductors, check to make sure it is designed and constructed to withstand the voltages and stresses to which it has been exposed.

What special training do employees need?

All employees should be trained to be thoroughly familiar with the safety procedures for their particular jobs. Moreover, good judgment and common sense are integral to preventing electrical accidents. When working on electrical equipment, for example, some basic procedures to follow are to:

- deenergize the equipment,
- use lockout and tag procedures to ensure that the equipment remains deenergized,
- use insulating protective equipment, and
- maintain a safe distance from energized part ■

CERTAIN FACTS ABOUT FORMALDEHYDE

Formaldehyde is a colorless, strong-smelling gas often found in aqueous solutions. Commonly used as a preservative in medical laboratories and mortuaries, formaldehyde is also found in many products such as chemicals, particle board, household products, glues, permanent press fabrics, paper product coatings, fiberboard, and plywood. It is also widely used as an industrial fungicide, germicide and disinfectant

Although the term formaldehyde describes various mixtures of formaldehyde, water, and alcohol, the term "formalin" is used to describe a saturated solution of formaldehyde dissolved in water, typically with another agent, most commonly methanol, added to stabilize the solution. Formalin is typically 37% formaldehyde by weight (40% by volume) and 6-13% methanol by volume in water.

The formaldehyde component provides the disinfectant effects of formalin.

What Employers Should Know

The OSHA Formaldehyde standard (29 CFR 1910.1048) and equivalent regulations in states with OSHA-approved state plans protects workers exposed to formaldehyde and apply to all occupational exposures to formaldehyde from formaldehyde gas, its solutions, and materials that release formaldehyde.

• The permissible exposure limit (PEL) for formaldehyde in the workplace is 0.75 parts formaldehyde per million parts of air (0.75 ppm) measured as an 8-hour time-weighted average (TWA).

• The standard includes a second PEL in the form of a short-term exposure limit (STEL) of 2 ppm which is the maximum exposure allowed during a 15-minute period.

• The action level - which is the standard's trigger for increased industrial hygiene monitoring and initiation of worker medical surveillance - is 0.5 ppm when calculated as an 8-hour TWA.

Harmful Effects on Workers

Formaldehyde is a sensitizing agent that can cause an immune system response upon initial exposure. It is also a cancer hazard. Acute exposure is highly irritating to the eyes, nose, and throat and can make anyone exposed cough and wheeze. Subsequent exposure may cause severe allergic reactions of the skin, eyes and respiratory tract. Ingestion of formaldehyde can be fatal, and long-term exposure to low levels in the air or on the skin can cause asthma-like respiratory problems and skin irritation such as dermatitis and itching. Concentrations of 100 ppm are immediately dangerous to life and health (IDLH).

Note: The National Institute for Occupational Safety and Health (NIOSH) considers 20 ppm of formaldehyde to be IDLH.

Routes of Exposure

Workers can inhale formaldehyde as a gas or vapor or absorb it through the skin as a liquid. They can be exposed during the treatment of textiles and the production of resins. In addition to healthcare professionals and medical lab technicians, groups at potentially high risk include mortuary workers as well as teachers and students who handle biological specimens preserved with formaldehyde or formalin.

How Employers Can Protect Workers?

Airborne concentrations of formaldehyde above 0.1 ppm can cause irritation of the respiratory tract. The severity of irritation intensifies as concentrations increase.

Provisions of the OSHA standard require employers to do the following:

• Identify all workers who may be exposed to formaldehyde at or above the action level or STEL through initial monitoring and determine their exposure. Reassign workers who suffer significant adverse effects from formaldehyde exposure to jobs with significantly less or no exposure until their condition improves. Reassignment may continue for up to 6 months until the worker is determined to be able to return to the original job or to be unable to return to work, whichever comes first.

• Implement feasible engineering and work practice controls to reduce and maintain worker exposure to formaldehyde at or below the 8- hour TWA and the STEL. If these controls cannot reduce exposure to or below the

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PYROPHORIC IRON FIRES

At one time or another, most refineries experience spontaneous ignition of iron sulfide either on the ground or inside equipment. When this occurs inside the equipment like columns, vessels, and tanks and exchangers containing residual hydrocarbons and air, the results can be devastating.

Most commonly, pyrophoric iron fires occur during shutdowns, when the equipment and piping are opened for inspection or maintenance. Instances of fires in crude columns during turnarounds, explosions in sulfur, crude or asphalt storage tanks, overpressures in vessels, etc., due to pyrophoric iron ignition are not uncommon.

Often the cause of such accidents is a lack of understanding of the phenomenon of pyrophoric iron fires. This article aims to explain the basics of pyrophoric iron fires and to provide ideas for developing safe practices for handing over equipment for inspection and maintenance.

What is Pyrophoric Iron Oxidation?

The word "pyrophoric" is derived from the Greek for "fire-bearing". According to Webster's dictionary, "pyrophoric material" means "any material igniting spontaneously or burning spontaneously in air when rubbed, scratched, or struck, e.g. finely divided metals".

Iron sulfide is one such pyrophoric material that oxidizes exothermically when exposed to air. It is frequently found in solid iron sulfide scales in refinery units. It makes no difference whether these pyrophoric sulfides exist as pyrite, troilite, marcasite, or pyrrhotite. It is formed by the conversion of iron oxide (rust) into iron sulfide in an oxygen-free atmosphere where hydrogen sulfide gas is present (or where the concentration of hydrogen sulfide (H2S) exceeds that of oxygen). The individual crystals of pyrophoric iron sulfides are extremely finely divided, the result of which is that they have an enormous surface area-to-volume ratio.

When the iron sulfide crystal is subsequently exposed to air, it is oxidized back to iron oxide and either free sulfur or sulfur dioxide gas is formed. This reaction between iron sulfide and oxygen is

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Certain Facts....

(Contd. from page 7)

PELs, employers must provide workers with respirators.

• Label all mixtures or solutions composed of greater than 0.1 percent formaldehyde and materials capable of releasing formaldehyde into the air at concentrations reaching or exceeding 0.1 ppm. For all materials capable of releasing formaldehyde at levels above 0.5 ppm during normal use, the label must contain the words "potential cancer hazard."

• Train all workers exposed to formaldehyde concentrations of 0.1 ppm or greater at the time of initial job assignment and whenever a new exposure to formaldehyde is introduced into the work area. Repeat training annually.

• Select, provide and maintain appropriate personal protective equipment (PPE). Ensure that workers use PPE such as impervious clothing, gloves, aprons, and chemical splash goggles to prevent skin and eye contact with formaldehyde.

• Provide showers and eyewash stations, if splashing is likely.

• Provide medical surveillance for all workers exposed to formaldehyde at concentrations at or above the action level or exceeding the STEL, for those who develop signs and symptoms of overexposure, and for all workers exposed to formaldehyde in emergencies.

Recordkeeping Requirements

Employers are required to do the following regarding worker exposure records:

• Retain exposure records for 30 years.

• Retain medical records for 30 years after employment ends.

• Allow access to medical and exposure records to current and former workers or their designated representatives upon request. ■

SAFETY COMMUNICATION

LEARNING LESSONS FROM INCIDENT

What happened?

Two workers asphyxiated and died while cleaning a tank in a paper mill

Why it happened?

They were asphyxiated due to insufficient Oxygen inside the tank

Learning lessons:

- Working inside a tank or a confined space is more hazardous
- Additional precautions and control measures to be in place while carrying out any operation or maintenance work in confined spaces

Control measues:

- Entry into confined space for operation or maintenance should be based on a safety work permit.
- Safety work permit is mandatory for working inside a confined space as per Sec 36 of the Factories Act
- Confined space entry permit to be authorized by a higher level functionary in the unit and the safety in charge
- A stand by person to be available outside the confined space till the time some one is inside the confined space
- Rescue plan to be available to evacuate the personnel from the confined space in case of emergency
- All units to have an SOP for confined space entry with details of confined spaces in the unit / definition of confined space and provision for checking Oxygen and toxic gases before entry
- All the units should carryout risk assessment and list out confined spaces in their unit which require confined space entry permit.

Pyrophoric....

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accompanied by the generation of a considerable amount of heat. In fact, so much heat is released that individual particles of iron sulfide become incandescent. This rapid exothermic oxidation with incandescence is known as pyrophoric oxidation and it can ignite nearby flammable hydrocarbon-air mixtures.

Basic chemical reactions: Iron sulfide is one of the most common substances found in refinery distillation columns, pressure vessels, etc. It is formed by the reaction of rust or corrosion deposits with hydrogen sulfide as shown below:

$$Fe_2O_3\,(rust) + 3H_2S \longrightarrow 2FeS + 3H_2O + S \quad \text{Eq. 1}$$

There is a greater likelihood of this reaction occurring when the process involves a feedstock with high sulfur content. This pyrophoric iron sulfide (PIS) lays dormant in the equipment until the equipment is shutdown and opened for service, exposing the PIS to air, allowing the exothermic process of rapid oxidation of the sulfides to oxides to occur, as shown in the equations below:

$$4FeS + 3O_2 \longrightarrow 2Fe_2O_3 + 4S + heat \quad \text{Eq. 2}$$

$$4FeS + 7O_2 \longrightarrow 2Fe_2O_3 + 4SO_2 + heat \quad \text{Eq. 3}$$

The heat usually dissipates quickly unless there is an additional source of combustible material to sustain combustion. The white smoke of SO_2 gas, commonly associated with pyrophoric fires, is often mistaken for steam and the result is the fire resulting the consequencial damage. ■

FOOD HABITS AND DISEASES

Indians are consuming high levels of oils, fats and salts in their daily diets, exposing themselves to Non-Communicable Diseases (NCDs), including coronary heart ailments, hypertension and diabetes, says a new report.

The intake of high fiber foods like fruits and vegetables which act as a shield against NCDs, is very low in India as compared to the recommended level of five servings or at least 400 grams daily, a publication by the Public Health Foundation of India, said.

By contrast, oil intake increased a whopping 50 per cent-- from 18 grams a day in 1992 to 27 grams a day in 2005, while fat intake rose from 41 to 52 grams over the same period. High income groups have reported 32 per cent of their energy intake from fats alone, as against 17 per cent among low income groups, it said.

The publication, brought out on the eve of the first-ever UN High-Level Summit on NCDs held in New York, said protein consumption remained stagnant at 56 grams a day over the stated period while carbohydrate intake reduced from 75 to 71 grams a day.

Salt consumption, a strong determinant of high blood pressure and associated cardio-vascular diseases, has also been found to be very high across different regions of the country, with the average intake ranging from 9 to 12 grams a day, much above the WHO recommended daily intake level of 5 grams or less and the National Institute of Nutrition's recommended level of 6 grams or less.

Urban salt intake is much higher and is further set to increase due to rapid expansion of multi-national food chains, increasing the trend of eating out and easy availability of ready made foods, the report said.

"Processed foods are anticipated to become a major source of salt intake in India, making it imperative for the government to initiate appropriate preventive public health action," the report titled 'Chronic Non-Communicable Diseases in India: Reversing the Tide', said.

It also reveals an increasing trend in edible oil consumption in India, which has risen from 5.8 million tons in 1990-92 to 9.7 million tons in 2000-2001 and further to 14.3 million tonnes in 2007-08, with a high proportion of unhealthy oils, high in saturated and trans fats.

"Although national data on individual fat and oil intake is limited, aggregate consumption data clearly shows increase in oil and fat consumption," the 48-page report said.

Authored by K Srinath Reddy, President, Public Health Foundation of India, leading cardiologist D Prabhakaran and public health expert Sailesh Mohan, the document voices strong concerns over increasing food inflation and recommends a national policy to ensure easy availability of health foods like fruits.

"In the milieu of rising prices of fruits and vegetables, we underline the need for sound agricultural and pricing policy to ensure availability and affordability of such health foods," the experts said.

The report also illustrates as to how even the more health conscious South India is consuming much less fruits and vegetable than required, quoting a recent study which found the consumption of 265 grams a day, much lower than the required levels.

Data from seven states where the first Integrated Disease Surveillance Project was conducted, also indicated lower than WHO recommended levels of fruit and vegetable intake. In Maharashtra, 76 per cent of those surveyed reported consuming less than 5 servings a day and in Tamil Nadu, 99 per cent respondents also reported similar consumption.

The prevalence of Coronary Heart Disease (CHD), a major cardio-vascular disease in India, ranges from 6.6 per cent to 12.7 per cent in urban and 2.1 to 4.3 per cent in rural areas among those aged 20 years and above.

India currently has as estimated 30 million CHD patients. The stroke prevalence is reported to be between 334 and 424 per one lakh population in urban India and 244 to 262 per one lakh in rural India and the number is on the rise, the report said.

High blood pressure patients' figure is projected to nearly double from 118 million in 2000 to 213 million in 2025. Besides, India is set to become the world's diabetes capital and already houses 51 million diabetics at present. Cancer cases are detected to the tune of 8 lakhs every year, it added.

Courtesy: **Deccan Herald** ■

CASE STUDIES

CASE STUDY 1

Chlorine Tonner Leakage

Incident

Leakage of Chlorine was noticed from the valve of a chlorine tonner in the water filtration plant. They tried to control the leakage but when it became uncontrollable, they dumped the leaky tonner into the alkaline sump to neutralize the remaining chlorine. It is informed that around thirty persons complained of eye irritation.

Incident Control

The fire brigade and police reached site to control the gas leak. The team removed the leaky tonner from the pit and found to be empty.

Root Cause

- 4 Nos filled chlorine tonners were found stored for a long time in the open area. Out of which one tonner has leaked.
- Valve caps & protection domes were not provided on these tonners.
- Minor chlorine leakage from the valve of chlorine tonner remained unattended which resulted into a major leak because of corrosion due to rainy water.
- Chlorine is a dry gas. On leakage it attracts moisture from the atmosphere and increase the corrosion rate at a very high rate
- Storage in the open makes the accessories weak and further adds up to corrosion

Remedial Action Suggested

- Tonners should be stored under proper shed to protect them from direct sun light & heat.
- Valve caps & protection domes must be provided on the valves of tonners, if they are not being used.
- Chlorine Tonners should be subjected to periodical checking the leakage of chlorine with the help of ammonia torch.
- Even if minor chlorine leakage is noticed, the same must be attended immediately and should not be left unattended.
- Filled Tonners should not be stored for more than 90 days.
- Appropriate and suitable PPE's & tonner emergency handling kit should be readily available at user end.
- Periodical refresher training should be organized for employees handling chlorine tonner.
- Emergency handling procedure should be available at consumer end.

Most Important

- Under no circumstance, leaky chlorine tonners should be dumped in alkaline water sump which may cause major mishap.
- Tonner keeps floating on the surface of water and chlorine does not neutralize in the solution but spreads in the atmosphere
- Chlorine attracts moisture from water and further adds to corrosion
- Filler should be informed on first sight of leakage
- Even the leaked tonner though empty should be made safe by washing and drying and destroy as per rules.

CASE STUDY 2

Furnace explosion due to rise in temperature

Introduction

In a chemical factory yellow phosphorous was converted into red phosphorous in a rotary furnace. When the yellow phosphorous was cooked in the rotary furnace for its conversion to red phosphorous at 244°C, water which was surrounding the yellow phosphorous, became steam. When steam was vented, it carried away certain amount of phosphorous with it. In due course, the vent line got choked as phosphorous got depositd. This ultimately Increased the temperature and pressure of the vessel. Temperature shot up to 300°C and pressure was not monitored. Suddenly the furnace exploded and the stored up hot gases caused flash fire injury on the worker and subsequently he died.

Causes for the accident

1. Phosphorous which got deposited in the steam vent pipe causing choking has not been noticed which resulted in the rise in temperature in the furnace.
2. The rise in temperature in the furnace has increased the pressure in the furnace resulting in explosion.
3. Even though pressure gauge has been installed in the furnace, it was not monitored.
4. No safety valve has been provided in the furnace.

Remedial action suggested

1. Risk assessment has to be carried out so as to identify all

(Contd. on next page)

NIGHT-TIME AND OVERTIME WORK CAUSING INDUSTRIAL ACCIDENTS

It has emerged that one in every ten of South Korea's wage earners is doing overnight work that prevents them from sleeping. Not only does this late-night work present a grave risk of accidents, but it also threatens worker health, with a greater possibility of depression, sleep disorders, and digestive ailments. Yet nothing is being done in the workplaces to remedy this regressive practice.

Dankook University's Industry Academic Cooperation Foundation drafted a report on workers dealing with excessive workloads, including overtime, nighttime, and holiday hours. The report was based on the results of a Ministry of Employment and Labor examination of working conditions for different forms of employment, the Korea National Health and Nutrition Examination Survey, and the Korean Labor and Income Panel Study. In it, some 10.2% to 14.5% of all wage earners in South Korea, or 1.27 million to 1.97 million people, were reported to be engaged in nighttime employment. Another 15.0 to 31.9%, or 1.71 million to 4.17 million workers, were found to be working 52 hours a week or more.

By themselves, late-night work and long hours are prejudicial to employee health. In combination, their dangers are even greater. A representative example of this can be seen in the automobile industry. The Ministry of Employment and Labor conducted an examination September of the five workplaces for finished vehicles in South Korea. It found that employees worked an average of 55 hours per week doing late-night work in the daytime-nighttime two-shift system. This was fully 13 hours more than the average for all permanent workers. When workers suffer the double burden of nighttime work and long hours, the report said, their health is severely weakened, with a roughly twofold increase in depression risk.

The fact that such late-night and overtime work has failed to diminish owes a great deal to the fact that the pay system for production workers is based on an hourly rather than monthly rate. In order to earn more, workers are forced to deal with night–time and

(Contd. on next page)

Case Studies....

(Contd. from page 11)

the possible risks.

2. Temperature and pressure in the furnace should be monitored
3. Additionally a suitable warning device shall be fitted in the furnace so as to warn in case of rise in temperature.
4. A suitable safety valve shall be fitted in the furnace.
5. The chemical deposits in the vent pipe shall be removed periodically.

CASE STUDY 3

Fire in rice bran oil factory

Introduction

Manufacture of vegetable oil was carried on in a factory from rice bran by using hexane as a solvent. During maintenance, repair work was carried on in the extractor which was meant for transferring the rice bran. A 40 Watt electrical portable light was used to provide lighting in the area. When the worker was holding the portable electrical bulb near the view glass opening, it inadvertently hit against the view glass causing spark which ignited the hexane vapour present in the extractor resulting in a major fire.

Causes for the accident:

1. Hexane is highly flammable, the ordinary 40 Watt electrical bulb which has hit on the view glass has caused a spark is the root cause for this major accident.

Remedial action suggested:

1. Hexane being highly flammable, Permit to work system has to be followed before allowing any work in the vicinity.
2. The oil extractor should be purged thoroughly with inert gas before permitting maintenance work.
3. Only flame proof, 24 Volt portable electrical light shall be permitted.
4. No material which is a source of ignition shall be permitted near flammable area. ■

INTRINSIC SAFETY

Intrinsic Safety is a technique used to prevent explosions that may be caused due to sparks generated by electrical apparatus in hazardous areas. In case you didn't know (highly unlikely, eh) "hazardous areas", are those designated areas of a plant or facility, that have the possibility of explosive mixtures of gas, vapor or dust present either for long periods of time or at least sometimes during the year. They are also referred to as Classified locations in North America.

Intrinsic Safety is used to implement circuits (mostly Instrumentation circuits), that will not have any sparking at all. There are other kinds of non sparking techniques of explosion protection, but these will not be covered here.

The use of barriers and isolators

In an Intrinsically safe circuit, a safety barrier is used between the control room or designated "safe area" and the "hazardous area" (in other words the plant or production area), so that any fault that generates a high energy level (and sparks) would not get carried over to the hazardous area; it is prevented from doing so by the safety barrier. Barriers are of many types, but broadly they can be classified as (passive) Zener barriers and (active) Isolators. The zener barriers have several zener diodes in them that carry away fault currents to ground. In the case of isolators, the devices provide transformer like isolation between the safe area circuits and the hazardous area circuits, so that large currents from the safe area do not enter the hazardous area.

Prevention is better than cure

All of us know that "prevention" is better than cure. This is the principle on which the concept of intrinsic safety is based, since the sparks are prevented from ever causing an explosion. As regards the explosion proof method of protection, one can consider it to be mitigative as the explosion does occur (say in case of a spark in a junction box located in a hazardous area), only the effects are mitigated to some extent. Therefore, many engineers and safety professionals prefer Intrinsic Safety over Explosion proof or similar methods. However, many engineers and technical personnel who are not familiar with Intrinsic safety, do not prefer it as they do not understand it completely. To be fair, to use explosion proof equipment is simple, use everything that is explosion proof! Designs using Intrinsic Safety is not so simple however, as the design engineer needs to select the right kind of instrument, barriers, cables and other accessories, in order to meet the intrinsic safety requirements. A mistake means that the design is not safe.

Advantages and Disadvantages of Intrinsic Safety

The advantages of using intrinsic safety as a protection technique

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Night-time....

(Contd. from page 12)

overtime work that offers bonuses they cannot get with daytime work. For this reason, remedying the late-night work situation will require additional changes to be carried out as well, including conversion to a monthly salary system. Once the late-night work and long hours have been addressed, there will also be an employment inducement effect from the distribution of positions.

As it happens, an automobile unit announced plans to do away with late-time work as of 2013 and change to a daytime two-shift system. This appears to have been influenced by calls from the Ministry of Employment and Labor to address the late-night working practices following its examination of working conditions. But this plan is something that the company and its labor union already agreed upon in 2009. It has yet to go into effect because no agreement could be reached on methods of maintaining production levels or addressing wage reductions following the decrease in working hours. We hope, the automobile unit's labor and management can reach an agreement on this issue and break the chain of inhumane late-night labor.

(***Source :*** Editorial in the South Korean Newspaper)

IN THE NEWS

The Honorable Minister of State for the Ministry of Chemicals and Fertilizers has given the following information in the Rajya Sabha on 05-08-2011 while answering a question relating to the accidents caused due to gas leakage in the country.

The yearwise accident details:

Year	No. of gas leakage accidents
2009	8
2010	15
2011 (Upto June)	10

Following steps have been taken by the State Labour Department to stop such accidents:

(i) Issuing directions for installation of smoke detector, chlorine sensors, combustible gas sensor with alarm system

(ii) Issuing directions for putting in place sufficient number of automatic fire quenching system

(iii) Impart periodic training to the officers to make them competent to inspect the chemical industries

(iv) Issuing instructions for installing fire extinguishers and water sprinklers

(v) Impart training to workers / supervisors for making them aware of chemical (industrial) safety)

(vi) Conducting regular inspection of the factories

(vii) Conducting onsite mock drills.

(viii) Prosecution against the occupier of the factory in the respective Judicial Courts for safety violations

(ix) Conducting safety audits by external experts

(x) Providing and using proper personal protective equipments

(xi) Issuing directions for using pipes conforming to Indian standard

(xii) Adequate provisions for ensuring safety measures and remedial measures to prevent industrial accidents are already stipulated under the Factories Act, 1948, State Factories Rules and the Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989.

(xiii) Instructions for avoiding recurrence of similar accidents are also issued to the management during accident investigations by the Labour department officials.

Pollution due to e-Waste

A UN environmental conference in Cartagena, Colombia, attended by more than 170 countries in October 2011, has agreed to accelerate a global ban on the export of hazardous waste, including old electronics and discarded computers and mobile phones, from developed to developing countries. Environmental campaigners, who have been battling to broker a deal on the dumping of toxic waste for more than 20 years, said they were “ecstatic” about this “major breakthrough”. “All forms of hazardous waste including that sent for recycling, to obsolete electronic waste, will be banned from leaving wealthy countries destined for developing countries.”

The UNEP report “Recycling - from E-waste to Resources” was released on the Indonesian island of Bali on February 22, 2010 at the start of a week-long meeting of officials and environmentalists. According to the report's authors by 2020 e-waste in South Africa and China will have jumped by 200-400 per cent from 2007 levels, and by 500 per cent in India.

IN THE NEWS

(Contd. from page 14)

India produces about 3,80,000 tonnes of e-Waste per annum, which includes only the waste generated out of television sets, mobile phones and PCs, a major chunk of which comes from organizations. E-waste produced in India includes over 100,000 tonnes from refrigerators, 275,000 tonnes from TVs, 56,300 tonnes from personal computers, 4,700 tonnes from printers and 1,700 tonnes from mobile phones. The un- organized recycling sector which fails to practice eco-friendly e-Waste recycling methods release large amount of toxic chemicals. The toxic gases and the large volume of Electronic Waste adds Environmental Pollution in India

India imports almost 50,000 tonnes of e-waste yearly. It generated 330,000 tonnes of e-waste in 2007 and the number is expected to touch 470,000 tonnes by 2011, according to a study on e-waste assessment conducted jointly by MAIT and the German government's sustainable development body GTZ in April 2010.

AUSTRALASIAN SAFETY CONFERENCE 2011

As Australia's leading professional safety organisation, IFAP has demonstrated its success in the safety conference arena with a host of high-profile and well attended events. These events are designed to help maximise investment in safety and health by recognising the challenges, offering solutions and enhancing the sustainability of businesses across Australia.

The 2011 Australasian Safety Conference will feature the most up-to-date information from leading experts and professionals across major industry sectors and will raise the bar for OHS on a regional level with the inclusion of APOSHO 26. This is the first time that Western Australia has been afforded the honour to host the annual gathering of APOSHO (Asia Pacific Occupational Safety and Health Organization).

In a world where business transcends international borders, and where Australian companies are venturing into nations in the Asia Pacific region, the event represents a rare opportunity for Australian business and safety leaders to exchange experiences and views and to gain significant insights into how to accomplish best practice in occupational safety and health performance.

Intrinsic....

(Contd. from page 13)

are many, but the most important one is that it is the only technique allowed to be used under Zone O of the IEC Classification system for hazardous areas. One cannot use any other technique like explosion proof (or increased safety, or non incendive methods, or any of the many other methods of protection) in Zone O. Other advantages are, that since it uses the entity concept, the designer can mix and match various compatible components to make the circuit intrinsically safe. It gives him/her greater flexibility. Also, using this technique eliminates the need for explosion proof junction boxes in the hazardous area, one can safely use weatherproof junction boxes too, with IS (intrinsically safe) loops.

The main disadvantage of Intrinsic Safety as a protection method, is that it can be used for only low power circuits; thus you cannot have intrinsically safe motors, for example. So Intrinsic Safety is used mostly for instrumentation like pressure transmitters, control valve positioners, small capacity solenoid valves and so on.

The entire measurement loop needs to be designed as Intrinsically Safe and this can be a daunting task for many, but it need not be really so. You do need a step by step method, with examples to understand how the process works. ■

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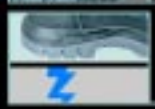
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