



**SEA (INDIA)**

(Regn No: 1391 / 2000)

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# INDIAN SAFETY ENGINEER

QUARTERLY JOURNAL OF SAFETY ENGINEERS ASSOCIATION

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**VOL: 12 No. 1**

**JANUARY – MARCH 2013**

## FROM THE DESK OF PRESIDENT

Dear Members,

62nd Executive Committee meeting of SEA India was held on 30th Mar 2013. 33rd Professional Development Programme was held on 20th Jan 2013. Our journal "Indian Safety Engineer" for the fourth quarter 2012 was released in Jan 2013 and the next issue for the first quarter of 2013 will reach you soon. We are arranging a factory visit to Madras Atomic Power Station, Kalpakkam on 27th April 2013.



Members interested to participate may contact Secretary for further details.

Mumbai Chapter of SEA India has conducted their Professional Development Programme on 02nd Feb 2013 with Presentations by eminent specialists on different topics, viz., "Challenges in Fire Fighting", "Transportation Safety Management", "Legislations on transportation of Hazardous chemicals" and "Features of ICC's new software system for managing Transportation of Hazardous chemicals including Emergencies". The programme was well attended by safety professionals from different industries in the region. Request all of you to join me in congratulating Mumbai Chapter of SEA India for their good efforts.

We are hearing positive messages from our Coordinators from New Delhi on the formation of Delhi Chapter of SEA (India). After couple of informal meetings, they are planning their first meeting of the Chapter before Apr 2013. Let us wish them good luck.

Fourteenth Batch of NEBOSH IGC course by SEA India was conducted in March 2013 and 20 members attended classes and wrote the examinations during 27th - 28th Mar 2013. We strongly recommend leading Corporates and MNCs through our Members, to consider training their Safety Officers, Safety Coordinators and Safety Committee Members in this purposeful NEBOSH - IGC Course, towards achieving best safety results in their respective activity centers. SEA will be too happy to extend necessary support and guidance in conducting this course for them.

SEA (India) website, [www.seaindia.org](http://www.seaindia.org) is now fully functional, pending periodic updates. Members may advise their Service providers / vendors to advertise their products / services in the exclusive web page available in the site towards bringing in awareness among members.

Members are once again reminded to make use of very good collection of Safety Books available in the SEA Library maintained at SEA Office.

Wish you and your family members a Safe, Healthy and Prosperous endeavors!!

Best Wishes!

**S. Ulaganathan**

President, SEA (India)

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Printed at Sunitha Printers, Chennai – 600 014

## NEBOSH Course Update

The Fourteenth batch of International General Certificate Course of NEBOSH was conducted during March 2013 at Sri Ramachandra University, Porur with 20 candidates. The examination was conducted on March 27<sup>th</sup> and 28<sup>th</sup> of 2013. The candidates expressed satisfaction about the course and the results are expected by May 2013.

We are planning to have the next batch once we get 20 nominations. 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](mailto:info@seaindia.org) for getting admission.



March 2013 batch, NEBOSH, I G C Course candidates

## 33<sup>RD</sup> PROFESSIONAL DEVELOPMENT PROGRAMME

Thirty Third Professional Development Programme was held on Sunday, 20<sup>th</sup> January 2013 at Chennai. Mr D R Muralidharan, Freelance Trainer, M/S L P A Risk Management Systems, Hyderabad delivered the talk on, "Road Safety Management".

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

Large number of SEA India members participated and enriched their knowledge on Road Safety. The salient features discussed during the programme is given in this article for the benefit of the members who could not participate in the program.

### Introduction:

During the year 2011 over 1, 35,000 people lost their lives due to road accidents in India. Deaths due to road accidents formed 35% of the total accidental deaths occurred during the said year. For every minute

one road accident occurs and for every four minutes one life is lost. The economic loss due to fatalities and



injuries is estimated to be around 2% to 3% of our GDP. Despite the efforts taken by the Government of India and NGOs the trend continues and alarmingly the death figure goes up year after year.

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### 33rd Professional ....

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Accidents don't happen on their own but are caused. There are various reasons for accidents to occur but the driver's error tops the list. Given below are the main causes for accidents to happen and the ways to overcome them:

1. Driver's distraction: Internal distractions viz., talking on cell phone, sending text messages, smoking etc. External distractions include watching roadside hoardings, posters etc., It is to be noted that distraction causes more harm than drunken driving as the latter occurs mostly during night whereas distraction can take place at any time during day and night. Stay focused on the roads.

2. Over Speeding: Unfortunately some drivers think that speed limits specified on the roads/rules are meant to be achieved. When a vehicle collides at a travelling speed of 50 Km/h the impact will be equivalent to falling from a height of around 30 feet. At 100 Km/h it will be equivalent to falling from a height of around 130 feet. Try to limit the speed well within the prescribed limits.

3. Overtaking: Many accidents happen due to wrong methods adopted while overtaking. As a general rule overtaking has to be made from the right side of the vehicle that is overtaken. It is to be ensured that road ahead is clear so that after overtaking it is possible to rejoin our lane without forcing the oncoming vehicles to shift their path. Never follow a vehicle that is in the process of overtaking. Before attempting to overtake ensure that no other vehicle is trying to overtake you. Above all ensure that the gap available between the vehicle that is being overtaken and the oncoming vehicle is wide enough to complete the process.

4. Inadequate stopping distance: Not maintaining proper stopping distance results in rear end collisions that not only cause damages to vehicles but also result in injuries and casualties. Hence care should be taken to maintain adequate stopping distance which is one car distance for every 15Km of speed.

5. Driving during rains: Rains make roads slippery and hampers the braking efficiency. For a safer ride we must reduce our normal speed and increase the following distance. Avoid driving at sides of the roads as water build up will likely to be more there and tyres may not have a firm grip.

6. Night Driving: Visibility on the roads gets reduced during nights that warrant the driver to pay more attention on the roads. Glare from the oncoming vehicles poses a hazard and the driver can have a faster glare recovery if he/she doesn't stare at the headlights. Sleeping at wheels is another hazard associated with night driving. To avoid sleeping he/she can take a break of smaller durations for every 2 hours of journey and refresh by doing simple stretching/breathing exercises. The driver has to opt for light food before journey. Further, stopping distance has to be increased during night driving.

7. Influence of drugs: It is not only illegal drugs but, sometimes, legally prescribed drugs also make the driver incompetent to drive after administration of such drugs. Hence the driver has to take the advice of the doctor to confirm whether driving can be undertaken after taking such drugs.

8. Drunken Driving: Driving needs constant attention on the road and the driver is forced to take quick decisions in case of an emergency. The intake of alcohol impairs the driving capability of the driver and he/she loses his/her ability to make

proper judgment. The degree of impairment becomes severe with higher levels of alcohol consumption. As per Indian rules a person on wheels is said to be drunk when alcohol level in his/her blood exceeds 30mg per 100 ml of blood.

9. Non-wearing of Seatbelts: When collisions occur at higher speeds the occupants of the car are ejected out of the vehicle which results in grievous injuries or death to the occupants. Seat Belt protects the driver and other occupants by restraining them in their seats even after so many tosses the vehicle might have underwent. It must be made a practice to wear seatbelts while driving

10. Non-wearing of Helmets: In case of two wheeler accidents most of the victims die due to head injuries. Injury to the brain may lead to death or various types of damages/disabilities. Such victims not only become incapacitated in leading a normal life but also render themselves at the mercy of their family members for performing their daily chores. Hence top priority has to be given for wearing a helmet whenever a two wheeler is driven, no matter how short the distance is and how lower the speed is. Pillion rider also should be made to wear a helmet. More importantly the helmet should conform to IS 4151 standards and any compromise in this aspect will defeat the very purpose of wearing it.

The rising road accident casualties worldwide prompted United Nations Organisation to proclaim the UN Decade of Action for Road Safety 2011-2020 which will be adhered to by more than 100 countries including India. The goal of the action plan is to stabilise and then reduce global road traffic fatalities by 2020. India has already initiated measures towards this goal. Let us hope for safer roads in the near future. ■

## INTERESTING RECYCLING FACTS & BENEFITS

1. There is no limit to the number of times an aluminum can be recycled.
2. Recycling a 3-foot-high stack of newspapers can save one whole tree.
3. Rubber shoe soles can be recycled to make basketball courts and soccer fields.
4. Recycled paper takes about 60% less energy and water to make new paper.
5. Recycled cans can be made into airplanes, appliances, furniture and more.
6. Recycled glass bottles can be made into roads, tiles, even surfboards.
7. Recycled plastic bottles can be made into rugs, jackets, fences and more.
8. Approximately 60% of our rubbish thrown away today could be recycled.
9. A survey was done and 9 out of 10 people surveyed said they would recycle more if it was easier.
10. The most common products in recycling programs are paper products, cardboard, plastic, glass and aluminum.
11. By recycling one plastic bottle not only saves anywhere from 100 to 1000 years in the landfill but also saves the environment from the emissions in producing new bottles as well as the oil used to produce that bottle.
13. For every one ton of plastic that is recycled, we save the equivalent of 2 people's energy use for 1 year, the amount of

water used by 1 person in 2 month's time and almost 2000 pounds of oil.

### Recycling Tips

1. You can make a lovely hat out of previously-used aluminum foil.
2. Empty tissue boxes can provide easy and handy storage for plastic grocery bags.
3. Newspapers can be reused as wrapping paper for gifts.
4. Plastic bags can be reused as bin liners or package stuffing.
5. Junk mail and newspaper can be reused as package stuffing.
6. Film canisters can be reused to store nails, screws, buttons and pins.
7. Unneeded printouts can be cut and stapled to make notepads.

### Aluminum Recycling Facts

- o A used aluminum can is recycled and back on the grocery shelf as a new can, in as little as 60 days.

That's closed loop recycling at its finest!

- o Used aluminum beverage cans are the most recycled item in the USA , but other types of aluminum, such as siding, gutters, car components, storm window frames, and lawn furniture can also be recycled.
- o Recycling one aluminum can save enough energy to run a TV for three hours - or the equivalent of a half a gallon of gasoline.
- o More aluminum goes into beverage cans than any other product. Because so many of

them are recycled, aluminum cans account for less than 1% of the total USA waste stream, according to EPA estimates. An aluminum can that is thrown away will still be a can 500 years from now!

- o We use over 80,000,000,000 aluminum soda cans every year.
- o At one time, aluminum was more valuable than gold!
- o A 60-watt light bulb can be run for over a day on the amount of energy saved by recycling 1 pound of steel. In one year in the United States, the recycling of steel saves enough energy to heat and light 18,000,000 homes!

### Paper Recycling Facts

- o To produce each week's Sunday newspapers, 500,000 trees must be cut down.
- o Recycling a single run of the Sunday New York Times would save 75,000 trees.
- o If all our newspaper was recycled, we could save about 250,000,000 trees each year!
- o If every American recycled just one-tenth of their newspapers, we would save about 25,000,000 trees a year.
- o If you had a 15-year-old tree and made it into paper grocery bags, you'd get about 700 of them. A busy supermarket could use all of them in under an hour! This means in one year, one supermarket can go through over 6 million paper bags. Imagine how many supermarkets there are just in the United States !

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## Interesting ....

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- o The average American uses seven trees a year in paper, wood, and other products made from trees. This amounts to about 2,000,000,000 trees per year!
- o The amount of wood and paper we throw away each year is enough to heat 50,000,000 homes for 20 years.
- o Approximately 1 billion trees worth of paper are thrown away every year in the USA .
- o Americans use 85,000,000 tons of paper a year; about 680 pounds per person.
- o The average household throws away 13,000 separate pieces of paper each year. Most is packaging and junk mail.
- o In 1993, USA paper recovery saved more than 90,000,000 cubic yards of landfill space.
- o Each ton (2000 pounds) of recycled paper can save 17 trees, 380 gallons of oil, three cubic yards of landfill space, 4000 kilowatts of energy, and 7000 gallons of water. This represents a 64% energy savings, a 58% water savings, and 60 pounds less of air pollution. The 17 trees saved can absorb a total of 250 pounds of carbon dioxide from the air each year. Burning that same ton of paper would create 1500 pounds of carbon dioxide.
- o The construction costs of a paper mill designed to use waste paper is 50 to 80% less than the cost of a mill using new pulp.

## Plastic Recycling Facts

- o Americans use 2,500,000 plastic bottles every hour and most of them are thrown away.
- o Plastic bags and other plastic garbage thrown into the ocean kill as many as 1,000,000 sea creatures every year!
- o Recycling plastic saves twice as much energy as burning it in an incinerator.
- o Americans throw away 25,000,000,000 Styrofoam coffee cups every year.

## Glass Recycling Facts

- o Every month, we throw out enough glass bottles and jars to fill up a giant skyscraper. All of these jars are recyclable.
- o The energy saved from recycling one glass bottle can run a 100-watt light bulb for four hours or a compact fluorescent bulb for 20 hours. It also causes 20% less air pollution and 50% less water pollution than when a new bottle is made from raw materials.
- o A modern glass bottle would take 4000 years or more to decompose and even longer if it's in the landfill.
- o Mining and transporting raw materials for glass produces about 385 pounds of waste for every ton of glass that is made. If recycled glass is substituted for half of the raw materials, the waste is cut by more than 80%.

## Solid Waste and Landfills

- o About one-third of an average dump is made up of packaging material.
- o Every year, each American

throws out about 1,200 pounds of organic garbage that can be composted.

- o The USA is the number 1 trash-producing country in the world at 1,609 pounds per person per year.

This means that 5% of the world's people generate 40% of the world's waste.

- o The highest point in Hamilton County, Ohio (near Cincinnati) is "Mount Rumpke". It is actually a mountain of trash at the Rumpke sanitary landfill towering 1045 feet above sea level.

- o The US population discards each year 16,00,00,00,000 diapers, 1,60,00,00,000 pens, 2,00,00,00,000 razor blades, 22,00,00,000 car tires, and enough aluminum to rebuild the US commercial air fleet four times over.

- o Out of every \$10 spent buying things, \$1 (10%) goes for packaging that is thrown away. Packaging represents about 65% of household trash.

- o On an average, it costs \$30 per ton to recycle trash, \$50 to send it to the landfill, and \$65 to \$75 to incinerate it. If you are aware of the need to save resources and to reuse products, or help out so that they can be used again, then you are well on the road to recycling. Today recycling is common in the United States. Whereas ten years ago many were unfamiliar with this practice, now schools, businesses, churches and offices, as well as homes are on the track to recycling. ■

# ISOCYANATES

This article explains the health hazards posed by isocyanates and describes the types of products that contain isocyanates. It also describes the dangers of applying isocyanate-based products in the workplace and how to reduce the risk of exposure.

## What are isocyanates?

Isocyanates were developed in Germany during World War II as part of a process to replace natural rubber, which became very scarce during the war.

Isocyanates are very reactive chemicals that contain the isocyanate group (-NCO). They react with alcohols to produce polyurethane polymers. Isocyanates are the essential raw materials for polyurethane plastics.

The most commonly used isocyanates are toluene diisocyanate (TDI) and methylene bisphenyl isocyanate (MDI). TDI is used in the production of soft synthetic rubbers. MDI is used in producing foams, hard synthetic rubbers (elastomers), and coatings.

Other isocyanates include

- Naphthalene diisocyanate (NDI)
- Hexamethylene diisocyanate (HDI)
- Isophorone diisocyanate (IPDI)

NDI is used to produce elastomers. HDI and IPDI are both used in paints, coatings, leather finishings, and foams.

Products containing isocyanates have several brand or trade names. Isocyanates also have many different chemical names.

The product's material safety data

sheet (MSDS) can be checked to see if the product contains isocyanates.

## Where are isocyanates used?

Isocyanates are used in the production of paints and coatings to create weather-resistant surfaces. They are also used to make building materials (for example, Styrofoam, flexible foams, adhesives, elastomers, and binders) and in the production of manufactured goods (for example, bedding, furniture, clothing, appliances, electronics, tires, and packaging).

## How does exposure to isocyanates occur?

During the plastic-making process, some isocyanates evaporate into the air and can pose a health risk. Isocyanate mist and vapour can be released into the air by a variety of work activities, including:

- Spraying paints or foams containing isocyanates
- Heating polyurethane plastics
- Cutting polyurethane foams using hot wire cutting methods
- Applying varnish
- Manufacturing urethane foam forms
- Hand painting or rolling isocyanate coatings

## What are the health effects of isocyanate exposure?

Isocyanates are irritants to the eyes, skin, and respiratory system. Short-term exposure can cause dermatitis and irritation or burns to the eyes, nose, and throat. Even a small amount of isocyanates can produce significant health effects, such as asthma.

It has been estimated that 1 in 20

workers who work with isocyanates will become sensitized to them. Some worker deaths from isocyanate asthma have also been reported.

Sensitization is permanent. Workers who become sensitized can no longer be exposed to isocyanates without experiencing a reaction, often a severe one.

Symptoms of isocyanate exposure include

- Sore eyes
- Running nose
- Sore throat
- Coughing
- Wheezing (asthma)
- Chest tightness

Isocyanates can have a fruity, musty, or pungent odour. Do not use odour to identify hazardous concentrations of isocyanate, because once you can smell it, it is above the permissible concentration. Your sense of smell will not warn you that you are being overexposed to isocyanates until it is too late.

Exposure to airborne isocyanates may cause eye irritation, tearing, and a temporary decrease in sharpness of vision. Direct contact with isocyanates, a splash to the eye, for example, can cause irritation, conjunctivitis (irritation of the membrane lining the eyelids and part of the eyeball), and eye tissue damage.

Direct skin contact with unreacted isocyanates can cause rashes, blistering, and reddening of the skin. In rare cases, the skin can become so sensitized that severe skin reactions will occur through contact with small amounts of isocyanate. Skin exposure can also

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## **Isocyanates ....**

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cause the entire body to become sensitized.

### **Occupational exposure limits**

Employers must ensure workers are not exposed to isocyanate levels above the occupational exposure limits (OELs). The OELs for isocyanates are very low, an 8-hour time-weighted average (TWA) of 0.005 parts per million (ppm) and a ceiling value (not to be exceeded) of 0.01 ppm. Isocyanates are ALARA substances, meaning exposure must be kept as low as reasonably achievable. TDI, a type of isocyanate, is listed as a carcinogen.

### **Employer responsibilities**

Employers must develop and implement an effective exposure control plan, which includes training workers and supervisors in relevant sections of the plan.

An exposure control plan for a workplace where workers are exposed to isocyanates must include:

- A written policy that
- States the employer's commitment to health and safety
- States the plan's objectives
- Defines the responsibilities and roles of the employer, supervisors, and workers. An assessment of the workplace hazards (for example, where workers are likely to be exposed to isocyanates) controls used to reduce the hazards (for example, ventilation, barriers, or personal protective equipment) written safe work procedures and emergency response procedures (for example, rescue procedures)

Training for supervisors and workers, records and statistics (for example, first aid records for workers who are exposed to isocyanates)

### **Worker responsibilities**

To help reduce the risk of exposure to isocyanates, workers (including subcontractors) must

- Attend education and training sessions provided by the employer
- Use controls and follow safe work practices outlined in the exposure control plan
- Use available personal protective equipment (for example, airline respirators) as required
- Know how to report exposure incidents

### **Sampling for isocyanates**

Choosing the correct sampling method for isocyanates can be difficult because they may occur as vapours or aerosols of various sizes. Each method has its own potential problems, and most underestimate the amount of isocyanate present. Sampling methods include

- Air sampling: Air is passed through a liquid solvent (for example, in glass impingers or bubblers) or a filter (usually made of glass fibre) coated with a reagent. The isocyanates are dissolved in the liquid or adhere to the filter, and are then sent to a laboratory for analysis.
- Surface/skin sampling: Skin can be sampled using adhesive tape, which is placed in a reagent and sent to a laboratory for testing. Indicator pads are also available, which change colour (usually to red) in the presence of isocyanates.

### **Reducing the risk of exposure**

The risk of unsafe levels of isocyanates can be reduced with the following controls:

- Substitution: If practicable, products that do not contain isocyanates should be used. However, if isocyanates must be used, some are less hazardous than others. For example, MDI is better than TDI because it has a lower vapour pressure and will not vaporize as easily as TDI when applied.
- Engineering: Ventilation must be used when applying isocyanates. The type of ventilation (for example, area or local exhaust) and the amount will depend upon the size of the application.
- Isolation controls: Unprotected workers must be kept a safe distance from where isocyanates are applied. (See the Controlling exposure section of this bulletin for safe distances.)
- Regular inspection and maintenance: Spray (and other) equipment should be checked regularly to make sure it is operating properly (for example, not clogged). Containers holding liquid isocyanate products should be tightly covered to prevent evaporation.
- Education: Workers must be taught how to prevent exposure to isocyanates and how to use protective breathing equipment.
- Monitoring: Isocyanate levels in the air must be measured where there is a risk of exposure. Skin and surfaces

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## Isocyanates ....

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should also be checked for contamination.

- Personal protective equipment (PPE): Respiratory protection will depend on how isocyanate-containing products are applied. Skin must also be protected from isocyanate exposure. Examples of PPE for applying isocyanate products are given below.

### Controlling exposure

When spraying products containing isocyanates, workers must use air-supplying respirators such as the following:

- **Self-contained breathing apparatus (SCBA)** - This consists of an air cylinder, which is normally worn on the back, and a full-face mask to protect the eyes and face. A hose connects the face mask to the regulator and the air cylinder.
- **Supplied-air (airline) respirator** - This consists of an airline attached to
- **A hood - or helmet-style respirator,** or
- **A regulator and full-face mask**

Workers who use respirators must be clean-shaven where the respirator seals with the face to ensure a good seal.

PPE should also include a chemical-resistant suit, goggles that seal to the face, and gloves (preferably nitrile or polyvinyl alcohol).

Workers who apply isocyanate products using a roller, brush, or caulking gun should wear a half-face elastomeric respirator with combination HEPA (particulate) and organic vapour/acid gas cartridges.

Used cartridges must be replaced with new cartridges every shift.

The work area should be isolated from unprotected workers. Ideally, the barriers should be as airtight as possible. Unprotected workers should not be allowed within 8 m (25 ft.) of an indoor work zone or within 3 m (10 ft.) of an outdoor work zone. Indoor work zones must be vented to a safe outdoor location.

Ventilation for non-spray applications (paint, caulking, roll-on, etc.)

If practicable, products that contain TDI should be substituted with MDI-based products or other less hazardous products.

The work area should be ventilated. A written ventilation plan (for general or mechanical ventilation) should be prepared and should consider the following:

- General ventilation alone should not be used for controlling isocyanate exposure.
- Fans should be intrinsically safe (for example, non-sparking) and strong enough to provide sufficient air flow.
- Ducting must remain in good shape and be free of holes and tears.
- Intake and exhaust vents should be located in such a way that exhausted air is not brought back into the work area.
- Contaminants must be directed away from workers (and the work area), and there should be no "dead" spots.
- Mechanical ventilation equipment must be located and arranged to adequately ventilate the entire work area.

### Personal hygiene

Workers should follow these safety steps to minimize contact with isocyanates:

- Wash hands before eating or smoking
- Rinse any skin contaminated by isocyanates with diluted rubbing (isopropyl) alcohol to neutralize the isocyanate, and then wash with soap and water.
- Leave contaminated clothing at the workplace to protect family members from exposure.

Employers should do the following:

- Provide washroom and changing facilities that have separate lockers for work clothes and street clothes.
- Provide a separate area for storing and eating food, away from the work area.

### First aid

Washing and eyewash facilities must be available near areas where isocyanates are handled, and all workers must know how and when to use these facilities. Soap and water should be available at these facilities to treat contaminated skin. If isocyanates enter the eyes, follow these steps:

1. Flush the eyes with lukewarm water immediately, for at least 30 minutes.
2. Remove contact lenses after the eyes have been irrigated with water for a few minutes, and then resume irrigation.
3. See a doctor.

If isocyanates contact the skin, follow these steps:

1. Remove contaminated clothing. Contaminated clothing can be treated with a neutralizing mixture (10%

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## Isocyanates ....

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isopropyl alcohol and 1% ammonia in water) and sent for laundering.

2. Wash skin with soap and water. Shower if necessary.
3. Discard contaminated items such as leather watch straps and shoes.
4. See a doctor if there is a chemical burn.

If isocyanates are swallowed, follow these steps:

1. Do not induce vomiting.
2. Have the worker drink water or milk to dilute the material in the stomach.
3. Transport the worker to the nearest hospital as soon as possible.

If a worker is overcome by inhaling isocyanates, follow these steps:

1. Move the worker to fresh air, and give the worker oxygen, if available.
2. If the worker is having trouble breathing or is not breathing, start assisted ventilation using a pocket mask. Add oxygen to the mask, if available.
3. Transport the worker to the nearest hospital as soon as possible.

### Emergency procedures

Emergency procedures should be posted wherever there is a risk of exposure to isocyanates. Workers must be trained in emergency procedures for the following:

Spills-A written spill-response plan should be created for the worksite. Workers should be trained in spill

response before a spill occurs. The MSDS for the product used should contain information on how to contain and clean up a spill.

Isocyanate spills must be cleaned up immediately by workers wearing the proper PPE. Follow these steps:

1. Evacuate anyone in the area who is not involved in the cleanup.
2. Immediately cover the isocyanate spill with a dry absorbent such as vermiculite or sand. Do not use sawdust or shredded paper because of the fire hazard.
3. Shovel the waste into a metal container, cover it, and place the container outside in a shaded, dry area prior to disposal.
4. Make sure that the container is not sealed tightly so any pressure buildup can escape.

Chemical reactivity-Isocyanates react vigorously with water, ammonia, or strong bases to produce heat and carbon dioxide (CO<sub>2</sub>) gas. If this reaction occurs in a sealed container, the container may rupture or explode, releasing isocyanate vapour and CO<sub>2</sub>.

Before disposing of empty isocyanate containers, they must be decontaminated by filling them with water and leaving them uncovered (for at least 48 hours) to allow CO<sub>2</sub> gas to escape. The containers must be pierced to prevent reuse.

Fires: Isocyanates, and most substances containing them, are flammable. They will burn and release toxic gases such as carbon

monoxide, nitrogen oxides, and hydrogen cyanide. Burning polyurethane products made with isocyanates may release a number of hazardous substances, including benzene, toluene, carbon monoxide, nitrogen oxides, and hydrogen cyanide.

Isocyanates should be treated as a Class C fire hazard, do not use water or foam-containing fire extinguishers. Use a CO<sub>2</sub> or dry chemical extinguisher to put out flames. In the case of a major fire, firefighters must wear self-contained breathing apparatus (in positive-pressure mode) to protect them from toxic fumes.

### Medical monitoring

If you think a worker has been exposed to isocyanates (and the worker has persistent or recurring eye irritation, nasal congestion, dry or sore throat, cold-like symptoms, cough, shortness of breath, wheezing, or chest tightness), the worker should see a physician knowledgeable in work-related health problems. If sensitivity is present or developing, the worker should not be exposed further to isocyanates.

Lung function tests should be conducted on a regular basis (for example, as part of a yearly physical examination). If workers develop symptoms of isocyanate overexposure, a pulmonary specialist can determine whether or not they have become sensitized.

Workers should report any suspected health damage to their employer and a physician. Workers should act on medical advice and comply with any medical instructions, the doctor gives them. ■

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# CASE STUDY

## CASE STUDY 1:

### Accident during ultrasonic inspection

**Location: Production platform**

#### WHAT HAPPENED:

A young worker was trying to reach an inspection point on a suction scrubber for ultrasonic survey. While standing on piping approximately 2 feet above floor level, the worker slipped and fell down hitting against the valve. His face struck a valve causing a laceration to his nose. The worker required 8 stitches.

#### WHAT CAUSED IT?

- A hazard assessment was carried out, as per records. However, it did not identify fall hazards and working from temporary work platforms.
- Though a ladder was available, which would have been the correct equipment as temporary work platform, it was not used.
- The crew supervisor did not adequately monitor the young worker and failed to give clear direction for reaching the inspection location.

#### CORRECTIVE ACTIONS:

- Field-level hazard assessments should identify all the possible

hazards. It should be ensured that steps are being taken to control the hazards identified and reduce job risks.

- Correct equipment should be used even for minor operations.
- Basic safety rules should be followed by workers, and monitored by supervisors.

## CASE STUDY 2:

### Disregard for Energy Isolation Procedures

**Location: Rig Derrick Floor**

#### WHAT HAPPENED:

The derrick man was replacing a small hatch cover, which had been removed to clean out the auger on the horizontal conveyor in the sack room. The conveyor had backed up due to chemicals absorbing moisture because of the humidity and heat. The chemicals blocked the operation of the auger and had to be "dug out" using a special tool fit for the job. To determine that the auger was free, the auger was engaged and the derrick man observed it through the cleanout opening. Once it was determined that the auger was operating properly, the derrick man decided to put the hatch cover back in place; however, he failed to shut down the auger with

the E-stop prior to reinstalling the cover. With the system still running he began to reinstall the cover, which resulted in his left index finger coming in contact with the rotating auger and resulted in loss of his index finger.

#### WHAT CAUSED IT ?

- Improper hand and finger placement when fitting the cover back in place.
- The derrick man did not follow the company permit to work and Lock Out/Tag Out procedures in place for the job.
- The cover did not have a handle for the derrick man to grip and reinstall the cover.
- No JSA or Risk Assessment was conducted for the job because he stated, "we've always done it this way."

#### CORRECTIVE ACTIONS:

- Develop a JSA and risk assessment for this job.
- Place signage at all augers "Work to be only performed under Permit to Work and Isolation Certificate".
- Place handles on all auger covers to remove and reinstall safely, without the need for hands to go near augers. ■

# EFFECTIVE, EFFICIENT BAG-HOUSE CLEANING

There cannot be many metal casting processes that are less exciting than collecting dust, but that's no reason it cannot be done more effectively. A new nozzle technology makes it possible to reduce compressed-air pressure in reverse pulse-jet bag house dust collection, its developers say, and therefore to cut energy requirements, and still to disperse the particulates effectively.

Reverse pulse-jet bag house technology has not changed much in recent decades. These systems involve a blowpipe positioned just above the bag, with an orifice and a Venturi scrubber at the top of the bag/cage. The process uses bursts of 100-psi compressed air, and back-flushes the filters sequentially during the cleaning cycle.

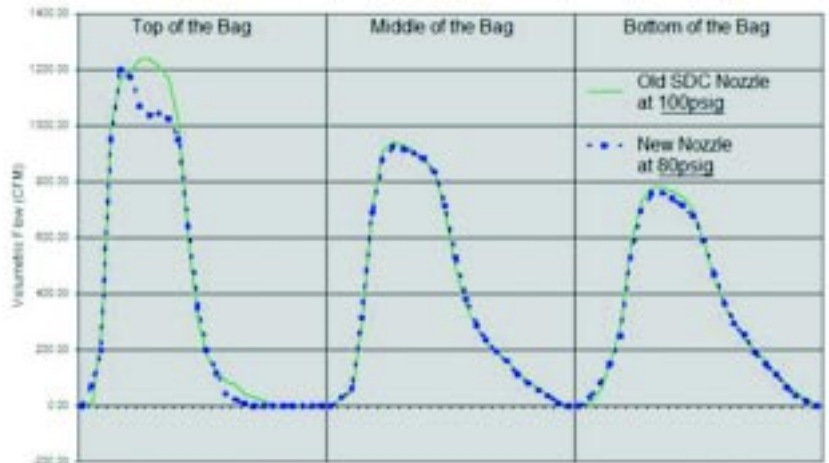
Scientific Dust Collectors' engineering manager Brian Mathews explained in a recent report that the cleaning cycle is the most important part of dust collection because of its effect on the system's efficiency and media life. Despite its prevalence, reverse pulse-jet technology has deficiencies, which SDC aimed to correct with the converging/diverging nozzle-based cleaning system it introduced more than 30 years ago. This "Original" supersonic nozzle eliminated the Venturi and added a cleaning

system that improved cleaning, filter life, and lowered pressure drop.

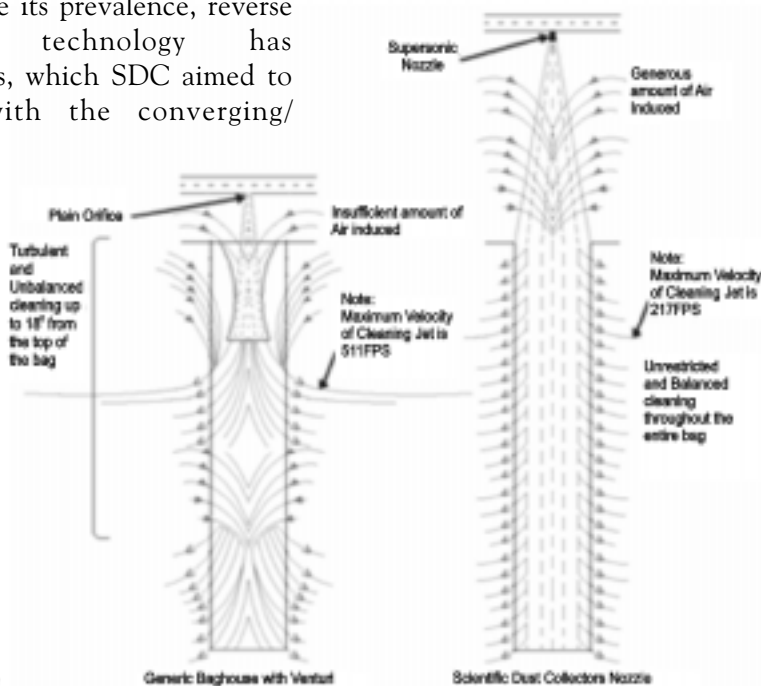
Ten years ago, SDC introduced a new converging/diverging nozzle to correct some of the remaining inefficiencies of the reverse pulse-jet bag house. This Next Generation nozzle improved on SDC's previous supersonic nozzle design, but Mathews explained that the generic orifice and Venturi system actually draws in a vacuum of air at the top of the bag during the cleaning pulse. The developer produced a separate report to

compare cleaning effects at the top of the bag with an orifice and Venturi system, and the SDC nozzle cleaning system. It concluded that the generic orifice and Venturi system does not allow the top 18 in. of filter to be used for repetitive cleaning, rendering useless that section of media.

The Original design has operated successfully at higher air-to-cloth ratios and with a manifold pressure of 100 psig, so the developer investigated the minimum manifold pressure needed for the Next



Volumetric flow at the top, middle, and bottom of a 10-ft. long bag for the original SDC nozzle at 100 psig, and for the Next Generation nozzle at 80 psig.



Cleaning system comparison of generic bag house with Venturi to SDC Nozzle.  
Cleaning system comparison of generic bag house with Venturi to SDC Nozzle.

Generation nozzle to achieve comparable cleaning flow at the bottom of the bag as the original supersonic nozzle? The answer is 80 psig, and a comparison of the results are shown in the nearby graph."The significant increase in cleaning at standard pressure, and similar cleaning achieved at a lower pressure is the result of our many years of research," Mathews noted. "In the Next Generation nozzle, we have a better understanding of supersonic flow that has allowed us to redesign and fine tune the many facets of the internal converging/diverging nozzle. Also, we were able to review the entire process from start to finish in the nozzle and eliminate flow reducing manufacturing and fabrication issues."

# RADIATION-INDUCED CANCER

Up to 10% of invasive cancers are related to radiation exposure, including both ionizing radiation and non-ionizing radiation. Additionally, the vast majority of non-invasive cancers are non-melanoma skin cancers caused by non-ionizing ultraviolet radiation. Ultraviolet's position on the electromagnetic spectrum is on the boundary between ionizing and non-ionizing radiation. Non-ionizing radio frequency radiation from mobile phones, electric power transmission, and other similar sources have been described as a possible carcinogen by the World Health Organization's International Agency for Research on Cancer.

Exposure to ionizing radiation is known to increase the future incidence of cancer, particularly leukemia. The mechanism by which this occurs is well understood, but quantitative models predicting the level of risk remain controversial. The most widely accepted model posits that the incidence of cancers due to ionizing radiation increases linearly with effective radiation dose at a rate of 5.5% per sievert. If the linear model is correct, then natural background radiation is the most hazardous source of radiation to general public health, followed by medical imaging as a close second.

**Mechanism :** Cancer is a stochastic effect of radiation, meaning that the probability of occurrence increases with effective radiation dose, but the severity of the cancer is independent of dose. The speed at which cancer advances, the prognosis, the degree of pain, and every other feature of the disease are not functions of the radiation dose to which the person is exposed. This contrasts with the deterministic effects of acute radiation syndrome which increase

in severity with dose above a threshold. Cancer starts with a single cell whose operation is disrupted. Normal cell operation is controlled by the chemical structure of DNA molecules, also called chromosomes.

When radiation deposits enough energy in organic tissue to cause ionization, this tends to break molecular bonds, and thus alter the molecular structure of the irradiated molecules. Less energetic radiation, such as visible light, only causes excitation, not ionization, which is usually dissipated as heat with relatively little chemical damage. Ultraviolet light is usually categorized as non-ionizing, but it is actually in an intermediate range that produces some ionization and chemical damage. Hence the carcinogenic mechanism of ultraviolet radiation is similar to that of ionizing radiation.

Unlike chemical or physical triggers for cancer, penetrating radiation hits molecules within cells randomly. Molecules broken by radiation can become highly reactive free radicals that cause further chemical damage. Some of this direct and indirect damage will eventually impact chromosomes and epigenetic factors that control the expression of genes. Cellular mechanisms will repair some of this damage, but some repairs will be incorrect and some chromosome abnormalities will turn out to be irreversible.

DNA double-strand breaks (DSBs) are generally accepted to be the most biologically significant lesion by which ionizing radiation causes cancer. In vitro experiments show that ionizing radiation cause DSBs at a rate of 35 DSBs per cell per Gray, and removes a portion of the epigenetic markers of the DNA, which regulate the gene expression.

Most of the induced DSBs are repaired within 24h after exposure, however, 25% of the repaired strands are repaired incorrectly and about 20% of fibroblast cells that were exposed to 200mGy died within 4 days after exposure. A portion of the population possess a flawed DNA repair mechanism, and thus suffer a greater insult due to exposure to radiation.

Major damage normally results in the cell dying or being unable to reproduce. This effect is responsible for acute radiation syndrome, but these heavily damaged cells cannot become cancerous. Lighter damage may leave a stable, partly functional cell that may be capable of proliferating and eventually developing into cancer, especially if tumor suppressor genes are damaged. The latest research suggests that mutagenic events do not occur immediately after irradiation. Instead, surviving cells appear to have acquired a genomic instability which causes an increased rate of mutations in future generations. The cell will then progress through multiple stages of neoplastic transformation that may culminate into a tumor after years of incubation. The neoplastic transformation can be divided into three major independent stages: morphological changes to the cell, acquisition of cellular immortality (losing normal, life-limiting cell regulatory processes), and adaptations that favor formation of a tumor.

In some cases, a small radiation dose reduces the impact of a subsequent, larger radiation dose. This has been termed an 'adaptive response' and is related to hypothetical mechanisms of hormesis.

(Contd. on next page)

## IN THE NEWS

### 140 countries agree on treaty to limit mercury use

Delegations from 140 countries agreed to adopt a ground breaking treaty, limiting the use and emission of health hazardous mercury, the U N said, though the environmental activists lamented it did not go far enough. The world's first legally binding treaty on mercury, reached after a week of thorny talks, will aim to reduce global emission levels of the toxic heavy metal, also known as quick silver, which poses risks to human health and the environment. The treaty has been named the Minamata Convention on Mercury, in honour of the Japanese town where inhabitants for decades have suffered the consequences of serious mercury contamination. The text will be signed in Minamata in October and will take effect once it has been ratified by 50 countries.

Mercury is found in products ranging from electrical switches, thermometers and light bulbs, to amalgam dental fillings and even facial creams. Large amounts of the heavy metal are released from small scale gold mining, coal burning power plants, metal smelters and cement production.

Serious mercury poisoning affects the body's immune system and development of the brain and nervous system, posing the greatest risk to fetuses and infants.

The treaty sets a phase out date of 2020 for a long line of products, including mercury thermometers, blood pressure measuring devices, most batteries, switches, some kind of fluorescent lamps and soaps and cosmetics. It, however, provides exceptions for some large medical measuring devices where no mercury free alternative exist. In a controversial move, it also excluded vaccines that use mercury as a preservative, since the risk from these vaccines is considered low and for many developing nations removing them would entail losing access to vaccines altogether. Amid pressure from dentist groups, the treaty also did not provide a cut off date for the use of dental fillings using mercury, but did agree that the product should be phased down.

Non Governmental groups lamented that the treaty fell short in addressing the greatest sources of mercury in the environment; small scale gold mining, which directly threatens the health of the 10-15 million people working in this field and contaminates water and air; and emissions from coal burning power plants.

However the U N E P stressed that the treaty is a dynamic instrument, insisting it would evolve over time to address all the areas.

Once up and running the treaty will provide funds to help transition away from mercury-linked products and processes through the U. N.'s Global Environment Facility, and probably also second mechanism.

*Courtesy: The Hindu*

### **Raditation ....**

(Contd. from previous page)

A latent period of decades may elapse between radiation exposure and the detection of cancer. Those cancers that may develop as a result of radiation exposure are indistinguishable from those that occur naturally or as a result of

exposure to other carcinogens. Furthermore, National Cancer Institute literature indicates that chemical and physical hazards and lifestyle factors, such as smoking, alcohol consumption, and diet, significantly contribute to many of these same diseases. Evidence from uranium miners suggests that

smoking may have a multiplicative, rather than additive, interaction with radiation. Evaluations of radiation's contribution to cancer incidence can only be done through large epidemiological studies with thorough data about all other confounding risk factors. ■

## IN THE NEWS

### **The Government of Tamil Nadu has renamed the Department of Inspectorate of Factories as “Directorate of Industrial Safety and Health” vide GO. Ms No. 94, Labour and Employment, Dated 7th March 2013.**

Further the designation of the officers have also been revised as given below.

<b>S.No.</b>	<b>Existing Designation</b>	<b>Revised designation</b>
1.	Chief Inspector of Factories	Director of Industrial Safety and Health
2.	Additional Chief Inspector of Factories	Senior Additional Director of Industrial Safety and Health
3.	Joint Chief Inspector of Factories	Additional Director of Industrial Safety and Health
4.	Deputy Chief Inspector of Factories	Joint Director of Industrial Safety and Health
5.	Inspector of Factories	Deputy Director of Industrial Safety and Health
6.	Assistant Inspector of Factories	Assistant Director of Industrial Safety and Health

### **Disposal of plastic waste**

Disposal of plastic waste is a serious concern in India. New technologies have been developed to minimize the adverse effect on the environment. Currently, widely accepted technology used for the plastic disposal is incineration. However, incinerators designed poorly, releases extremely toxic compounds (chlorinated dioxins and furans). Therefore, strong opposition arose from various organizations. In India, to introduce a cleaner and safer technology, FCIPT, Institute for Plasma Research had taken initiatives to develop plasma pyrolysis technology with the financial support from Technology Information, Forecasting & Assessment Council (TIFAC) and Department of Science and Technology (DST), New Delhi. In this technology extremely high temperature is produced using plasma torch in oxygen starved environment which destroy plastic waste efficiently and eco-friendly manner. FCIPT developed and demonstrated the technology successfully for waste disposal capacity approximately 15 Kg/hr.

Based on above developments on plasma pyrolysis technology, Central Pollution Control Board (CPCB) has sponsored a study to FCIPT, Institute for Plasma Research to conduct emission monitoring trials for Dioxins and Furans, PM, NO<sub>x</sub>, CO etc. from a recognized laboratory under Environment (Protection) Act, 1986. On the basis of emission results, CPCB may take initiatives to resolve issues of plastic waste disposal by installing few plasma systems in the country. The analytical results in respect of dioxins and furans emission results are found within the standards set for hazardous waste incinerators in case of disposal of 100% metallized plastics, 100% polyethylene plastics and 80% Polyethylene+ 20% PVC waste is in the plasma pyrolysis system (15 kg/hr). However, process optimization is done for 50% PVC + 50% polyethylene and 100% multilayer plastic waste. The results of dioxins and furans emissions were found within prescribed limits.

In order to make plasma pyrolysis technology economically viable, energy recovery possibilities from plastic waste is under consideration, because plastic contains high calorific value and it could be possible to recover surplus energy from the system. It is therefore, recommended to use of plasma pyrolysis system to re-solve the problems associated with plastic waste disposal. Further, there is an advantage that plasma pyrolysis system can be installed at hill stations, tourist places etc. to demonstrate decentralised disposal of plastic waste.

## SEA (INDIA) - MUMBAI CHAPTER ACTIVITIES

The Mumbai Chapter EC meeting was held on Saturday, February 2<sup>nd</sup> 2013 at Mumbai. Around 20 members participated in the meeting. A brief note of the activities are highlighted here.

Mr. P A Murali welcomed the SEA India members and stressed the importance of the subject "Safe Transportation of Hazardous Chemicals" and introduced the Speakers. He gave a presentation on SEA India activities.

Mr. Mandke, CFO Thane Fire Brigade in his presentation highlighted the Challenges encountered by fire fighting agency in mobilising resources, managing the crowd, information problems and lack of co-operation from nearby industries.

Mr. Balachandran from Total Oil made a presentation on "Total's transportation safety management, defensive driving and catering to the environmental issues offsite while the vehicle is travelling on road and spill occurs".

Dr. Dileep Wakankar from Clariant Chemicals made a presentation on new legislation, "Transportation safety of Dangerous goods (classification, packaging & labelling rules 2011)", which is in the draft stage and about to be published soon. This regulation related to Transportation of hazardous Chemicals which will be implemented in conjunction with C M V,1989.

Capt. Dinesh Desai from BASF, gave a presentation on a new initiative from ICC called NICER GLOBE. One of the important component of this initiative will be a web service specifically designed for supporting transportation of chemicals/ hazardous goods. He gave a detailed presentation of how the software will work, vehicle tracking system, emergency handling arrangement, benefits to the member companies, budget, annual expenditure and appealed the members to take advantage of it. The software launch is expected to be by April 2013.

Ms. Sneha Sriram distributed the forms to those who were interested in taking SEA India membership.





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