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INDIAN SAFETY ENGINEER

QUARTERLY JOURNAL OF SAFETY ENGINEERS ASSOCIATION

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NATIONAL SAFETY COUNCIL - TAMILNADU CHAPTER'S AWARD TO SEA (INDIA)

At the State Level Safety Awards and State level Safety Competitions function of National Safety Council, Tamilnadu Chapter held on 18th December 2014 at Chennai, SEA India was honored by Thiru P Mohan, Honorable Minister for Rural Industries and Labour Welfare, Tamilnadu for the continued patronage to National Safety Council.

Thiru S Ulaganathan, President, SEA India received the memento from the Honorable Minister.

Inside....

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NEBOSH Course Update

The International General Certificate Course of NEBOSH, UK was conducted at Sri Ramachandra University, Porur, Chennai from Monday, December 8th to 19th 2014 and the examinations were conducted by British Council on December 22 & 23, 2014 as usual. The candidates expressed satisfaction and the results are expected by February 2015.

SEA India encourages its members and other safety professionals to pursue this course to enhance their professional knowledge and career prospects. Those who are aspiring to join this course are requested to contact Mr Ramesh 044 24764101, SEA India or by mail,

info@seaindia.org or **paramesh48@msn.com** for getting admission.

FROM THE DESK OF PRESIDENT

Dear Members,

Wish you all a Happy, Prosperous and Safe New Year - 2015.

A retrospect to the past year shows it to be eventful with several activities that we can cherish. There were few important activities that we can consider to be towards the growth of SEA. Safety Professional Meet was organized at Chennai on 24th January 2014 to give an opportunity for the members to meet and interact with regulatory bodies and the feedback was so overwhelming. First Students Chapter of SEA was formed and inaugurated at AC Tech, Anna University, Chennai on 24th February 2014. SEA has joined hands with another professional body, American Society of Safety Engineers (ASSE) - India Chapter in collaborating with their organising "ASSE Safety India 2014 - Conference & Exhibition" at Chennai on 26th & 27th May 2014. SEA has also supported another national level OSH India Conference & Exhibition programme organized by UBM and held at Chennai on 17th -18th July 2014. Annual General Meet of SEA was held on 28th June 2014 and the new Executive Committee was elected and took charge. National Safety Council (Tamil Nadu Chapter) recognised SEA (India) association with them and awarded a Memento for Continued Patronage during a state level function held on 18th December 2014.

Seventy Second Executive Committee meeting of SEA was held on 3-10-2014. Professional Development Programme on "HSE Challenges in Oil Industry & Control" will be held on 04-01-2015. Our quarterly journal "Indian Safety Engineer" and the monthly 'Safety Alerts' are brought out and distributed to Members periodically. Organsing a second Factory visit programme to "Chennai Metro Rail - Underground Tunneling System" was not successful. However, we are trying to organize a Factory visit programme shortly.

Sixteenth Batch of NEBOSH IGC course was conducted during 08th-19th December 2014 and Exams were held on 22nd and 23rd December 2014. Sixteen members including few of the PG students in Industrial Safety participated.

Mumbai Chapter of SEA and Students Chapter at Anna University, Chennai are active. Safety programme on Disaster Management was conducted to a group of about 85 Safety Engineering students of Knowledge Institute of Technology, Salem. Safety Awareness programmes were also conducted at Anna University (Mechanical Eng. Students) and Saveetha Engineering College.

Our efforts to relocate SEA office to a more spacious and convenient location continues.

Members are advised to actively take part in different programmes of the association and contribute their mite.

Best Wishes and Seasons Greetings!

S. Ulaganathan
President, SEA (India)

CONTROLLING HEXAVALENT CHROMIUM EXPOSURES DURING ELECTROPLATING

Electroplating is a metal finishing process in which an object is covered with a metal coating. Workers performing electroplating are exposed to hexavalent chromium [Cr(VI)] which can cause severe health effects including lung cancer. Electroplating uses an electrical current passed through a chemical electrolyte solution containing the plating metal.

Types of chrome electroplating

- Hard chrome (HC) plating: a thick layer of chromium is electrodeposited on a base material (usually steel) to provide a surface with functional properties such as wear resistance, a low coefficient of friction, hardness and corrosion resistance. It is used in:
  - o Piston rings
  - o Hydraulic cylinder rods
  - o Machine rollers
- Decorative or bright (DC) plating: a thin layer of chromium is electrodeposited onto a base metal or other electrodeposited metals (nickel) for cosmetic and tarnish resistance purposes. It is used in:
  - o Chrome alloy wheels
  - o Appliances
  - o Plumbing fixtures

  Anodizing, sometimes confused with electroplating, is used to increase the thickness of the natural oxide layer on the surface of a metal part. Aluminum alloys can be anodized using chromic acid.

Photo courtesy of NIOSH

Hard chrome electroplating baths

Workers are exposed to Cr(VI) from mist generated during the electroplating or anodizing process. Severity of exposure to hexavalent chromium from the different processes can be ranked in the following order:

How electroplating operations cause Cr(VI) exposure in the workplace

There are several factors that contribute to hexavalent chromium exposure in the workplace, including:

- ***Mist generation during plating:*** hydrogen bubbles that form in the plating tanks burst when they reach the surface, causing small droplets of electrolyte solution, which contains Cr(VI), to go into the air. Conditions that increase the amount of mist generated include:
  - o Higher electrical current in the bath
  - o Longer plating times
  - o Higher bath surface tension
  - o Higher temperature of the plating bath
  - o Increased agitation of the plating bath
- ***Drag-out:*** mists can be generated and spills can occur when workers insert the racks or barrels into, or remove them from, the plating baths.

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Controlling....

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- ***Addition of Cr(VI):*** adding chromic acid and chromium powders/solutions to plating baths may result in spills or generate dusts or mists.
- ***Work practices:*** using compressed air to dry parts, not cleaning up spills promptly, and leaving containers open can increase the amount of Cr(VI) in the workplace.

Health Effects of Cr(VI)

- Lung cancer and nasal and sinus cancer
- Eye, nose and throat irritation
- Nasal septum ulcerations and perforations, gastritis, and gastrointestinal ulcers
- Contact dermatitis, irritation, ulcers, and sensitization from skin contact

How workers are exposed

- Inhaling mists/dust or fumes containing Cr(VI).
- Skin contact with Cr(VI) solutions.

Role of personal air monitoring

- Air monitoring helps to determine the amount of Cr(VI) a worker may be exposed to.
- Monitoring results are compared to applicable exposure limits to evaluate compliance.
- Results of the air monitoring must be provided to the affected employees within 15 workdays.

Controlling hexavalent chromium levels

- ***Product substitution.*** Use a less toxic substitute in place of Cr(VI). For example, trivalent chromium is less toxic than Cr(VI). There are a variety of alternatives available that provide similar characteristics to chrome electroplating.
- ***Reduce mist generation.*** Chemical surfactants or wetting agents can be added to the plating bath to lower surface tension and reduce mists. Foam blankets or plastic balls can also be used as physical barriers to reduce mists from going into the air. However, precautions should be taken if they are used. Foam blankets can cause explosive hazards and the plastic balls need to be handled carefully to prevent spills.
- ***Use eductor nozzles for mixing chemical baths.*** Eductor nozzles are used to reduce agitation in the tank during mixing and to ensure a uniform bath solution. Space constraints may be an issue when using eductors.
- ***Remove mists from the air using ventilation.*** Local exhaust ventilation (LEV) is the most effective method to reduce overall Cr(VI) concentrations during electroplating operations. The LEV needs to be properly designed and maintained to effectively remove Cr(VI) mists from the breathing zone. The LEV system should undergo regular inspections by qualified individuals to maintain proper air flow.

How workers can reduce their Cr(VI) exposure during electroplating

- Use good work practices:
  - o Remove parts slowly and carefully.
  - o Rinse parts with low pressure.
  - o Do not use compressed air for drying.
  - o Clean up spills quickly and carefully.
  - o Keep chemical tanks and containers covered when not in use.
  - o Add chromic acid to the plating bath as a solution. Avoid dry chromic acid additions.
  - o Clean surrounding work surfaces (tables, etc.) at the end of each shift.
- ***Personal protective equipment (PPE):*** Where skin or eye hazards are present due to likely contact with Cr(VI), employees must use appropriate protective clothing and equipment. In electroplating work, such PPE can include chemically-resistant aprons or suits, shoes/boots, gloves, as well as face shields, safety glasses with side shields or goggles. PPE must be properly maintained and laundered.
- ***Respirators:*** If work practices and engineering controls are not sufficient to reduce Cr(VI) exposures to or below the PEL, workers must use respiratory protection. ■

BCSP provides those holding India's Diploma in Industrial Safety a New Path to the CSP

The Board of Certified Safety Professionals (BCSP) has completed an evaluation of the Government of India's Diploma in Industrial Safety, finding those who hold the diploma qualify for the Certified Safety Professional (CSP)examination by waiver of the Associate Safety Professional (ASP).

The Diploma in Industrial Safety is offered by the Government of India, Ministry of Labour & Employment's Regional Labour Institutes (RLI) in Chennai, Faridabad, Kanpur, and Kolkata and the Central Labor Institute in Mumbai (CLI). BCSP evaluated its equivalency against the ASP's requirements, noting the similarities in the processes and standards used by BCSP and the RLIs/CLI.

"Safety is valued by people around the world," explains BCSP Board of Directors President Dr. Lon Ferguson, CSP. "This agreement promises to strengthen the protection of people, property and environment."

"BCSP is committed to working alongside organizations that share our vision, and we look forward to further collaboration in India and elsewhere," added BCSP's CEO, Dr. Treasa Turnbeaugh, CSP, CET. BCSP maintains Memoranda of Understanding with organizations in several countries, is a member of the International Network of Safety and Health Practitioner Organizations (INSHPO), and attended the first ASSE Safety India conference this year.

While the agreement is in effect, individuals who have earned the Diploma in Industrial Safety from CLI/RLIs of the Government of India, remain in good standing with that body, meet any continuing requirements, and meet the eligibility requirements of BCSP have the opportunity to apply for the Certified Safety Professional (CSP) via this new agreement.

WORK-RELATED ASTHMA?

What is work-related Asthma?

Work-related asthma is a lung disease caused or made worse by exposures to substances in the workplace. Common exposures include chemicals, dust, mold, animals, and plants. Exposure can occur from both inhalation (breathing) and skin contact. Asthma symptoms may start at work or within several hours after leaving work and may occur with no clear pattern. People who never had asthma can develop asthma due to workplace exposures. People who have had asthma for years may find that their condition worsens due to workplace exposures. Both of these situations are considered work-related asthma.

A group of chemicals called isocyanates are one of the most common chemical causes of work-related asthma.

Why you should care about work related Asthma

Work-related asthma may result in long-term lung damage, loss of work days, disability, or even death. The good news is that early diagnosis and treatment of work-related asthma can lead to a better health outcome.

What to do if you think you have work related Asthma

If you think that you may have work-related asthma, see your doctor as soon as possible.

Work-related Asthma quick facts

- Work-related asthma can develop over ANY period of time (days to years).
- Work-related asthma may occur with changes in work exposures, jobs, or processes.
- It is possible to develop work-related asthma even if your workplace has protective equipment, such as exhaust ventilation or respirators.
- Work-related asthma can continue to cause symptoms even when the exposure stops.
- Pre employment training covering work related Asthma, causes, and symptoms is advisable

Periodical medical check up and monitoring the health condition is the best remedy to do away with work related asthma. ■

SAFELY IN THE USE OF METAL WORKING FLUIDS - A GUIDE FOR EMPLOYEES

Introduction

This leaflet aims to help employees who work with metalworking fluids understand the main risks to their health. It contains general advice on the precautions which you and your employer can take to avoid these risks.

What are metalworking fluids?

Metalworking fluids - sometimes referred to as suds, coolants, slurry or soap - are used during the machining of metals to provide lubrication and cooling, and to help carry away debris such as swarf and fine metal particles. They can also help to improve machining performance and prolong the life of the cutting tool, as well as provide corrosion protection for the surfaces of workpieces.

How can metalworking fluids affect you?

Metalworking fluids are mostly applied by continuous jet, spray, or hand dispenser.

They can affect you:

- if you inhale the mist, aerosol or vapour generated during machining operations. Your exposure will depend on the type of machining you are doing and how well the machine is enclosed and ventilated. Exposure is likely to be highest:
  - near the metalworking machine;
  - in operations involving high-speed tools or deep cuts;
  - at machines where the process is not enclosed;
  - where there are inadequate ventilation arrangements.
  - through contact with the skin, particularly hands and forearms, if appropriate precautions (eg the use of gloves, overalls or face shields) are not taken. Skin contact can occur during the preparation or draining of fluids, handling of workpieces, changing and setting of tools, and during maintenance and cleaning operations. Fluids can also splash onto you during machining, eg. if there are no splashguards or if they are inadequate;
- by entering your body through cuts and abrasions or other broken skin; or
- by entering your body through the mouth if you eat or drink in work areas, or do not wash your hands before eating or smoking. ■

ENVIRONMENTAL IMPACTS OF THE INDUSTRY

INTRODUCTION

Oil plays a vast and vital role in our society as it is organized today. Oil represents much more than just one of the main energy sources used by mankind. Besides being an important energy source, petroleum product serve as feedstock for several consumer goods thus playing a growing and relevant role in people's lives.

On the other hand, the oil industry holds a major potential of hazards for the environment, and may impact it at different levels: air, water, soil and consequently all living beings on our planet. Within this context, the most widespread and dangerous consequence of oil and gas industry activities is pollution. Pollution is associated with virtually all activities throughout all stages of oil and gas production, from exploratory activities to refining. Wastewaters, gas emissions, solid waste and aerosols generated during drilling, production, refining (responsible for the most pollution) and transportation amount to over 800 different chemicals, among which, prevail oil and petroleum products.

Other environmental impacts include intensification of the greenhouse effect, acid rain, poorer water quality, groundwater contamination, among others. The oil and gas industry may also contribute to biodiversity loss as well as to the destruction of ecosystems that, in some cases, may be unique.

Most potential environmental impacts related to oil and gas industry activities are already well documented. It is still necessary to find ways to conciliate industry development with environmental protection, that is, with sustainable development.

After recovered and transported, crude oil has to go through refining processes in order to be converted into products that hold commercial value. Oil refineries are major polluters, consuming large amounts of energy and water, producing large quantities of waste waters, releasing hazardous gases into the atmosphere and generating solid waste that are difficult both to treat and to dispose of.

On the other hand, despite its potential threats to the environment, the oil industry plays a positive role in society as well, creating many jobs and generating a significant volume of tax revenues and royalties to national governments.

Therefore, oil companies may profit even more in different ways by adopting proactive environmental strategies. However, many companies in the oil business are still not adopting pollution prevention practices. Their environmental policies are oriented towards the compliance of rules established by the environmental authorities, which reflects an End of Line Control corporate culture as well as a reactive approach to enviromental management.

Taking the environmental variable into account in productive process has been a serious and imporant challenge for the oil industry. Today, the commitment to promote sustainable development goes beyond ethical and moral obligations, and has become a demand from society. This commitment alone is a limiting factor to the survival of companies, since numerous companies may be influenced by the negative image associated with companies that harm the environment.

The following table presents a simplified manner the main and potential environmental impacts of the oil industry, as well as some feasible alleviating measures.

Potential Environmental Impacts	Mitigation Measures
• Water contamination due to different waste water cooling water discharges, and seepage from storage and waste tanks	• No wastewaters shall be discharged without appropriate treatment into rivers or other locations where infiltration may occur.
• Water contamination due to dischrage of water effluents rich in inorganic salts without appropriate treatment (saline pollution)	• Water effluents may be treated by neutralisation, evaporation, aeration, flocculation, oil and grease separation, carbon absorption, reverse osmosis, ion exchange, biotreating etc., depending on the contaminant to be removed
• Thermal pollution due to discharge of effluents with temperatures higher than recipient water bodies;	• Liquid effluent discharges into recipient water bodies must comply with standards governed by laws and regulations adopted in each country.

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Environmental....

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• Water contamination due to oil spills;	• Materials that may seep due to rains must be placed in covered storage areas equipped with drainage systems, in order to avoid contamination of rain waters. • Areas for storing and handling of raw materials and products should be water proofed and have a drainage system, so that any spills and wash waters can be directed to treatment
• Particulate emissions into atmosphere generated during operations at production and refining plants	• Particulate emissions can be controlled by equipment such as cyclones, bag filters, electro static precipitators and scrubbers, among others; • Acidic emissions such as sulfur and nitrogen oxide can be controlled with the use of scrubbers; • Dust emissions from patios and outdoor areas free from chemical contaminants can be controlled with water sprays
• Sulfur and nitrogen oxides, ammonia, acid mist and fluorine compounds gas emissions from production and refining plants operations	• Gas emissions can be controlled by wet scrubbers or carbon absorption, among other techniques
• Soil, surface water and/or groundwater contamination by inappropriate disposal of soild waste resulting from chemical industry processes, including effluent treatment sludge and particulate matter from dust collectors	• Solid wastes cannot be recycled must be treated appropriately before final disposal • The choice of appropriate treatment must comply with the waste classification according to the pertinent regulation(s) • Depending on the nature of the waste, possible, treatment, methods include: incineration, controlled landfill disposal, chemical immobilization and solidification, encapsulation, burning in cement kilns, etc. • Should these treatments be unavailable at the site, the waste may be treated in other plants with suitable facilities, in which case special care must be taken during waste transportation • If the waste is not teated immediately after being generated, there must be suitable areas for storage at the plant site.
• Changes in local traffic due to truck circulation (including dangerous cargos)	• Accessibility and road system conditions must be assessed during feasibility studies, selecting the best routes to reduce impact and risk of accidents
• Noise pollution caused by equipment and operations that generate loud noise.	• Acoustic treatments by enclosure of equipment or soundproofing buildings that hold loud equipment and/or units that operate at significant noise levels.
• Accidents that impact the environment, such as large oil spills, leaks, fires and explosions on plants. Eventual deaths.	• Emergency Response Plan. ■

ETHYLENE OXIDE - FACT SHEET

What is ethylene oxide?

Ethylene oxide (EtO) is a flammable, colorless gas at temperatures above 10.7° C that smells like ether at toxic levels. EtO is found in the production of solvents, antifreeze, textiles, detergents, adhesives, polyurethane foam, and pharmaceuticals. Smaller amounts are present in fumigants, sterilants for spices and cosmetics, as well as during hospital sterilization of surgical equipment.

How can ethylene oxide harm workers?

In addition to eye pain and sore throat, exposure to EtO can cause difficult breathing and blurred vision. Exposure can also cause dizziness, nausea, headache, convulsions, blisters and can result in vomiting and coughing. Both human and animal studies show that EtO is a carcinogen that may cause leukemia and other cancers. EtO is also linked to spontaneous abortion, genetic damage, nerve damage, peripheral paralysis, muscle weakness, as well as impaired thinking and memory. In liquid form, EtO can cause severe skin irritation upon prolonged or confined contact.

What should employers know about ethylene oxide?

Employee exposure is limited to one part EtO per million parts of air (1 ppm) measured as an 8-hour time-weighted average (TWA). Employee exposure may not exceed the short-term excursion limit of 5 ppm EtO averaged over any 15-minute sampling period.

When employers can demonstrate that the processing, use, or handling of products containing EtO will not release airborne concentrations of EtO at or above the standard's action level of 0.5 ppm. The action level is calculated as an 8-hour TWA and is the threshold for increased compliance activities (e.g., air monitoring, medical examinations, labeling, employee information, and training).

What must employers do when exposures exceed the standard's permissible exposure limits?

If employee exposures exceed either the PEL or the excursion limit, employers must take the following actions:

- Use engineering controls and work practices to control employee exposure.
- Establish and implement a written compliance program to reduce exposures to or below the TWA and exposure limit.
- Establish personal air monitoring as well as information and training programs for employees exposed to EtO at or above the action level or above the excursion limit. Conduct training upon initial job assignment and annually.
- Establish a regulated area wherever airborne concentrations of EtO are expected to exceed the 8-hour TWA or the excursion limit.
- Establish a medical surveillance program for employees exposed to EtO at concentrations above the action level of 0.5 ppm, measured as an 8-hour TWA, for more than 30 days per year.
- Place warning labels on all containers that might cause employee exposures at or above the action level or excursion limit.
- Remember that employee rotation is prohibited as a means of compliance with the 8 hour TWA or exposure limit.
- Select, provide, and maintain appropriate personal protective equipment and ensure that employees use it to prevent skin and eye contact.

When must employers require workers to use respirators?

Employers must ensure that workers use respirators to control EtO exposure in the following circumstances:

- During installation or implementation of feasible engineering controls and work practices;
- During maintenance, repair, and certain operations when engineering and work practice controls are not feasible;
- When engineering and work practice controls are not currently available to reduce exposures to or below the PEL; and
- During emergencies.

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Ethylene....

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What are employers required to do concerning exposure monitoring?

To help protect workers, employers must conduct the following exposure monitoring:

- Initial monitoring to determine the airborne concentrations of EtO that workers are exposed to (representative sampling of employees' exposures is permitted).
- Periodic exposure monitoring if the airborne concentration of EtO is at or above the action level or above the 15-minute excursion limit.
- Additional monitoring if there has been a change in workplace conditions, such as process or materials used, and if the change could increase employee exposures.

Note: If the exposure level is maintained below the action level, you may discontinue TWA monitoring until there is a change in production, equipment, processes, personnel, or control measures that may result in new or additional exposure to EtO.

Employers must also do the following:

- Allow affected employees or their designated representatives to observe the monitoring.
- Notify affected employees of the results of the monitoring within 15 working days of receiving the results.

Do all businesses where EtO is present need medical surveillance programs?

Employers must implement a medical surveillance program, conducted or supervised by a licensed physician, for an employee under the following circumstances:

- If the employee is assigned to an area where exposure to EtO may be at or above the action level for 30 days or more during the year.
- If the employee has been exposed to EtO in an emergency situation.

What steps must employers take to communicate with workers about EtO exposure?

Employers must do the following to communicate information to affected workers:

- Establish regulated areas where occupational exposure to EtO exceeds the 8-hr TWA or excursion limit, and clearly mark them to limit the number of workers in the regulated area and to allow only authorized persons to enter.
- Provide the signs and labels specified by the standard clearly indicating EtO's carcinogenic and reproductive hazards in regulated areas.
- Train workers upon initial assignment and then annually if they are at risk of exposure at or above the action level or above the excursion limit.
- Maintain a material safety data sheet for EtO.

Are there any recordkeeping requirements concerning employee exposures to EtO?

Employers are required to maintain the following records relating to employee exposure to EtO:

- Retain employee exposure records for 30 years.
- Keep employee medical records for the duration of employment plus 30 years.

What should employees do to protect themselves from EtO exposure?

To protect against EtO exposure, follow these safety precautions:

- Wear goggles and skin protection at all times in areas where there is a risk of splashes from liquid EtO.
- Wear proper protective clothing and other approved personal protective equipment when working with EtO.
- Discard clothing that has been degraded by EtO.
- See a doctor if you are exposed to EtO.
- Do not eat, drink, or smoke while working with EtO.

How can you get more information on safety and health?

OSHA has various publications, standards, technical assistance, and compliance tools to help you, and offers extensive assistance through workplace consultation, voluntary protection programs, grants, strategic partnerships, state plans, training, and education. ■

CASE STUDY

SERIOUS ACCIDENT WHILE WORKING ON PRESSURE DIE CASTING MACHINE:

Accident Type: Caught Between

Type of Industry: Engineering

Size of work Crew: 4/600

Work Site Inspection Conducted: Yes

Designated competent Person on Site: No

Employer Safety and Health Programme: No

Training and Education for Employees: No

Craft/Type of Deceased Employee: Unskilled

Age and Sex: 19, Male

Time on the Job: A month

Time on the Task: 6 Hrs

Description of the Accident:

In a factory involved in manufacturing Aluminum castings for automobile industry, a worker working on one of the several Pressure Die Casting Machines (PDCM), was crushed to death. In the said factory there were several PCDMs. One of them was of 800 MT capacity. The cylinder heads were manufactured on this machine. The machine had two large platens of size about one square meter, carrying molds on it. One on them was mounted on the tail stock, a reciprocating die carrier of the machine and the other was mounted on head stock of the machine, a stationary die holder of the machine. There was an interlocked guard on the machine consisting of two cages made out of wire mesh. One of the cages was a fixed one fencing the moving parts of the tailstock of the machine. The other was a reciprocating telescopic type.

The process involved,

- inserting loose cores in to the die on the tail stock,
- spray the dies with a special kind of oils for easy removal of the castings,
- insert a loose sleeve on the die mounted on the headstock of the machine,

  pouring a molten aluminum metal into the hopper of the injection cylinder of the machine,
- pull the reciprocating telescopic guard to cover the open space into which the die holding reciprocating tailstock would move to close the dies, and set the machine ready for injection,
- operate two interlock switches (push buttons)on the body of the machine, and actuate the injection operation,

The operation of two switches would actuate the tail stock of the machine to move forward to close the dies and the molten metal would then get injected automatically in the die cavities. After the injection of the molten was complete, following was the sequence of the operation of the machine.

- The reciprocating tailstock of the machine would automatically traverse back into its earlier position,
- Open the reciprocating guard on the machine manually,
- Remove the castings from the machine, remove the loose cores from the castings, and keep them into trolley for further machining operations,
- set the machine for the next cycle,

The cycle for the described sequence of operations was of about 3 minutes. The closing of dies would take hardly 5 seconds, after the guard was set in its place. Four workers were involved into the manufacturing of the Aluminum Castings in the manner prescribed above. Three of them were on one side of the machine on which a control panel was installed, on the pillar of the headstock of the machine and another worker, a forth one was required to work on the opposite side of the machine. One of the three workers was the main machine operator. His job was to spray the oil mist on the dies when they were ready for closing and injection, pour the molten metal into the injection cylinder of the machine, operated two interlock switches on the machine, to actuate the closing of the molds, followed by injection. The second would put the loose cores into the die cavities, and the third worker would help transfer the casting into the trolley, after it was taken out. The job of worker on the opposite side of the machine was to keep the loose sleeve on the die, mounted on the headstock of the machine.

On the fateful day, the sliding portion of the interlocking guard (front gate) was not functional, and the machine was being operated without using the front

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Case Study....

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gate of the guard. It resulted in dies closing even before the sliding portion of the interlocking guard was pulled over to cover the opening into which the tailstock-die would move. The activity of manufacture had been going on this fashion for over two hours, with proper coordination amongst all four workers. At one stage, when the main machine operator was about to actuate the two interlock switches on the control panel, the forth worker on the other side of the machine noticed that the loose sleeve he had kept on the die mounted on the head stock had moved little away from its position. He therefore, leaned into the opening between the dies, and tried to set it right into its position. However meantime, unaware of what the worker on the side of the machine was doing, the main machine operator pushed the two switches on the control panel of the machine, for closing dies for injection. As the tailstock moved forward to close the dies for injection, the worker on the other side of the machine, who was leaning into the opening between the dies to set the loose sleeve right into its position, was caught with his upper portion of his body between the moving tailstock and the headstock, of the Pressure Die Casting Machine, and was crushed to death on the spot.

Accident Prevention Measures:

- An electrical interlock arrangement shall be provided so that the molds cannot be closed unless front safety gate is fully closed and on opening the front safety gate, the molds would stop automatically,
- A hydraulic safety shall be incorporated with the front safety gate such that it will prevent the tailstock mold plate forward, on opening of the front safety gate,
- The interlock arrangement so provided shall be maintained in effective working condition.

Serious Accident while Material handling

In one factory worker met an serious accident, while loading the M. S. Plates on the platform of the truck, sustaining serious head injury which proved fatal. This accident occurred due to adoption of unsafe system of work.

ABOUT ACCIDENT:

On the day of accident, the deceased worker, had attended the duty at 8.30 am as usual along with three co-workers. The work of loading the M S plates (size – 5m. x 1.25m. x 6mm) in the truck was being carried on in the store yard of the factory.

In store yard of the factory, there are various types of material such as MS bars, angles, channels, pipes including MS Plates and on the said day the work of loading of MS plates was to be completed, which was started with the help of JCB loader for lifting the plates, employing four workers.

The system and arrangement of loading the M S plates in the truck was as follows.

The plate which was to be loaded in the truck was being made holes lengthwise at a distance of one meter from both the ends of the plate by gas cutter. Then the wire rope (5/ 8') with Dshackle was bolted in both the holes and the plate was lifted vertically by JCB (power-76 hp.) 6 inch above the height of platform of the truck (4 ft.) and was being dropped on the platform which was falling horizontally with huge sound on the platform with most of the portion outside the platform of the truck in imbalance position Then the four workers were used to push the plate inside, on the platform so as to load it completely on the platform.

It is marked that, the JCB which is used specifically for digging purpose was used for lifting and loading the heavy plates resulting into the said fatal accident.

On the day of accident, the deceased worker, along with his coworkers started the work of loading at 9 am. and completed the loading of one M S plate till 9.30 am. under the supervision of a Supervisor. As there were total 12 Plates the supervisor, thought that loading may consume more time if plates are loaded one by one and therefore second time two plates were taken at a time, which were made holes by gas cutter and wire rope with D shackle was bolted to both the plates and was lifted vertically by the hand (bucket) of JCB and dropped on the platform of the truck. The plates fell horizontally on the platform in such a way that most of the portion (75 %) was outside the platform. Immediately after falling the plates, the deceased worker who was standing there itself, started loading the plates, along with three coworkers by pushing the said plates inside, on the platform and while doing so, the plates which were in imbalance position due to maximum portion outside, fell on the body of the workers. However

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Case Study....

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the other coworkers escaped miraculously and the plates fell on the back of the deceased sustaining serious head and neck injury. The other workers nearby rushed to the spot. However the deceased worker was profusely bleeding. He was immediately taken to Hospital. However Doctor examined and declared him dead.

SPOT ANALYSIS :

The spot examination, work system of loading the plates , working of JCB, Position of lifting plates, position of truck platform , working position of the deceased worker etc. revealed the details which are as follows-

Machine / Mechanism: JCB Loader

Make: BEML Ltd.

Bucket Capacity of lifting soil: 1 cu m.

Power : 76HP

Operating height : 5.8 m.

Size of wire rope with D shackle : 5/8"

Dimension of M S plate: 5m x 1.25m x 6mm

Weight of one Plate: 300 kg

Size of loading platform of truck: 5.3 x 2.4 m.

Distance of loading platform from ground level: 4 ft.

Position of plates while lifting: Vertical

Position of plates after dropping on platform: Horizontal

Portion of plates outside platform after falling: 75 %

Plates lifted at a time: 2 No.

System of loading plates: Improper and Dangerous

Arrangement for handling of plates: Unsafe and Risky

WHAT WENT WRONG:

The lifting of heavy M S plates by JCB loader is itself very dangerous act since it is not meant for lifting plates but for the use of digging the soil. Further for loading the plates after falling in imbalance position on the platform of the truck, the workers should not have allowed to push it inside , on the platform of the truck unless stable position of the plates was ensured which was not done and resulted into the said fatal accident.

Secondly, the arrangement used in connection with handling that is lifting the plates was done by JCB loader which is at all not meant for the said purpose.

The Management should have provided and carried out the said work of lifting and loading by making the arrangement of suitable crane to ensure the health and safety of the workers at work and further by adopting the proper system of work that are safe and without the risk to health, which could have prevented the said accident.

REMEDIAL MEASURES :

1) The suitable crane with adequate lifting capacity shall be provided for lifting / handling the heavy M S plates.

2) The plates shall not be lifted vertically and dropped down from the distance which is dangerous to cause accident.

3) The proper system of lifting and loading shall be adopted to ensure safety and absence of risk to the health of the workers.

4) The workers shall be well acquainted and properly trained to carry out the loading of heavy plates.

5) Protective wears like safety shoes, helmet, hand gloves shall be provided to the workers. ■

IN THE NEWS

A world without fatal work accidents is possible

GENEVA - A world without fatal or serious occupational accidents is possible, the organizers of the XX World Congress on Safety and Health at Work 2014 have appealed, as the largest global occupational safety event opened in Frankfurt, Germany.

Nearly 4,000 occupational safety experts, politicians and scientists from 141 countries will, until Wednesday evening, be discussing ways of making work safer and healthier. The triennial Congress is coorganized by the International Labour Organization (ILO) and the International Social Security Association (ISSA), and is hosted this year by the German Social Accident Insurance (DGUV).

According to the ILO, 2.3 million people worldwide die annually as a result of occupational illnesses and accidents at work. In addition, there are 860,000 occupational accidents every day, with consequences in terms of injuries. The direct or indirect cost of occupational illness and accidents at work is estimated at US$2.8 trillion worldwide.

“These figures are unacceptable and yet these daily tragedies often fail to show up on the global radar. Clearly, there is still much to be done. Serious occupational accidents are, firstly, human tragedies but economies and society also pay a high price,” said ILO Director-General Guy Ryder. “The right to a safe and healthy workplace is a basic human right - a right to be respected at every level of development and in different economic conditions. Respecting this human right is an obligation - as well as a condition for sustainable economic development. Prevention is possible, it is necessary and it pays."

“Investment in risk prevention has led to remarkable socioeconomic benefits,” declared ISSA President Errol Frank Stoové, referring to a recent ISSA study that calculates the return on investments in prevention as averaging more than twice the amount invested. “However, with a dramatically changing world of work, the health and well-being of workers remain a concern, in particular due to mental and ergonomic strain. This requires that we develop new, integrated strategies for prevention, which connect the safety, health and well-being of the individual."

“Vision Zero is no ivory tower idea. It’s feasible,” is the view of Dr Joachim Breuer. The Managing Director of the German Social Accident Insurance (DGUV) pointed to the occupational accident statistics for DGUV. “A hundred years ago in Germany there were 10,000 deaths a year at work. Last year the figure was less than 500 deaths for the first time.” The number of reportable accidents had been halved in the past 20 years alone. “This success is not just specific to Germany - it's repeatable. Experience and many examples from our international cooperation efforts have shown us this,” Dr Breuer stated.

Dr Walter Eichendorf, President of the 2014 World Congress, added: “Solutions to occupational safety problems are being developed worldwide. There are examples of best practice, with measures being tested and evaluated in the most diverse of countries. The exchange of ideas at the World Congress prevents anyone from having to start again from zero.”

IN THE NEWS

Industrial accidents bring to focus the need for safety audit

“Though safety apparatus is being reviewed nothing is materialising”. “It's a matter of serious concern that there is no let-up in industrial accidents. We have to review the safety situation and conduct audit each industry-wise”, Mr. Srinivasa Rao *(Minister for Human Resources, Primary, Secondary, Higher & Technical Education, Govt. of Andhra Pradesh)* said.

Frequent industrial accidents notwithstanding the talk of safety audit have remained an empty rhetoric.

It has become a normal practice to review the safety apparatus vis-à-vis the protocols being implemented for occupational safety and health whenever a major accident occurs but in practice nothing concrete is materialising, say trade union leaders.

Another point for deplorable track record, some due to safety negligence and others due to pollution, is stated to be lack of supervisory mechanism for want of manpower by the AP Pollution Control Board, Factories, Fire and other concerned departments. Though there was a proposal to locate the headquarters of APPCB in Visakhapatnam due to location of several industrial units, there appears to be no serious move in this regard as yet.

The death of one worker and injuries sustained by 10 others at Anjaneya Alloys Limited in a furnace blast at AP Special Economic Zone on Sunday is a case in point on the need for regulator safety audit. Some of the workers injured in the accident told Ministers Ganta Srinivasa Rao, Ch. Ayyanna Patrudu and CPI (M) team led by State Secretariat member Ch. Narsinga Rao that despite warning on water leakage no immediate action was taken to halt production.

Cause for concern

“It’s a matter of serious concern that there is no let-up in industrial accidents. We have to review the safety situation and conduct audit each industry-wise,” Mr. Srinivasa Rao said.

Visakhapatnam has witnessed some of the worst industrial accidents. Two engineers of a private firm died following suspected gas leakage in June at Visakhapatnam Steel Plant. Frequent gas leakages have been reported in some of the units at Jawaharlal Nehru Pharma City, Parawada. Three workers died in fire at Hetero Drugs, Nakkapalli last year. While 19 died in an explosion at oxygen pressure reduction station of VSP on June 13, 2012, cooling tower collapse at HPCL Visakh Refinery claimed 27 lives on August 23, 2013.

“All these accidents buttress our claim on deteriorating safety status of our industrial establishments mainly due to over-dependence on outsourcing and cost reduction,” said INTUC district president Mantri Rajasekhar.

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