SEA (INDIA)

INDIAN SAFETY ENGINEER

QUARTERLY JOURNAL OF SAFETY ENGINEERS ASSOCIATION

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VOL: 10 No. 1 **JANUARY – MARCH 2011**

FROM THE DESK OF PRESIDENT

Dear Members,

In the last quarter, our 53rd Executive Committee meeting was held on 22nd Jan 2011. 26th Technical Meet was held on 19th Feb 2011. Our journal "Indian safety Engineer" for the fourth quarter 2010 was released in time and hopefully the next one will also reach you soon, and in time.

I am happy to share with you all that our long cherished desire of forming the Mumbai Chapter of SEA is now fulfilled on 12th March 2011. First set of office bearers under the presidentship of Dr. P.K. Pant, Sr. Vice President, RIL (Retd), took charge during the second coordination committee meeting held at Mumbai for this purpose. I am sure the new Chapter would provide additional platform for the safety professionals, particularly of that region, to have better networking and sharing of resources. On behalf of the Executive Committee and members of SEA, let me congratulate the new office bearers of the Mumbai Chapter and wish the Chapter all the success.

Appears the SEA website, www.seaindia.org is now widely used and we do get some online applications from safety professionals for membership and also for their placement in Nebosh IGC course. Arrangements are made to upload the site periodically. New Email ID, Mumbai@seaindia.org is provided to the new Chapter for communication purposes.

SEA India Group mail under Yahoo Groups of Emails is now functional and those who are not yet connected may request Mr. Kamarajan, Moderator on his email ID: krajan@etaascon.com.

The results of Seventh International general Certificate Course of NEBOSH, UK was announced on February 24th 2011 and the results are encouraging. The efforts taken by NEBOSH tutors are appreciated.

Membership cards are getting ready for the corporate grade life members and the same will be distributed soon.

We are planning to convene the next AGM in June 2011 and hope to see you all by then.

Best Wishes!

S. Ulaganathan
President, SEA India

Inside....

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NEBOSH Course Update

The March 2011 batch International General Certificate Course of NEBOSH, UK was held at Sri Ramachandra University, Porur, Chennai. The contact classes were conducted from 24th February to 6th March 2011 and the examinations were conducted on 9th and 10th of March 2011. This time, eighteen candidates attended the contact classes and two candidates could not get leave to attend the course. As usual, class tests and model examinations were conducted in addition to tutorial classes and it was very much appreciated by the candidates. The candidates expressed satisfaction on the conduct contact classes and good result is expected this time also.

The Results are expected by 14th May 2011. The next examination is scheduled on Wednesday, 7th September 2011 for which admissions have been in progress.

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 by mail, info@seaindia.org for getting admission.

March 2011 batch with Tutors

26th Technical Meet

26th Technical Meet was held on Saturday, 19th February 2011 at Chennai.

Shri P C Sridher, General Manager, Tata Power Company, Mumbai delivered the talk on “Project Safety Philosophy – A tool for implementing Risk Based Safety during Design”.

Large number of SEA Members participated in the technical meet and enriched their knowledge.

PROJECT SAFETY PHILOSOPHY – A tool for implementing Risk-based safety during design

1. Project safety philosophy- An Introduction

The Project safety philosophy provides guidance on safety codes, standards and practices, and design criteria to be followed *for the design and construction of* plant and facilities.

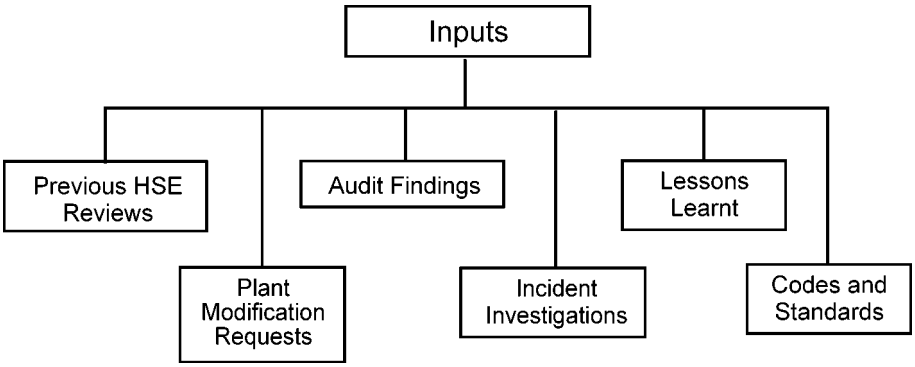
The project safety philosophy is required to be developed by project team at *conceptual stage.*

It enables various discipline engineers of design, construction, operations, maintenance to understand their specific role and interaction with one another, in order to achieve a *risk-based design*.

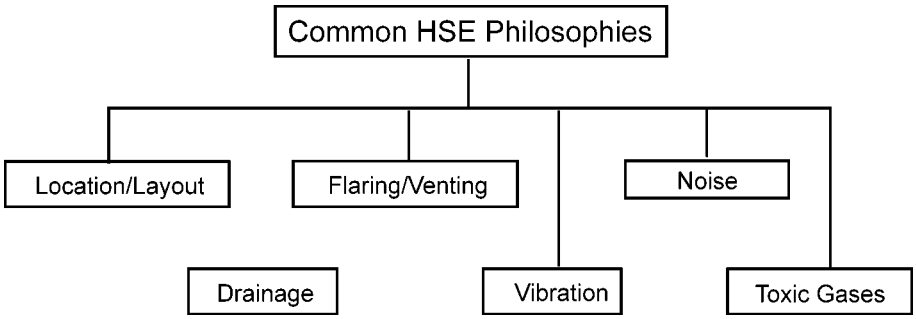
2. Objectives of Project HSE Philosophy

- Ensuring that all facilities are designed to a consistent standard.Guiding all disciplines to ensure "Built-In" Safety within design
- Ensuring that Occupational Health, Safety, Fire Protection, and Construction impacts are considered in all stages of a project
- Defining Engineering basis for a project to ensure risk based approach to design to achieve As Low As Reasonably Practicable (ALARP)
- Ensuring compliance with statutory regulations, standards and codes
- Ensuring design follows Best Available Techniques (BAT) and global Best Practices
- Assisting in standardizing operating and maintenance requirements within facilities. Gives basis for plot plan layout and equipment spacing
- Ensuring that Lessons Learned from existing operations are incorporated into new designs

3. Main inputs for project safety philosophy



4. Main considerations for project safety philosophy



Contents of Project safety philosophy

4.1 Location/Layout: Whereby key safety design considerations are detailed, they include prevailing wind direction, toxic and flammable gases and sources of ignition, personnel areas including control room locations, electrical substations and public areas, issues related to site access and egress, ease of access by emergency and support services.

4.21Safe Distances: This is developed in conjunction with location/layout whereby safe separation distances between process units is defined, as well as external safe distances for unrelated activities.

4.3 Drainage: Whereby the principal methods of draining the plant is established taking into consideration the hazardous nature of drained fluids. This includes closed drain system for process drainage and open drain system for surface fluids.

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This covers process and non-process areas.

Accidentally contaminated drainage is critical in the event of pool fire, where by oil and oily water are drained away from process area into a safe area, the system includes sloping and curbing of surface areas, flame traps, storage and a recovery system.

4.4 Flaring and Venting: This includes the basis for managing process gases, whether in normal operation or during emergencies, this has two main parts one is the Gas dispersion (Toxic and Flammable) and Heat Radiation and their effects to people, environment and process.

4.5 Toxic gases: The maximum concentration levels are defined in addition to criteria for normal and emergency modes of operation.

4.6 Noise: Where the maximum noise levels are defined, those include process areas, manned areas, offices and accommodation. It also defines the acoustic insulation requirements for each area.

4.7 Vibration: Potential sources of vibration need to be identified and reviewed during design to ensure structural integrity.

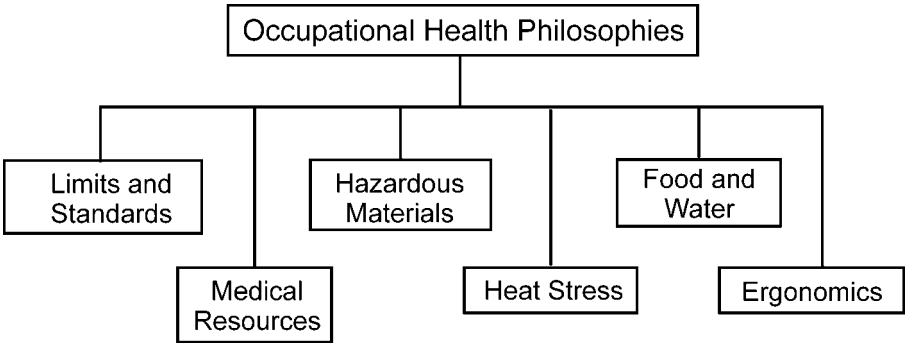
4.8 Personal Protective Equipment (PPE): The PPE requirements for operation, maintenance and construction are specified including any special requirements e.g. x-ray.

5. Main considerations for Occupational Health (OH) philosophy

Contents of Occupational Health (OH) philosophy

5.1 Limits and standards: All Occupational Health exposures shall be identified, reviewed and addressed.

5.2 Provision for Medical Resources: Medical facilities are specified including both temporary facilities during construction and permanent facilities.



5.3 Hazardous Material Storage, Handling and Disposal: Suitable areas for handling and storage of hazardous materials also cross reference to approved handling and enforcement authority procedures.

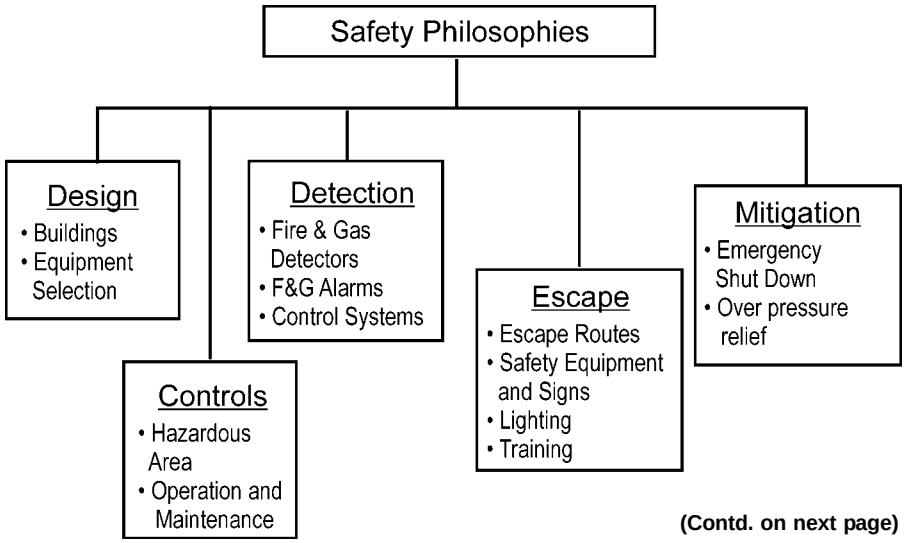
5.4 Radiation control/limits: This relates to location of high voltage equipment (more than 1000V) adjacent to manned areas.

5.5 Heat Stress: Design shall cater for operational and maintenance needs of personnel, which include shades and area shelters in addition to utilising of remote monitoring. In addition there are all the other requirements regarding construction activities.

5.6 Water Quality: this relates to potable as well as disposal water quality.

5.7 Food Safety: this relates to project camps and food preparation areas, where by standards are defined.

5.8 Ergonomics: The basis for ergonomic design is defined this is mainly for manned buildings.



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6. Main considerations for Safety philosophy

Contents of Safety Philosophy

6.1 ***Roadway Construction:*** Those are related to all access roads, junctions and crossings.

6.2 ***Structural design:*** Design parameters are defined for all types of buildings and supports.

6.3 ***Offices, Administration Buildings and Accommodation:*** Where location in relation to existing Hazards matters and its effects on the building design including fire and gas detection and protection.

6.4 ***Emergency Evacuation and Escape Routes:*** This is related to emergencies, the design of escape routes including design of exits and safety signs.

6.5 ***Emergency Doors, Exits and Gates in Perimeter Fencing:*** Stipulates design criteria for emergency escape routes, fire rating of fire doors and emergency exits and safety requirements for emergency escape gates in perimeter fencing.

6.6 ***Heating, Ventilation and Air Conditioning (HVAC):*** Design parameters are specified for air locks, smoke detection on fresh air inlets, smoke and fire dampers, prevention of the effects of adverse winds and ingress of fumes, vapours and toxic gasses.

6.7 ***Stairs, Ladders and Platforms:*** Safety requirements, including emergency/ escape needs are indicated for the design of stairs, ladders and platforms.

6.8 ***Classification of Hazardous Areas:*** Specifies design requirements with respect to classified areas utilizing the latest version of IP-15.

6.9 ***Control Rooms:*** stipulates structural protection against over and under pressure explosions, fireballs, plant missiles, glass fragmentation and gas ingress, fire protection arrangement, Hydrocarbon gas detectors and toxic gas detectors.

6.10 ***Equipment Control and Power Control Rooms:*** Requirements for addressable analogue fire detection and alarm system, installation of VESDA, (Very Early Smoke Detection Apparatus), inert fire extinguishing system are stipulated.

6.11 ***Substations:*** safe siting of substations, pump or facility, addressable analogue fire detection and alarm systems and multi-zone VESDA (Very Early Smoke Detection Apparatus), Inert gaseous fire extinguishing systems for switchgear rooms, heat sensing fire detection cables, cable trenches, trays and voids beneath substations.

6.12 ***Transformers:*** Transformer pits size, fixed temperature heat detectors, heat sensing detection cables in the cellar and cable trenches, audio and visual alarms, cable inlets sealing requirements.

6.13 ***Battery Rooms:*** Conventional addressable analogue smoke detection on an intrinsically safe circuit, with an external MAC and alarm bell, explosion proof extraction fans, and lighting.

6.14 ***Equipment Identification:*** Design drawings, specifications, procurement requisitions and equipment, equipment requiring any colour coding or hazard warning notices.

6.15 ***Emergency Lighting:*** Classification (Maintained and Non-Maintained), duration of Emergency and Emergency Exit Lighting, lighting levels in the process area and on emergency escape, both inside buildings and within all plant areas.

6.16 ***Emergency Power Supplies:*** The design philosophy for emergency power, both electrical power supplies and the un-interrupted (UPS) supply shall be stated.

6.17 ***Earthing / Bonding:*** Stipulates bonding requirements as per NFPA 70 article 250.

6.18 ***Communication Systems:*** Covers internal plant communication systems such as public address or telecommunications, paging and external communication between operations and other plants or civil authorities.

6.19 ***Combustion Equipment and Ignition Sources:*** Specifies location of combustion equipment and ignition

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sources (furnaces, fired heaters, boilers and engines). Specifies Ignition suppression methods and systems in conjunction with area classification, and also defines all thermal insulation requirements.

6.20 ***Isolation:*** Defines design criteria for isolation in the Basic Engineering to ensure the requirements for double block and bleeds, positive isolation by means of spectacle blinds etc, by-passes, purging, cathodic probes, and interlocking systems are detailed as the design develops.

6.21 **Overpressure and Relief Protection:** Outlines design philosophy for relief and overpressure protection systems for vessels, equipment and pipelines against loss of containment or rupture.

6.22 ***Exhausts and Vents:*** Covers Area Classification, prevailing winds, location of other equipment, HVAC air intakes, vents, combustion air intakes for turbines etc.

6.23 ***Emergency Shut Down (ESD):*** States the number of levels required for shut down. This is normally between 3 minimum and 6 maximum. The highest level is evacuation of the plant after the total shutdown of all operating systems. The lowest level is the automatic shutdown of items of equipment due to an operation varying outside set limits. Specifies fire rating and SIL classification of ESD valves, passive fire protection for the actuators and cables.

6.24 ***Safety Signs and Notices:*** All safety signs shall be in accordance with UK Health & Safety Executive, Safety Signs and Signals, Health and Safety Regulations 1996, Guidance L64.

6.25 ***Safety Equipment:*** The principal requirements for all types of safety equipment shall be specified including installation and storage locations.

6.26 ***Emergency Safety Showers and Eye Wash Stations:*** Permanently installed Emergency Safety Showers and Eye Wash Stations shall be installed upwind of the prevailing wind direction at all risky locations. Risk areas include vehicle loading/off loading facilities, decanting, chemical injection points and at locations where there are flanged hose line connections throughout the plant. Pump seals, sample points, valve manifolds, mix tanks, chemical storage and battery rooms are more examples. Additional design considerations are necessary to ensure adequate shade and cooling is provided, water pressure and water temperature is specified and maintained within the limits.

6.27 ***Wind Socks:*** Wind socks shall be fluorescent orange colour and located throughout the plant in highly visible locations.

6.28 ***Operations and Future Maintenance Considerations in Design:*** Design safe access to all areas, particularly those at height enabling easy removal of valves and equipment during maintenance periods. Provide platforms to enable access to frequently serviced items, lifting beams for heavier valves and equipment. Minimize disruption; avoid the dismantling of civil structures to remove plant and equipment.

6.29 ***Lifting and Mechanical Handling:*** Specifies lay down areas, maximum safe working loads for cranes, hoists, lifting gear and appliances in detailed engineering for both the construction phase and post commissioning operations. Specifies Tare weight and maximum lifting capacities, Manual handling requirements for construction, operations and maintenance activities during design stage. Normal operational swing zones of permanently installed lifting tackle, cranes, hoists shall not pass over hydrocarbon / hazardous material containing equipment or pipelines.

6.30 ***External Emergency Services:*** Specifies all emergency services, fire medical and control, the conditions and equipment required to allow them to operate in emergency condition.

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7. Main considerations for Fire Protection philosophy

Main contents of Fire protection philosophy

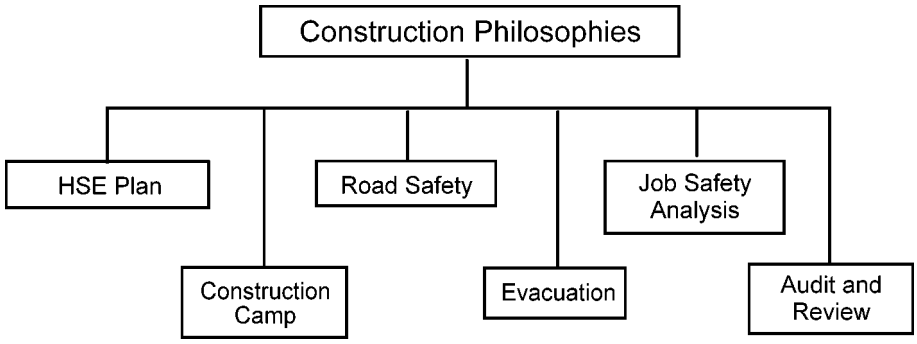
Fire fighting: includes both active and passive fire fighting systems, mainly CO_2 flooding systems, sprinkles, monitor and foam systems. A very important requirement here is the application rates of the active fire protection systems. Fire Protection shall be risk based upon requirements as identified in the Fire Safety Assessment study, API and NFPA Fire Codes.

8. Main inputs to Environmental Philosophies

Contents of Environmental Philosophies

8.1 ***Limits and standards****:* This relates to acceptable emissions and quality of effluents with a specified method of disposal.

8.2 ***Energy****:* This includes the use of heat recovery systems.



8.3 ***Waste Management****:* This concerns all wastes whether construction, operation or abandonment.

9. Main inputs to Construction safety Philosophy

Contents of Construction safety philosophy

9.1 ***Transportation****:* This includes the use of vehicles for the construction contractors.

9.2 ***HSE plan requirements****:* What needs to be done and when.

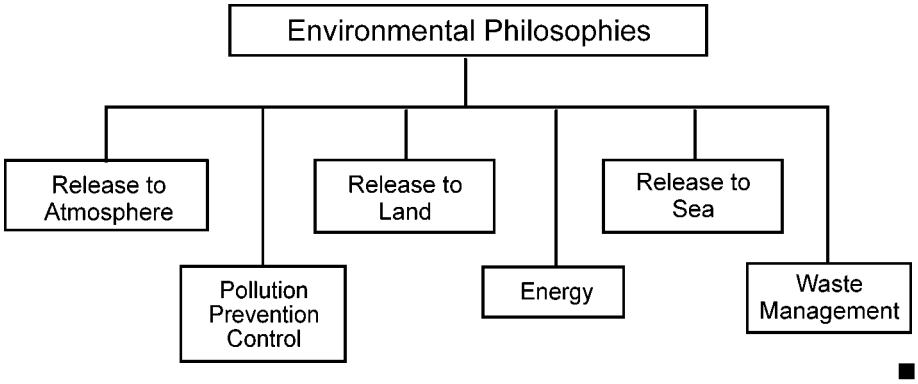
9.3 ***Construction methodology****:* to be defined in construction plan.

9.4 ***Safety organisation****:* the qualification and number of site cover to be defined.

10. Summary

The Project safety philosophy is a systematic risk based safety tool that helps to ensure safety is inbuilt in design.

It helps in maintaining consistency and compliance to legislation, stakeholders and policy requirements.



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THE RISK OF USING MOBILE PHONE WHILE DRIVING

Modern mobile phones are small, compact, to use and have become an essential part of life for many people. They enable people to maintain contact with family, friends and business associates. As well as the general communi-cation benefits, access to a mobile phone also provides safety benefits by enabling people to alert breakdown or emergency services when necessary.

However, there is considerable concern that using a mobile phone while driving creates a significant accident risk, to the user and to other people on the road, because it distracts the driver, impairs their control of the vehicle and reduces their awareness of what is happening on the road around them.

Physical Distraction: When using a hand-held mobile phone, drivers must remove one hand from the steering wheel to hold and operate the phone. They must also take their eyes off the road, at least momentarily, to pick up and put down the phone and to dial numbers. While using a hand-held phone, the driver must continue to simultaneously operate the vehicle (steer, change gear, use indicators, etc) with only one hand.

Although the physical distraction is far greater with hand-held phones, there is still some physical activity with hands-free systems. Even though they do not need to be held during the call, the driver must still divert their eyes from the road to locate the phone and (usually) press at least one button.

Cognitive Distraction: When mental (cognitive) tasks are performed concurrently, the performance of both tasks is often worse than if they were performed separately, because attention has to be divided, or switched, between the tasks and the tasks must compete for the same cognitive processes. When a driver is using a hand-held or hands-free mobile phone while driving, she or he must devote part of their attention to operating the phone and maintaining the telephone conversation and part to operating the vehicle and responding to the constantly changing road and traffic conditions. The demands of the phone conversation must compete with the demands of driving the vehicle safely.

ABNORMAL SITUATION MANAGEMENT

In June 2002, a real-life case study was presented at **Honeywell User's Group** meeting. The meet aimed at discussing ways to manage abnormal situations popularly known as ASM-abnormal situation management.

In Europe, lightning struck a certain oil refinery. Almost instantly a fire broke out. Within a few hours a vessel was overfilled causing the liquid to enter the flare line. (A flare line had been designated for vapour usage only). The flare line failed resulting in a huge explosion releasing over twenty tonnes of flammable liquid hydrocarbons. A colossal damage to the plant, injuring 26 employees, costs due to lost production apart.

Investigation into this incident revealed many causes. Some of which included:

1. A plant modification had not been properly assessed.
2. An indication of a control valve had been misleading.
3. The graphics of the control panel did not include overviews.
4. Operators were faced with 275 alarms during the 11 minutes before the explosion.

Apart from this incident several such cases were presented in the meeting. The discussion highlighted the importance of Abnormal Situation Management (ASM). The participants concluded that ASM could reduce the primary causes of such incidents. Therefore they exhorted companies to join the ASM consortium.

Honeywell leads the ASM consortium. This consortium consists of leading oil and chemical companies and other organisations with special expertise. The consortium proposes to demonstrate the technical feasibility of collaborative decision-support technologies that can improve the performance of operational personnel during abnormal situations.

Abnormal conditions happen in any processing environment right from oil refineries to food, pharmaceutical, and biotechnology industries. Researches from the ASM consortium say that incidents resulting from abnormal conditions adversely impact productivity and increase other associated costs primarily in the form of equipment repair.

The inability of automated control systems and personnel to control these abnormal situations costs the US economy atleast $20billion a year. According to the ASM consortium, process disruptions can cause plant capacity losses of 3 to 8 percent per year.

Three musketeers: ASM consortium identified three major factors of abnormal situations:

1. People or work factors.
2. Equipment factors.
3. Process factors.

People factor: This factor accounts for an average of 42% of the incidents. The training, skill and experience levels of the operations teams and their levels of stress when situations reach alarming conditions are some of the people factors that impact abnormal situations.

Hence, dynamic training that can provide rigorous, intense and realistic scenarios will help high-performance operations teams. Deliberate and disciplined sharing of insights and experiences gained from unusual events can promote communication and improve operation teams' preparedness to handle such situations.

Process factors: These factors account for 22 percent of all incidents. Some of the impacts include process complexity, types of manufacturing like batch vs. continuous and state of operation whether steady state vs. startups, transition or shut downs.

Most of the vendors of process control systems today are including safety solutions in their systems. These safety solutions should warn the operations' team well in advance of the current health condition, of any process.

Equipment factors: These factors account for about 36 percent of incidents. Their impacts include failure and degradation of the equipment as in the case of pumps, compressors and furnaces and failures in the control equipment like sensors, valves and controllers. The operations team should carry out constant vigilance and maintenance of these equipments to eliminate failures.

The ASM consortium member companies are supposed to apply ASM across a number of process control systems (apart from those of Honeywell) .To support this the consortium-developed solutions and software standards that are vendor-independent. One such example is the Consortium's guideline documents. They provide information regarding various design principles in a generic, non-equipment specific fashion. These guidelines explain how operator

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ENVIRONMENTAL DAY 2011

The Theme - Forests: Nature At Your Service

Forests cover one third of the earth's land mass, performing vital functions and *services* around the world which make our planet alive with possibilities. In fact, 1.6 billion people depend on forests for their livelihoods. They play a key role in our battle against climate change, releasing oxygen into the atmosphere while storing carbon dioxide.

Forests feed our rivers and are essential to supplying the water for nearly 50% of our largest cities. They create and maintain soil fertility; they help to regulate the often devastating impact of storms, floods and fires.

Splendid and inspiring, forests are the most biologically diverse ecosystems on land, and are home to more than half of the terrestrial species of animals, plants and insects.

Forests also provide shelter, jobs, security and cultural relevance for forest-dependent populations. They are the green lungs of the earth, vital to the survival of people everywhere — all seven billion of us.

Forests embody so much of what is good and strong in our lives. Yet despite all of these priceless ecological, economic, social and health benefits, we are destroying the very forests we need to live and breathe.

Global deforestation continues at an alarming rate — every year, 13 million hectares of forest are destroyed. That's equal to the size of Portugal.

Short-term investments for immediate gains (e.g., logging) compound these losses. People who depend on forests for their livelihoods are struggling to survive. Many precious species face extinction. Biodiversity is being obliterated. What's more, economists around the world have proven that by not integrating the values of forests into their budgets, countries and businesses are paying a high price. One that ultimately impoverishes us all as harm to our forest life-support system continues each and every single day.

But this trend is not irreversible. It's not too late to transform life as we know it into a greener future where forests are at the heart of our sustainable development and green economies.

Conserving forests and expanding them need to be recognized as a business opportunity. When we add it up, an investment of US$30 billion fighting deforestation and degradation could provide a return of US$2.5 trillion in new products and services.

Furthermore, targeted investments in forestry could generate up to 10 million new jobs around the world. Already, many leaders are glimpsing the potential for renewable energy and nature-based assets, but for transformation to happen, forests need to become a universal political priority.

The services forests provide are essentially to every aspect of our quality of life. And the answer to sustainable forest management, moving towards a green economy, lies in our hands. ■

Abnormal....

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displays should work in a hierarchical fashion besides other important details like the type of colour to be followed on schematics.

Consortium members pay some annual and initiation fees, which are utilised as ongoing research fund. Carrying out research in this special field is a costly affair. By collaborating organisations can actually sit together and benchmark across various plant sites and determine the best practices and address the root causes.

"Pooling of knowledge" is one such method where many people can sit together and exchange their knowledge such that each of them learns a lot more than they would have otherwise done. It is only when organisations put their principles into practice that they can succeed and benefit.

The case of the oil refinery in Europe could have been prevented, had the company taken appropriate measures such as better overview displays and applications of ASM alarm management services.

Many such incidents keep occurring in industries. Preventing and concentrating on functional performance of the equipment rather than just preventing breakdowns is what is needed. The proof of an organisation's commitment to preventing and managing abnormal situations lies in the kind of practices and tools it implements. ■

LOW CARBON LIFESTYLE

Mother Earth is the only planet we have for human living .Global Warming can lead to irreversible changes in the delicate balance that exists in the planet's climate and life systems. It is a growing crisis with large scale implications on mortality, health, economics and security.

The importance of actions at all levels to tackle this problem can not be over emphasized. All of us will be affected, irrespective of economic status or nationality and it is upto each one of us to apply our creative knowledge to move towards the common goal and also save money. We have still not reached a point of no return and the most dangerous climate changes can still be avoided. It is action on the ground, which makes all the difference in achieving our goal!.

In this, each one of us has a role to play as a symbol of a responsible society.

Our vision is to create a prosperous, but not a wasteful society, and an economy that is self sustaining. Individual efforts may seem like drops in the ocean.

However, the impacts from the positive changes from these efforts in Lifestyles and consumption pattern by millions of people will make significant contribution towards a more climate friendly Mother Earth.

Let us do our bit now for our city, country and our environment.

As Mahatma Gandhi once said, "Whatever you do may seem insignificant to you, but it is most important you do it".

Let all of us try to reduce the emission of CO_2 by adopting the following Lifestyle in our routine life.

ELECTRICITY

- Replace all the ICL bulb with Compact Fluoroscent Lamp (CFL)
- Use Table lamps while studying and reduce energy consumption Go out for a couple of hours everyday instead of watching TV/computer and be healthy
- Switch from a desktop to a laptop so as to reduce energy consumption
- Turn off lights and fans when not in use
- Buy BEE 5 star rated electrical appliances such as Fan, Refrigerator, air conditioner which will reduce energy consumption and carbon footprint.
- Use the Geyser efficiently.
- Install solar water heater
- Eat together and heat one time only so as to reduce unnecessary use of microwave oven
- Ensure proper temperature controls in washing machines
- Switch off the TV, Set top box and DVD player at the plug, and not with a remote Trees & Paper
- Use Paper only when required otherwise switch over to e statements
- Do not use fresh paper for rough work
- Do not cut the trees instead plant as many trees as possible
- Use gas stoves in the kitchen instead of wood burning

TRANSPORTATION

- Practice to use public transport for journey
- Use carpool system for office going
- Switch off ignition at traffic red signals
- Regularly inflate vehicle tyres
- Use cycle for short distances

IN KITCHENS

- Use pressure cookers
- Use fuel efficient cooking methods
- At home compost your kitchen wastes

WATER

Conserve water

Measures to reduce wastage of water,

- Fix unleaky taps, showers and flushes
- Do not let the tap run when you wash hands or brush your teeth
- Use a bucket and small mug to water plants, instead of a hosepipe
- Use a bucket and a cloth to wash vehicles, instead of a hosepipe
- Water potted plants with water that has been used to wash vegetables and lentils
- Change old flush cisterns to water efficient dual flush cisterns
- Wash only full loads in the washing machine
- Harvest rainwater. ■

INDUSTRIAL RADIOGRAPHY – MANAGING RADIATION RISKS

Introduction: *In most of the industries* non-destructive testing (NDT) is carried out for radiographic inspection. This includes inspection of products, operating plant, civil engineered structures or pipeline installations. The information sheet will also be relevant to managers of these NDT companies, self-employed contractors and companies who carry out in-house radiography. The purpose of this article is to focus on the management of health and safety risks arising from industrial radiography work .

What is the problem? Industrial radiography usually involves using intense radiation sources which can expose people at work to significant amounts of radiation. Over the years several serious incidents have been caused by the failure to maintain equipment, to carry out routine monitoring or to employ proper emergency procedures. Is has been found that in most of the cases, the NDT adopting persons fail to adopt routine working practices capable of keeping radiation exposures of employees as low as reasonably practicable. Incidents occur because of poor job planning (most notably with site radiography), failure to use adequate local source shielding, or inadequate systems of work. Generally, people working in industrial radiography have received higher doses than those working in other sectors using ionising radiation.

Enclosure radiography v site radiography: If the work involves routine radiography of readily moveable articles it is nearly always reasonably practicable to carry it out in an adequately shielded enclosure or cabinet. Where practicable, using a suitable shielded enclosure must always be the first choice for radiography work. In some cases it may be practicable to build a temporary enclosure on site if sufficient time is available. Enclosures can make it far easier to restrict exposure and prevent accidental exposures . This has a number of advantages over undertaking the work out of hours under 'open shop' conditions. It will make work safer and will ensure more flexibility about the timing of the work.

When site radiography is considered the only practicable option, personal exposure restriction and risks should still be controlled, so far as practicable, by using local shielding and through appropriate administrative arrangements such as systems of work and radiation controlled area designation.

In fact, material is often required to be moved off site, for example for stress relief or pressure testing, and a suitable stop off for radiography can often be organised during the shipment of the finished article

Assessing the risks: The first step is to carry out a Risk Assessment. Employers should review this risk assessment periodically to ensure that it remains valid. When product or plant requires radiographing, whether in-house or by contractors, the employers should assess as part of the general risk assessment how this can be done safely. They also have to consider the possibility of a radiation accident occurring and take reasonable steps to prevent this or to mitigate its consequences by drawing up emergency procedures and appointing a responsible person for administering them

For site radiography work, the risk assessment should take into account any special features of the site. There might be problems of access or lighting; manual handling or lifting equipment difficulties; or the need to isolate vessels or pipelines carrying dangerous materials or atmosphere

Planning for the job: Where the project includes radiographic inspection of plant, they should develop safe procedures, with the co-operation of the NDT contractor, at the planning stage. These details should be incorporated into the pre-tender health and safety plan by the planning supervisor and subsequently by the principal contractor for the construction phase health and safety plan.

- They must provide information about risks on site and the precautions for dealing with these (including information on appointed people responsible for emergency procedures).

This information will help the contractor to ensure that the work is properly planned and carried out.

Enclosure radiography: Manufacturers who need radiographic inspections of their products will often find that it is cost effective to provide an enclosure for the work, whether they do the work themselves or engage contractors. A well designed and constructed enclosure or cabinet for routine radiography will generally have walls (and roof, if appropriate) sufficient to restrict the dose rate outside to below 7.5 microsieverts per hour.

Remember, however that even this low dose rate should never occur outside areas the employer carrying out the radiography has control over.

When assessing shielding requirements, the three dimensional space surrounding the source needs to be considered, as people working near, above or below the enclosure may also be at risk. Scattered radiation (sky-shine) outside large open-top enclosures can often be

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controlled by adequate collimation.

During typical radiographic set-ups, it is very important to monitor levels of radiation around the enclosure to ensure that levels of radiation are as low as reasonably practicable (and below 7.5 microsieverts per hour). Monitoring should include measurements away from the enclosure walls to detect the presence of sky shine.

For X-ray sets it should always be reasonably practicable to install effective devices, such as reliable electrical or mechanical interlocks, which prevent or terminate an exposure if the door of the enclosure is opened. It may not always be possible to achieve this level of protection for sealed sources. These devices should be installed so that they are fail-safe, but they can deteriorate and require periodic checks.

At major petrochemical plants ongoing radiography is likely to be needed during the entire working life of the plant, so it is sensible for the client to construct a permanent radiography enclosure. This will then be available for continuing use during all subsequent maintenance and refurbishment operations.

In the chemical and offshore sectors, during construction projects or in the course of major refurbishment of existing plant, a significant amount of radiography will often be needed for loose pipe work before it is installed. If pipe work is prefabricated at another location, it should normally be possible for this to be radiographed before its arrival on site. When the fabrication is being done on the construction site and no permanent enclosure is available, it may be possible to provide a temporary enclosure or additional local shielding.

Managing site radiography: Site radiography is only acceptable when it is not reasonably practicable to provide a shielded enclosure for radiographing articles. However, there are clearly situations in which site radiography is the only option, for example pipe work which is an integral part of process plant.

Contractors (including temporary workers and the self employed) need to be given sufficient information on the work to be done as far in advance as possible. If access is difficult (eg if a weld is inside a vessel or the pipe work is in a rack at height) radiographers will need a pre-determined safe location to control the exposure from. Localised shielding, barriers, warning notices and signals, site lighting and access routes may also need to be agreed or arranged well in advance of work starting. Careful planning is particularly critical for complex site radiography work. This could be in a structure which can be accessed by several people on site to areas irradiated by the radiation source at different levels; where more than one radiography team is working simultaneously; or where the person changing films is not clearly visible from the control position. An effective communication system between the radiographer and assistants will be necessary to prevent misunderstandings.

Exposures must be kept as low as reasonably practicable by using temporary enclosures or localised shielding). Even earth mounds or a careful array of large drums filled with water can provide effective shielding. The boundary of the area must be supervised, to ensure that only authorised people may enter. A number of special systems are available which use purpose-made localised shielding around exposed sources to significantly reduce the size of the controlled area. Boundaries to the radiographic area must be continuous. Suitable warning signs are required for each designated controlled area and may be appropriate for some supervised areas.

Use and maintenance of equipment for radiography: The use of torch-type containers in the past has caused serious overexposures and should be avoided. It should always be reasonably practicable to use sealed source exposure containers.

If critical components of radiography equipment such as the control cable, pigtail connector and guide tube of projection type containers fail, this is likely to leave the source exposed. So it is essential that NDT contractors have a suitable inspection schedule and maintenance of their radiography equipment and keep adequate records . Source changing should be left to specialist contractors unless the NDT company has the correct equipment and trained staff capable of carrying out this work safely.

Monitoring arrangements: Dose rate monitoring instruments enable radiographers to check that sealed sources have fully retracted into containers, or X-ray sets have stopped emitting radiation. Many radiographers have received inadvertent exposures to radiation because they failed, or were unable, to make checks with monitoring equipment that the source had returned to its shielded container, or that the X-ray set was de-energised.It is therefore essential that dose rate monitoring instruments are in working order; have been type tested; have a valid test certificate and are within their calibration date.

In addition, personal electronic alarming dosemeters give immediate warning of high dose rates, so wearing these may be particularly useful to radiographers. However, this should not replace the use of portable dose rate monitors. ■

Courtesy: **H&S Executive**

CASE STUDY

CASE STUDY 1:

ROOF FAILURE OF FUEL OIL STORAGE TANK

Description: One of the fuel oil storage tank roof got collapsed while it was idle for nearly 50 hours. There was a huge sound like breaking of a big tree. The tank was almost empty-while collapsing. The roof got collapsed and was resting inside the tank. There were totally 16 fuel oil tanks, all tanks had been connected to export pump suction through a common header of 36 inch diameter pipe line.

In addition to the roof collapse, all the foam riser pipes, foam lines, spiral stair case and roof trusses had also been damaged.

Possible causes for the accident:

- Roof to shell welding joint would have been corroded
- A vacuum would have been created due to excessive withdrawal of fuel
- Weakened roof with accumulated rain water would have caused this accident due to added weight.

Remedial action:

- The welding joints should be subjected to periodical inspection
- Withdrawal rate should never be exceeded from the design value by having integrated connection arrangement
- The fuel tank vents should be checked periodically for choking.
- If possible additional vents can be provided with the approval of the manufacturer.

CASE STUDY 2:

TROLLEY COLLAPSE

Description: Two workers were pushing a trolley loaded with two tonnes of steel. When they were pushing it inside a large industrial oven, one of the panels under it collapsed resulting the death of one of the workers and the other worker broke both legs, his right foot and ankle.

Possible causes for the accident:

- The trolley which weighed nearly 2.8 tonnes was not wide enough to fit on both the load bearing rails inside the industrial oven and the trolleys right hand wheels had rolled along the pedestrian walkway between the rails.
- The panel that collapsed was repaired recently and the quality of welding was poor

Remedial action:

- The fitting of the trolley wheels on the rail should be checked before pushing.
- The trolley should never be over loaded
- Repairing work should be carried out only by competent agencies
- Quality checks should be conducted after repair work.

CASE STUDY 3:

FALL FROM HEIGHT

Description: A worker was positioning a 12 inch pipe for welding in the top tier of the main pipe on the Sulphur plant. While doing so he has fallen through a distance of nearly 10 meter as he stepped into a temporary opening which had already been made in order to allow the installation of a separate 3 inch pipe. The worker was wearing a safety harness at the time of the accident but it was not tied on with the handrail.

Possible causes for the accident:

- The upper hand rail would have been removed from the working platform.
- The temporary cutting on the scaffold boards had no edge protection.
- The worker was not kept informed of the modification of the opening made before the start of this work as the job was done by other worker.

Remedial Action:

- Before the commencement of any work, risk assessment can be carried out so as to overcome all possible risks.
- Before allowing any worker to work at height, wearing of an approved safety harness and "tie Off" with a rigid platform should be ensured by a competent person.
- Temporary scaffolds should also be rigidly fastened so as to avoid inadvertent removal.
- All the openings should have rigid fence protection.
- All workers involved in the work can be made accountable for the creation of any unsafe condition.
- All the workers can be educated to inform the unsafe conditions they notice during the course of work to the person concerned, who is empowered to act on it. ■

IN THE NEWS

Notification by Government of Tamil Nadu

1. The Factories engaged in the manufacture of the following works have been exempted from the provisions of section 58(1) (overlapping of shifts) of the Factories Act 1948 Vide G O No: MS 251 of Labour and Employment dated 6.12.2010.

- Automobile parts and accessories
- Parts and accessories belonging to the Ministry of Railways, Government of India
- Parts and accessories belonging to Ministry of Defence
- Glass or ceramics & related components
- Handling & making of petroleum products
- Cement products
- Tyre and its products or Repair of tyre & its products

2. Synthetic Gem Cutting Works has been added in the list of industries under section 85(1) of the Factories Act1948 Vide G O No: 270 of Labour and Employment dated 23.12.2010.

3. Fire Work Factories have been notified as Hazardous Process in the list of industries scheduled under section 2 (cb) of the Factories Act 1948 Vide G O No: 271 of Labour and Employment dated 23.12.2010.

Notifications by Government of India

PLASTIC WASTE (MANAGEMENT AND HANDLING) RULES 2011

On 7th February, 2011 the Ministry Of Environment and Environment, Government of India has notified the Plastic Waste (Management and handling) Rules 2011 by replacing the earlier Recycled Plastics Manufacture and Usage Rules 1999.

Some of the salient features of the new Rules are:-

- Use of plastic materials in sachets for storing, packing or selling gutkha, tobacco and pan masala has been banned.
- Under the new Rules, foodstuffs will not be allowed to be packed in recycled plastics or compostable plastics.
- Recycled carry bags shall conform to specific BIS standards.

Plastic carry bags shall either be white or only with those pigments and colourants which are in conformity with the bar prescribed by the Bureau of Indian Standards (BIS). This shall apply expressly for pigments and colourants to be used in plastic products which come in contact with foodstuffs, pharmaceuticals and drinking water.

Plastic carry bags shall not be less than 40 microns in thickness. Under the earlier rules, the minimum thickness was 20 microns. Several State Governments in the meanwhile, had stipulated varying minimum thickness. It is now expected that 40 microns norms will become the uniform standard to be followed across the country.

The minimum size (of 8x12 inches) for the plastic carry bags prescribed under the earlier Rules has been dispensed with.

Carry bags can be made from compostable plastics provided they conform to BIS standards.

One of the major provisions under the new Rules is the explicit recognition of the role of waste pickers. The new Rules require the municipal authority to constructively engage agencies or groups working in waste management including these waste pickers. This is the very first time that such a special dispensation has been made.

IN THE NEWS

Order declaring Section 66(1) (b) of Factories Act unconstitutional upheld

The Madras High Court has upheld a single Judge's order declaring unconstitutional Section 66 (1) (b) of the Factories Act.

A Division Bench, comprising Justices C. Nagappan and M.M. Sundresh, delivered the judgement while dismissing an appeal by the Tamil Nadu Labour Department and the Chief Inspector of Factories challenging the single Judge's order of 2002.

Earlier, the petition was filed by V. Rajeswari, a worker of Viswabharathi Textiles Ltd., Unit-II, Vadamadurai, challenging the constitutional validity of the legal provision, alleging that it was discriminatory to the interests of women folk in the liberalised scenario of globalisation.

Following an earlier decision of the Madras High Court in 2001, the single Judge allowed the writ petition.

In its appeal the State government submitted that the single Judge had failed to see that the impugned statutory provisions which prohibited the employment of women in any work in any factory between 7 p.m. and 6 a.m. was incorporated in the larger interests of women workers as a protective provision considering their safety, security, and lack of transport facilities during night hours.

In its judgement the Bench said counsel for the textile company, R.S. Pandiyaraj, submitted that the Centre had not preferred any appeal against the single Judge's order. Only the State government had preferred the appeal challenging the impugned order. The Centre had also not preferred any appeal against the court's decision in 2001 and it was allowed to become final.

The Bench said it was recording the submission and was dismissing the writ appeal as not maintanable.

SAFETY TIPS: DO NOT MIX OXYGEN AND OIL

General Precautions: Oxygen under pressure and hydrocarbons (oil and grease) can react violently, resulting in explosions, fire, and injury to personnel and damage to property. Never allow oil or grease to come into contact with oxygen under pressure. Even a small amount of hydrocarbon can be hazardous in the presence of high oxygen concentrations. In fact, any organic matter in contact with oxygen under pressure could have a violent reaction.

Installation Precautions:

- Maintain the pressure element assembly and connection free from dirt and any grease or grime
- Follow the manufacturer's instruction manual for the correct pressure ranges to be used and for proper care and storage.
- Use the proper size wrench to secure the gauge to the regulator
- Use only the thread sealant recommended by the manufacturer.
- Leak test the gas outlet connection using soap solution prior to use.
- Do not touch Oxygen regulators or cylinder heads with hands or gloves that are contaminated with oil grease, grime or any organic material. An explosion could result.
- Do not Install a low pressure gauge into the high-pressure port on a regulator. Always double check.
- Do not use gauges designed for a specific gas for a different gas.

Eg: Never use an oxygen gauge for acetylene. From one gas application to another.

- Do not Exchange gauges from one regulator to another.
- Do not remove the restrictor installed in the gauge connection. The restrictor limits gas flow and aids in limiting temperature rise due to adiabatic compression.
- Do not use or handle gas regulators unless you are authorized and qualified to do so.

Operating Precautions: Gauges can fail during operation and the energy contained in the compressed gases can produce violent effects should the pressure element assembly rupture.

- Always apply cylinder pressure slowly. The gas may heat up due to compression and ignite. This is called adiabatic compression
- Stand with the cylinder between you and the regulator when turning on the gas cylinder. This will reduce the possibility of injury from flying parts should pressure element assembly rupture.
- Use good judgment and common sense. Know the hazards of the materials you work with.

DO NOT use clamps or substitute materials that are not approved by the regulator manufacturer.

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