SEA (INDIA)

INDIAN SAFETY ENGINEER

QUARTERLY JOURNAL OF SAFETY ENGINEERS ASSOCIATION

Block III, Flat No. 28, Maanasarovar Apartments, 11-A, Arcot Road, Chennai – 600 116.
Tel : 044-24764101 E-mail: info@seaindia.org Website: **www.seaindia.org**

VOL: 10 No. 3 **JULY – SEPTEMBER 2011**

Factory Visit to TOSHIBA JSW Turbine & Generator Pvt. Ltd.,

Manali New Town

On 13th August 2011, Safety Engineers Association has arranged factory visit to Toshiba JSW Turbine & Generator Pvt. Ltd which is located at Manali new town, Chennai. 22 members participated in the factory visit. Toshiba has made elaborate arrangements for the visit and the visit was very useful for the members to understand the nature of work and the best safety practices followed by Toshiba JSW Turbine & Generator Pvt. Ltd.

Members were explained about the systematic and innovative way in which the construction and machine erection along with safety are planned and executed. The activities at the site involve civil, electrical and mechanical works and all the safety requirements associated with each of the activity were explained. Members were impressed to see how safely the construction as well manufacturing functions were taken care, including the legal compliance for the both.

The SEA members were wondering about the methodology followed by the Toshiba for each and every activity from the design stage itself. We appreciate Toshiba's effort to achieve zero accident till date.

On behalf of SEA India, Mr. Balakumaran & Mr. Thiruvengadam, thanked the management of Toshiba JSW for all the arrangements made satisfactorily.

Inside....

Printed at Sunitha Printers, Chennai – 600 014

NEBOSH Course Update

Twenty candidates were admitted to the Nineth batch of NEBOSH course as the maximum no of candidates per batch is limited to twenty only as per NEBOSH regulations.

The contact classes were conducted from 25th August to 4th September 2011 followed by examinations on 7th September and 8th September 2011.

The candidates expressed satisfaction about the conduct of the course and we expect good result.

NEBOSH, U K has revised the syllabus and course content of International General Certificate course , and the revised syllabus will be followed by SEA India effective from 2012 onwards, the preparation of course material in view of new syllabus is on.

The next International General Certificate Course of NEBOSH will be conducted by SEA India during the last week of February 2012 for which admission has been started.

SEA India encourages its members and other safety professionals to pursue this course to enhance their professional knowledge and career prospects. All those aspiring to join this course are requested to contact the Secretary, SEA India by mail, info@seaindia.org for getting admission.

FROM THE DESK OF PRESIDENT

Dear Members,

This time I have to start with the sad news on the demise of our beloved Patron Dr. S. Maruthappa on 15-09-2011. With deep regret and profound sorrow let us mourn his death and pray for his soul to rest in peace and give enough strength for his bereaved family members to bear the loss.

In the last quarter, our 55th Executive Committee meeting was held on 16-07-2011 and the 28th Technical Meet was held on 18-09-2011. Our journal "Indian safety Engineer" for the second quarter 2011 was released in time and hopefully the next one will also reach you soon, and in time.

Mumbai Chapter of SEA had their second Executive Committee meeting held on 02-07-2011. They have combined their EC meeting with their Technical Meet, in which two topics were presented. Their membership drive seems to be giving good results.

SEA (India) website, www.seaindia.org is recently updated. Your comments and suggestions for improvements are welcome. Recommend to your professional colleagues to view the site and advise them to use it for enrolling as member or for applying for Nebosh course. Service providers may choose to use the link for propagating their new products or services to the members and others.

I see improvements in networking among the members using our SEA India Group mail under Yahoo Groups of Emails. But it can still improve.

Ninth batch of NEBOSH IGC course was conducted during 25th August to 8th September 2011 and one more set of our members have appeared for the examination.

As you know we have started to offer lectures to the students of the engineering colleges in order to give them an insight into safety engineering before they come out of the college as young engineers.

Remember to propagate safety, On the job, and Off the job as well.

Best Wishes!

S. Ulaganathan

President, SEA India

HOMAGE

Dr S Maruthappa

(1932–2011)

Safety Engineers Association has lost one of its very senior members in the demise of Dr. S. Maruthappa. Being one of the early members of the association, his contributions to the professional forum were significant. He is a well known and highly recognised expert in the field of fire safety across India.

He was also one of the accredited tutors for taking classes in the NEBOSH International General Certificate courses conducted by Safety Engineers Association. His unstinted efforts and active participation, even at his elder years were truly setting example to the young safety professionals.

When his services were recognized by Government of India by awarding him the "Life Time Achievement Award" in the year 2007, the association took pleasure in congratulating him with a trophy and a certificate. The association also recognised his services in the safety field by awarding him the prestigious "Patron" position, in the year 2010 which he was holding till his unfortunate demise.

His passing away is a great and non compensable loss to the Fire & Safety fraternity at large. We at Safety Engineers Association mourn his death and extend our sincere prayers for his departed soul to rest in peace.

28th PROFESSIONAL DEVELOPMENT PROGRAMME

Twenty Eighth Professional Development Programme was held on Sunday, 18th September 2011 at Chennai.

Mr S Suresh , Mr A Sivakumar and Mr Maria Selvam of Environmental & Geo Spatial Solutions, Chennai delivered the talk on "B O W T I E - As a tool for Efficient Risk Management".

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

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

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

1. Bowtie Risk Management Methodology: The Bowtie methodology does more than just visually presenting all of the risks. It also provides a visual representation of your Safety Critical Elements (SEC). In Bowtie, the SCE is known as a Barrier or Control that prevents, controls or mitigates major accident scenarios. Besides identifying SCE's, Bowties also look into the factors that might reduce or defeat their effectiveness (called Escalation Factors in Bowtie theory). This increases the awareness and insight into what factors might indirectly influence the safety performance, and also gathers the practical knowledge in the organisation and makes it explicit. This is also one of the reasons why Bowties are used for organisational learning. But even more important, it allows organisations to think one step ahead and foresee complex interactions without the need for an incident to occur.

Besides being ideal for visualising the SCE's and their Escalation Factors, Bowties are also good at building a system for managing SCE's. Managing Safety Critical Elements in BowTieXP is done by defining activities and responsibilities that assure the integrity of the SCE. This builds a Safety Management System that is firmly rooted in a Bowtie risk analysis in which each activity can be traced back to the reasons for doing it. This also increases acceptance of an SMS because everyone can see the risk context in the Bowtie.

A Bowtie is a diagram that visualizes the risk you are dealing with in just one easy to understand picture. The diagram is shaped like a Bowtie creating a clear differentiation between proactive

(Contd. on next page)

(Contd. from previous page)

and reactive risk management. The power of a Bowtie diagram is that it shows you a summary of several plausible risk scenarios in a single picture. In short its provides a simple, visual explanation of a risk that would be much more difficult to explain. Mastering Bowtie methodology enables HSE and Risk professionals to undertake qualitative risk assessments using the leading BowTie Analysis software and best practices.

There are 8 main steps in creating a Bowtie diagram

1. Identify Hazards
2. Identify Top Events
3. Identify Threats
4. Evaluate Consequences
5. Identify Proactive/preventive Controls
6. Identify Reactive Controls
7. Identify Escalation Factors
8. Identify Escalation Factor Controls

2. Introduction to Risk and Risk assessment Tools

There has been a paradigm shift in the government's focus from its rescue, relief, and restoration-centric approach to a planning, prevention/mitigation and preparedness approach. It has been realised that effective Industrial Disaster Management (CDM) is possible by the adoption of preventive and mitigation strategies as most industrial disasters are preventable in comparison to natural disasters that are difficult to predict and prevent provided a proper Risk Management concept is adopted.

Risk may be defined more broadly as the probability of occurrence of an adverse outcome and the severity of the consequences if the outcome does occur. The elements of risk are hazards, vulnerabilities, threats and consequences. Managing risk is an integral part of good management and is something many managers do already in one form or another. Risk management begins with the assessment of risk. It provides a structured way of identifying and analysing potential risks, and devising and implementing responses appropriate to their impact. These responses generally draw on strategies of risk prevention, risk transfer, impact mitigation or risk acceptance. Risk analysis is the process of identifying risks, estimating their likelihoods and evaluating potential consequences.

The common methods that are in use to address the risk are Check List, flow chart, Risk Inspection, HAZOP, HAZAN, Decision Tree method, Hazard Indices etc. One of the most powerful and increasingly popular risk assessment techniques is the 'Bow-tie' method. This method goes beyond the usual risk assessment snapshot and puts emphasis on the linkage. It thus can help to ensure that risks are truly managed, rather than just analysed. It forces practitioners into undertaking a comprehensive and structured approach to risk assessment, and it is also an excellent means of communicating risk issues to non-specialists.

3. Safety Culture & Resilience Building

Safety Culture is the latest preoccupation of management and safety professionals of industrial organizations across developed economies. They are increasingly challenged by the concepts and workings of Safety Culture which is being hailed as the panacea especially for achieving further improvements in organizations that are already in the league of world-class safety performers.

For these organizations, Safety Culture follows the lineage of Technological Standards and Safety Management Systems which they had relied upon in the 1980's to achieve improved safety performance. Whilst that may be so, Safety Culture is a much more fuzzy and intangible subject than its predecessors. This prompted a major oil company to describe Safety Culture thus:

"It's never easy to define, and impossible to touch: yet safety culture and leadership form the bedrock for safe and reliable operations in any organization".

Viewed against this backdrop, it is a matter of time when managements and safety professionals in Indian industries would likewise be contending with

Summary of a Bowtie Diagram

(Contd. on next page)

(Contd. from previous page)

the complexities of Safety Culture.

Let's now take a closer look at Safety Culture.

4. Case for Positive Safety Culture

Major disasters like Bhopal, Flixborough, ChernobyI, Piper Alpha, Clapham Junction, and more recently Texas City Refinery and Deepwater Horizon, have highlighted lapses in the management of risks inherent in industrial operations. These disasters have revealed that complex systems broke down disastrously despite the adoption of the full range of engineering and technical safeguards because people failed to do what they were supposed to do. These were not simple, individual errors, but malpractices that corrupted large parts of the social system that makes organizations function.

The last two incidents, which unfortunately occurred under charge of a single corporate management, have shown that technological standards and management systems are not enough to avert incidents. Safety needs to become an inherent part of the every member of the organization, from the chief executive officer to the operator or technician at the shop-floor, if it were to ensure that nothing falls through the 'safety net'. Safety has therefore to become a primary consideration in every activity at every level of the organization. Thus, Safety Culture can be construed as the extent to which Safety features in the organizational culture of the establishment.

Definition of Safety Culture

Safety Culture is variously defined by different organizations. Its definition ranges from

The traditional:

"....the way we do things round here."

To the more formal definition:

"The product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine commitment to and the style and proficiency of an organization's health and safety management" (of the Advisory Committee for Safety in Nuclear Installations).

Where are we now in Safety Culture?

Since Safety Culture is part and parcel of the organizational culture, an organization aspiring to leverage Safety Culture for improved safety performance needs first to understand where it stands in term of making Safety an integral feature of the organizational culture.

To answer this question effectively, we need to have an organizational consensus on the following two points:

1. An Understanding of What is Safety Culture - a definition shared by all across the Corporation
2. The Strategy and Methodology to measure the Maturity of Safety Culture in the Corporation

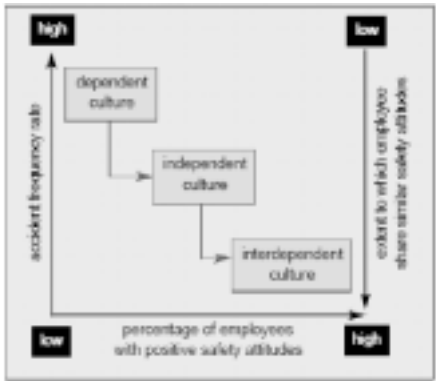
While there are many tools with varying levels of complexity to measure the maturity of Safety Culture, cursory self-diagnosis:

Organizations committed to building a Safety Culture aspire to promote an organizational culture that:

- Is committed to conducting its operations free of any incident or injury,
- Creates a mindset that is intolerant of any injury
- Emphasizes the Human side of Safety Performance
- Promotes personal responsibility and ownership for safe work performance
- Instills genuine safety behavior in people for both self and others
- Makes people care for one another at all times
- Believes in proactively managing safety
- Assures all workers go home safely to their family each day
- Seeks success instead of avoiding failure

Stages of Safety Culture Improvement

Generally organizations take the following path of maturity in Safety Culture:



(Contd. on next page)

(Contd. from previous page)

Dependent Culture

- Emphasis on management and supervisory control
- Extensive use of discipline to enforce safety measures
- Heavy reliance on written safety rules and procedures
- Safety performance is dependent on the level of management commitment to enforcing rules and procedures

Independent Culture

- Focus is on personal commitment to and responsibility for safety
- Relies on all employees developing their own personal safety standards and adhering to these standards
- While there will still be company safety rules and procedures, employees look after their own safety and make active choices to keep themselves safe

Interdependent Culture

- Team commitment is the dominant factor
- Employees' Sense of responsibility for safety beyond their own work
- Caring for the safety of others
- Share a common belief in the importance of safety

Improving Safety Culture

There is no one best way to improve Safety Culture. However, the following two vital focus areas have been identified to offer high returns

Employee Involvement and empowerment through the Self Managing Teams Approach

- They have an established track record
- Widely adopted in the manufacturing industry
- Being adopted in safety critical industries
- Day-to-day control devolved to frontline employees
- Supervisors become coaches
- A UK study attests to the positive results from this approach on Safety Culture

Supervisory safety management skills

- The Supervisor has long been recognized as the key individual in the management of safety
- Their proximity to worksite gives them the ability to know if safety measure are working in practice
- Recent research in the offshore oil industry identified a number of supervisor attributes impacting subordinates' safety behaviour, including less risk taking.
- Workers with positive safety behaviours indicated that their supervisors had following attributes:
- Valuing their subordinates
  - Visiting the worksites frequently
  - Facilitation of work group participation in decision making
  - Effective safety communication. ■

GREEN HOUSE GAS

As you are aware, rising Green House Gas (GHG) levels in atmosphere and emergence of climate change is one of the greatest challenges facing countries, Government and other stakeholders and various initiatives are being developed to limit GHG concentrations in earth's atmosphere. One such standard which is under consideration is ISO 14067, which details the requirement for quantification and communication of carbon footprints. This standard is under consideration in ISO.

JOB STRESS AND CARDIOVASCULAR DISEASE

A number of well-known factors are related to increased risk for cardiovascular disease (CVD). These risk factors include smoking, obesity, low density lipoprotein (the "bad" cholesterol), lack of exercise, and blood pressure, among others. Using two large U.S. data sets, Murphy found that hazardous work situations, jobs that required vigilance and responsibility for others, and work that required attention to devices were related to increased risk for cardiovascular disability These included jobs in transportation (e.g., air traffic controllers, airline pilots, bus drivers, locomotive engineers, truck drivers), preschool teachers, and craftsmen. Among 30 studies , most have found an association between workplace stressors and CVD.

Job strain and CVD. Job strain refers to the combination of low work-related decision latitude and high workload Fredikson, Sundin, and Frankenhaeuser (1985) found that job strain was related to increased activity in the sympathoadrenomedullary and adrenocortical axes] Belki? et al. (2000) found that many of the 30 studies mentioned above indicated that decision latitude and psychological workload exerted independent effects on CVD; two studies found synergistic effects, consistent with the strictest version of the strain model. A review of 17 longitudinal studies having reasonably high internal validity found that 8 showed a significant relation between job strain and CVD and 3 more showed a nonsignificant relation The findings, however, were clearer for men than for women, on whom data were more sparse.

Effort-reward imbalance and CVD. An alternative model of job stress is the effort-reward imbalance model. That model holds that high work-related effort coupled with low control over job-related intrinsic (e.g., recognition) and extrinsic (e.g., pay) rewards triggers high levels of activation in neurohormonal pathways that, cumulatively, are thought to exert adverse effects on cardiovascular health. At least five studies of men have linked effort-reward imbalance with CVD.

Job loss. OHP-related research has also shown that job loss adversely affects cardiovascular health as well as health in general.

Adverse working conditions and economic insecurity linked to psychological distress and reduced job satisfaction

What is meant by psychological distress. A number of well-designed longitudinal studies have adduced evidence for the view that adverse working conditions contribute to the development of psychological distress. Before turning to those studies, the reader should note that psychological distress refers to feelings of demoralization that are aversive to people, and often drive them to seek professional help, without the individuals necessarily meeting criteria for a psychiatric disorder. Psychological distress is often expressed in affective (depressive) symptoms, psychophysical or psychosomatic symptoms (e.g., headaches, stomachaches, etc.), and anxiety symptoms. The relation of adverse working conditions to psychological distress is thus an important avenue of research. Job satisfaction is included in this section because it is a key variable in a great deal of research on organizations and is related to a host of health outcomes

Working conditions and psychological distress. Parkes (1982) conducted one of the methodologically soundest studies of the relation of working conditions to psychological distress in British student nurses. She found that in this "natural experiment," student nurses experienced higher levels of distress and lower levels of job satisfaction in medical wards than in surgical wards; compared to surgical wards, medical wards make greater affective demands on the nurses. In another methodologically sound study, Frese (1985) showed that objective working conditions give rise to subjective stress and psychosomatic symptoms in blue collar German workers. In addition to the above studies, a number of other well-controlled longitudinal studies have implicated work stressors in the development of psychological distress and reduced job satisfaction.

Work and mental disorder

Schizophrenia. In a case-control study, Link, Dohrenwend, and

(Contd. on next page)

(Contd. from previous page)

Skodol found that, compared to depressed and well control subjects, schizophrenic patients were more likely to have had jobs, prior to their first episode of the disorder, that exposed them to "noisesome" work characteristics (e.g., noise, humidity, heat, cold, etc.). The jobs tended to be of higher status than other blue collar jobs, suggesting that downward drift in already-affected individuals does not account for the finding. One explanation involving a diathesis-stress model suggests that the job-related stressors helped precipitate the first episode in already-vulnerable individuals. There is some support for the finding from data collected in the Epidemiologic Catchment Area (ECA) study.

Depression. Using data from the ECA study, Eaton, Anthony, Mandel, and Garrison (1990) found that members of three occupational groups, lawyers, secretaries, and special education teachers (but not other types of teachers), showed elevated rates of DSM-III major depression, adjusting for social demographic factors. The ECA study involved representative samples of American adults from five U.S. geographical areas, providing relatively unbiased estimates of the risk of mental disorder by occupation; however, because the data were cross-sectional, no conclusions bearing on cause-and-effect relations are warranted. Evidence from a Canadian prospective study indicated that individuals in the highest quartile of occupational stress are at increased risk for an episode of major depression. A meta-analysis that pooled the results of 11 well-designed longitudinal studies indicated that a number of facets of the psychosocial work environment (e.g., low decision latitude, high psychological workload, lack of social support at work, effort-reward imbalance, and job insecurity) increase the risk of common mental disorders such as depression.

Alcohol use. Another study based on cross-sectional ECA data found high rates of alcohol abuse and dependence in the construction and transportation industries as well as among waiters and waitresses, controlling for sociodemographic factors. Within the transportation sector, heavy truck drivers and material movers were at especially high risk. A prospective study of ECA subjects who were followed one year after the initial interviews provided data on newly incident cases of alcohol abuse and dependence This study found that workers in jobs that combined low control with high physical demands were at increased risk of developing alcohol problems although the findings were confined to men.

Workplace interventions

Industrial organizations

OHP interventions often concern both the health of the individual and the health of the organization. Adkins (1999) described the development of one such intervention, an organizational health center (OHC) at a California industrial complex. The OHC helped to improve both organizational and individual health as well as help workers manage job stress. Innovations included labor-management partnerships, suicide risk reduction (there had previously been elevated suicide risk at the complex), conflict mediation, and occupational mental health support. OHC practitioners also coordinated their services with previously underutilized local community services in the same city, thus reducing redundancy in service delivery.

Hugentobler, Israel, and Schurman (1992) detailed a different, multi-layered intervention in a mid-sized Michigan manufacturing plant. The hub of the intervention was the Stress and Wellness Committee (SWC) which solicited ideas from workers on ways to improve both their well-being and productivity. Innovations the SWC developed included improvements that ensured two-way communication between workers and management and reduction in stress resulting from diminished conflict over issues of quantity versus quality. Both the interventions described by Adkins and Hugentobler et al. had a positive impact on productivity.

NIOSH-related interventions. Currently there are efforts under way at NIOSH to help reduce the incidence of preventable disorders (e.g., sleep apnea) among heavy-truck and tractor-trailer drivers and, concomitantly, the life-threatening accidents to which the disorders lead improve the health and safety of workers who are assigned to shift work or who work long hours, and reduce the incidence of falls among iron workers.

Courtesy: **Wikipidia**

ARC FLASH

An arc flash is an electrical breakdown of the resistance of air resulting in an electric arc which can occur where there is sufficient voltage in an electrical system and a path to ground or lower voltage. An arc flash with 1000 amperes or more can cause substantial damage, fire or injury. Temperatures can reach or exceed 35,000 degrees fahrenheit at the arc terminals. The massive energy released in the fault rapidly vaporizes the metal conductors involved, blasting molten metal and expanding plasma outward with extreme force. A typical arc flash incident can be inconsequential but could conceivably easily produce a more severe explosion. The result of the violent event can cause destruction of equipment involved, fire, and injury not only to the worker but also to nearby people.

In addition to the explosive blast of such a fault, destruction also arises from the intense radiant heat produced by the arc. The metal plasma arc produces tremendous amounts of light energy from far infrared to ultraviolet. Surfaces of nearby people and objects absorb this energy and are instantly heated to vaporizing temperatures. The effects of this can be seen on adjacent walls and equipment - they are often ablated and eroded from the radiant effects.

In general, arc flash incidents which ignite clothing are highly improbable on systems operating at less than 208 volts phase to phase (120V to ground) when fed by less than a 125 kVA transformer, as 120 volts does not provide sufficient energy to cause an arc flash hazard. Most 480V electrical services have sufficient capacity to cause an arc flash hazard. Medium-voltage equipment (above 600V) is higher energy and therefore a higher potential for an arc flash hazard.

As an example of the energy released in an arc flash incident, consider a single phase-to-phase fault on a 480V system with 20,000 amps of fault current. The resulting power is 9.6 MW. If the fault lasts for 10 cycles at 60 Hz, the resulting energy would be 1.6 megajoules. For comparison, TNT releases 2175 J/g or more when detonated (a conventional value of 4,184 J/g is used for TNT equivalent). Thus, this fault energy is equivalent to 380 grams (approximately 0.8 pounds) of TNT. The character of an arc flash blast is quite different from a chemical explosion (more heat and light, less mechanical shock), but the resulting devastation is comparable. The rapidly expanding superheated vapor produced by the arc can cause serious injury or damage, and the intense UV, visible, andIR light produced by the arc can temporarily and sometimes even permanently blind or cause eye damage to people.

There are four different arc flash type events to be assessed when designing safety programs:

- Open Air Arc Flashes
- Ejected Arc Flashes
- Equipment Focused Arc Flashes (Arc-in-a-box)
- Tracking Arc Flashes

Protecting personnel

There are many methods of protecting personnel from arc flash hazards. This can include personnel wearing arc flash personal protective equipment (PPE) or modifying the design and configuration of electrical equipment. The best way to remove the hazards of an arc flash is to de-energize electrical equipment when interacting with it, however de-energizing electrical equipment is in and of itself an arc flash hazard. In this case then one of the newest solutions is to allow the operator to stand far back from the electrical equipment by operating equipment remotely.

Arc flash protection equipment

With recent increased awareness of the dangers of arc flash, there have been many companies that offer arc flash personal protective equipment (PPE). The materials are tested for their arc rating. The arc rating is the maximum incident energy resistance demonstrated by a material prior to breakopen or at the onset of a second-degree skin burn. Arc rating is normally expressed in cal/cm2 or small calories of heat energy per square centimeter.

Selection of appropriate PPE, given a certain task to be performed, is normally handled in one of two possible ways. The first method is to consult a hazard category classification table, like that found in NFPA 70E. Table 130.7(C)(9)(a) lists a number of typical electrical tasks are various voltage levels and recommends the category of PPE that should be worn. For example when working on 600 V switchgear and performing a removal of bolted covers to expose bare, energized parts, the table recommends Category 3 Protective Clothing System. This Category 3 system corresponds to an ensemble of PPE that together offers protection up to 25 cal/cm^2 (105 J/cm^2 or 1.05 MJ/m2). The minimum rating of PPE necessary for any category is the maximum available energy for that category. For example, a Category 3 arc-flash hazard requires PPE rated for no less than 25 cal/cm^2 (1.05 MJ/m^2).

The second method of selecting PPE is to perform an arc flash hazard calculation to determine the

(Contd. on next page)

CASE STUDIES

CASE STUDY 1

Fatal during Hydrostatic testing

Description

Hydrostatic test was to be carried on 30" Pipe and the preparation of pressurization started in the morning. During the pressurization, 3 crew were on the top of the pipe rack which was at a height of 13m from the ground, checking the conditions, and one foreman was on the ground directing them. Before reaching the highest pressure, 30" pipe burst at the 45degree joint located 9m from the ground. The force of the blast threw one pipe fitter 14m from the top of the pipe rack . He hit the scaffolding on the other side, fell down from 7 m height and died as a result of skull fracture.

Possible Causes for the accident

The test pressure might have been wrongly selected

The leakage before bursting would have not been noticed

Air would have trapped inside the pipe during the test preparation

Remedial action:

Risk assessment is the basic need for carrying out work at such a height involving high risk.

Consideration should be given to the impact of pipe failure when such a large- sized piping system is tested

Maximum allowable test pressure should be ascertained before undertaking the high pressure testing.

During pressurization, leakage if any should be monitored with special care on joints.

Trapping of air inside the pipe should be prevented by adequate draining

Rigid work platform should be constructed when work is to be carried on at such height

Good communication should be ensured among co workers.

CASE STUDY 2

Combustion of iron powder

Description

"Atomized" iron powder was being manufactured and sold to the automotive and other industries for the production of metal parts using powder metallurgy.

(Contd. on next page)

Arc Flash....

(Contd. from previous page)

available incident arc energy. IEEE 1584 provides a guide to perform these calculations given that the bolted fault current, duration of faults, and other general equipment information is known. Once the incident energy is calculated the appropriate ensemble of PPE that offers protection greater than the energy available can be selected.

PPE provides protection after an arc flash incident has occurred and should be viewed as the last line of protection. Reducing the frequency and severity of incidents should be the first option and this can be achieved through a complete arc flash hazard assessment and through the application of technology such as high resistance grounding which has been proven to reduce the frequency and severity of incidents.

Reducing hazard by design

Three key factors determine the intensity of an arc flash on personnel. These factors are the quantity of fault current available in a system, the time fault until an arc flash is cleared, and the distance an individual is from an arc. Various design and equipment configuration choices can be made to affect these factors and in turn reduce the arc flash hazard.

Fault current

Fault current can be limited by using current limiting devices such as grounding resistors or fuses. If the fault current is limited to 5 amperes or less, then many ground faults self-extinguish and do not propagate into phase-to-phase faults.

Arcing time

Arcing time can be reduced by temporarily setting upstream protective devices to lower setpoints during maintenance periods or by employing zone-selective interlocking protection (ZSIP).

Arcing time can significantly be reduced by protection based on detection of arc-flash light. Optical detection is often combined with overcurrent information. Light and current based protection can be set up with dedicated arc-flash protective relays or by using normal protective relays equipped with arc-flash option.

The most efficient means to reduce arcing time is to use an arc eliminator that will extinguish the arc within a few milliseconds.

Distance

The distance from an arc flash source within which an unprotected person has a 50% chance of receiving a second degree burn is referred to as the "flash protection boundary". Those conducting flash hazard analyses must consider this boundary, and then must determine what PPE should be worn within the flash protection boundary. Remote operators or robots can be used to perform activities that are high risk for arc flash incidents, such as inserting draw-out circuit breakers on a live electrical bus. ■

(Contd. from previous page)

Two maintenance mechanics inspected a bucket elevator that had been reported to be malfunctioning due to a misaligned belt. The bucket elevator, located downstream of an annealing furnace, conveyed fine iron powder to storage bins. The two mechanics were standing alone on an elevated platform near the top of the bucket elevator, which had been shut down and was out of service until maintenance personnel could inspect it. When the bucket elevator was restarted, the movement immediately lofted combustible iron dust into the air. The dust got ignited and the flames engulfed the workers causing injuries. A dust collector associated with the elevator was reported to have been out of service for the two days leading to the incident.

Possible causes for the accident

"Tests conducted on samples of metal powder - collected from the plant - determined that this material is combustible,".

Investigation revealed significant quantities of metal dust on surfaces within close proximity to the incident locations. This was of particular concern as metal dust flash fires present a greater burn injury threat than flammable gas or vapor flash fires. Metal dust fires have the potential to radiate more heat and some metals burn at extremely high temperatures in comparison to other combustible materials." In addition to visible dust particles in the air, 2 to 3-inch layers of dust were observed on flat surfaces, rafters, and railings throughout the facility.

Remedial action

The standards prescribed for dust collection systems, dust cleaning frequency, and building construction and egress provisions should strictly be adheared.

An alarm system shall be installed in the area to give warning before the reach of flash point.

Care should be taken to see that Flash point of dust particle is never reached.

CASE STUDY 3

Explosion in drying section of a membrane electrolysis unit

Description

After a one day shut down of the chlor-alkali plant due to maintenance requirement in the chlorine consumer's plant, the chlorine production was restarted and, while the current intensity was increased, the chlorine gas pipeline leading to the drying unit exploded, causing an emission of chlorine.

In addition, broken parts of the chlorine pipeline hit other pipelines and concentrated sulphuric acid leaked out in the containment basin. The automatic emergency system immediately shut down the electrolysis unit.

Due to an increase in hydrogen concentration in the gaseous chlorine of a membrane electrolysis unit, the drying section exploded partially, leading to a chlorine leak. A concentrated sulphuric acid pipe was also damaged causing an additional acid leak.

The emergency system based on differential pressure shut down the unit directly when the pipe exploded, stopping the production of chlorine.

20 workers were evacuated but none was injured.

Possible causes for the accident

The examination of ion-exchange membranes by the manufacturer showed some damages on two of them, which were probably the cause of the hydrogen mixing in chlorine. It is well known that even very low ignition energy can start the explosion, and static electricity in polymer equipment could have been the source.

During the preparatory works, unusual increase of the brine loop pH was not detected by the operator. In addition, unusual decrease of the cells differential voltage was also overseen when the plant was re-started.

The wet chlorine gas pipeline was not equipped with a hydrogen analyser.

Remedial action

The following remedial actions are suggested

- To have a fast detection of hydrogen concentration increase at the outlet of the cells plus an additional monitoring system of the possible membrane damages (voltage/current, quality of products ...).
- To Installation of a hydrogen detector in the chlorine header connected to the emergency system.
- Continuous monitoring of differential voltage by groups of cells.
- Improvement of internal structure of the drying towers for preventing static electricity.
- Improvement of DCS graphics for better visibility of important alarms.
- Training of workers to increase their basic knowledge and help them in detecting important safety information.
- Update the start-up procedure (including putting the drying unit in line). ■

ENVIRONMENTAL EFFECTS OF BIODIESEL

Fossil fuels are non-renewable resources because they take millions of years to form, and reserves are being depleted much faster than new ones are being made. The production and use of fossil fuels raise environmental concerns. A global movement toward the generation of renewable energy is therefore under way to help meet increased energy needs.

The burning of fossil fuels produces around 21.3 billion tonnes (21.3 gigatonnes) of carbon dioxide (CO2) per year, but it is estimated that natural processes can only absorb about half of that amount, so there is a net increase of 10.65 billion tonnes of atmospheric carbon dioxide per year (one tonne of atmospheric carbon is equivalent to 44/12 or 3.7 tonnes of carbon dioxide)

Biodiesel refers to a vegetable oil- or animal fat-based diesel fuel consisting of long-chain alkyl (methyl, propyl or ethyl) esters. Biodiesel is typically made by chemically reacting lipids (e.g., vegetable oil, animal fat (tallow)) with an alcohol.

Greenhouse gas emissions

The incentive for using biodiesel is its capacity to lower greenhouse gas emissions compared to those of fossil fuels. If this is true or not depends on many factors. Especially the effects from land use change have potential to cause even more emissions than what would be caused by using fossil fuels alone.

Carbon dioxide is one of the major greenhouse gases. Although the burning of biodiesel produces carbon dioxide emissions similar to those from ordinary fossil fuels, the plant feedstock used in the production absorbs carbon dioxide from the atmosphere when it grows. Plants absorb carbon dioxide through a process known as photosynthesis which allows it to store energy from sunlight in the form of sugars and starches. After the biomass is converted into biodiesel and burnt as fuel the energy and carbon is released again. Some of that energy can be used to power an engine while the carbon dioxide is released back into the atmosphere.

When considering the total amount of greenhouse gas emissions it is therefore important to consider the whole production process and what indirect effects such production might cause. The effect on carbon dioxide emissions is highly dependent on production methods and the type of feedstock used. Calculating the carbon intensity of biofuels is a complex and inexact process, and is highly dependent on the assumptions made in the calculation. A calculation usually includes:

- Emissions from growing the feedstock (e.g. Petrochemicals used in fertilizers)
- Emissions from transporting the feedstock to the factory
- Emissions from processing the feedstock into biodiesel

Other factors can be very significant but are sometimes not considered. These include:

- Emissions from the change in land use of the area where the fuel feedstock is grown.
- Emissions from transportation of the biodiesel from the factory to its point of use
- The efficiency of the biodiesel compared with standard diesel
- The amount of Carbon Dioxide produced at the tail pipe. (Biodiesel can produce 4.7% more)
- The benefits due to the production of useful by-products, such as cattle feed or glycerine

If land use change is not considered and assuming today's production methods, biodiesel from rapeseed and sunflower oil produce 45%-65% lower greenhouse gas emissions than petrodiesel. However, there is ongoing research to improve the efficiency of the production process. Biodiesel produced from used cooking oil or other waste fat could reduce CO2 emissions by

(Contd. on next page)

(Contd. from previous page)

as much as 85%. As long as the feedstock is grown on existing cropland, land use change has little or no effect on greenhouse gas emissions. However, there is concern that increased feedstock production directly affects the rate of deforestation. Such clearcutting cause carbon stored in the forest, soil and peat layers to be released. The amount of greenhouse gas emissions from deforestation is so large that the benefits from lower emissions (caused by biodiesel use alone) would be negligible for hundreds of years. Biofuel produced from feedstocks such as palm oil could therefore cause much higher carbon dioxide emissions than some types of fossil fuels.

Deforestation

If deforestation, and monoculture farming techniques were used to grow biofuel crops, biodiesel may become a serious threat to the environment:

- Increasing the emission of climate change gases rather than helping curb them
- Damaging ecosystems and biodiversity
- Exacerbating social conflict

The demand for cheap oil from the tropical regions is of rising concern. In order to increase production, the amount of arable land is being expanded at the cost of tropical rainforest Feedstock oils produced in Asia, South America and Africa are currently less expensive than those produced in Europe and North America suggesting that imports to these wealthier nations are likely to increase in the future.

In the Philippines and Indonesia forest clearing is already underway for the production of palm oil. Indigenous people are forced to move and their livelihood is destroyed when forest is cleared to make room for oil palm plantations. In some areas the use of pesticides for biofuel crops are disrupting clean water supplies, and the loss of habitat caused by deforestation is threatening many species of unique plants and animals. One example is the already-shrinking populations of orangutans on the Indonesian islands of Borneo and Sumatra, which face extinction if deforestation continue at its projected rate.

This should be compared with the ecological degradation associated with oil production. For instance, oil production from the Athabasca Oil Sands in Canada has required the clear cutting of vast swathes of the Boreal forest to create open pit mines, and the consumption of vast amounts of water and natural gas. Another example is the oil production in the Niger Delta, which has destroyed fisheries and mangrove forests, and led to health problems among the local population.

Pollution

In the United States, biodiesel is the only alternative fuel to have successfully completed the Health Effects Testing requirements (Tier I and Tier II) of the Clean Air Act (1990).

Biodiesel can reduce the direct tailpipe-emission of particulates, small particles of solid combustion products, on vehicles with particulate filters by as much as 20 percent compared with low-sulfur (< 50 ppm) diesel. Particulate emissions as the result of production are reduced by around 50 percent compared with fossil-sourced diesel. (Beer et al., 2004). Biodiesel has a higher cetane rating than petrodiesel, which can improve performance and clean up emissions compared to crude petro-diesel (with cetane lower than 40). Biodiesel contains fewer aromatic hydrocarbons: benzofluoranthene: 56% reduction; Benzopyrenes: 71% reduction.

Biodegradation

A University of Idaho study compared biodegradation rates of biodiesel, neat vegetable oils, biodiesel and petroleum diesel blends, and neat 2-D diesel fuel. Using low concentrations of the product to be degraded (10 ppm) in nutrient and sewage sludge amended solutions, they demonstrated that biodiesel degraded at the same rate as a dextrose control and 5 times as quickly as petroleum diesel over a period of 28 days, and that biodiesel blends double the rate of petroleum diesel degradation through co-metabolism.

Courtesy: **Wikipidia**

IN THE NEWS

Project to phase out mercury use in private healthcare organizations

The Tamil Nadu Pollution Control Board (TNPCB) has launched a project to phase out use of mercury in private healthcare organisations. The project is based on a study done by the United Nations Development Programme on disposal of biomedical waste in developing countries.

A dozen private healthcare institutions, including hospitals, dental clinics and blood banks in the city, are part of a project to replace outdated equipment, said T.N. Ravishankar, national secretary, Indian Medical Association, College of General Practitioners.

According to doctors, traditionally the thermometer is placed in the armpit of children to prevent them from chewing on the instrument thus leading to accidental ingestion of mercury. However, studies done by various organisations have found that it is not accidental ingestion as much as improper disposal of mercury that causes extensive damage. Mercury from damaged thermometers and BP apparatus when disposed of without proper precaution could contaminate the environment.

Organic mercury compound is a highly toxic substance which could contaminate the groundwater, soil and food chain. Depending on the dosage and level of mercury poisoning, it could cause vision, hearing, speech impairment, respiratory ailments, neurological and gastrointestinal problems and lead to death. Children and pregnant mothers are particularly vulnerable.

TNPCB officials said several workshops were conducted to raise awareness of the need to shift from conventional equipment to technologically improved versions. The workshops were a result of the policy framework document prepared in 2007 by the Union Ministry of Health for providing guidance on the processes for infection control and biomedical waste management.

Doctors say in government hospitals digital thermometers are increasingly used, but aneroid BP devices are yet to catch up.

P. Ramachandran, Director, Institute of Child Health, said though official instructions have not been received, the new purchases for thermometers and BP devices comply with the decision to opt for internationally accepted devices.

Putting to rest fears of inaccuracy, he said the digital thermometer is durable, sensitive and reads the temperature accurately. The aneroid BP apparatus (sphygmomanometer) also provides accurate reading but is yet to be accepted by all doctors. Secretary of Nursing Council G. Josephine says nursing students are taught about the new technological devices as part of their education though there is no emphasis on the need to shift to newer devices.

Source: **The Hindu**

Metrowater to Earn Carbon Credit

Chennai Metro Water will soon earn carbon credit for its efforts in reducing carbon dioxide emissions in four of its Sewerage Treatment Plants. The process of obtaining carbon credit has reached the final stage with the consultant set to register the project with the United Nations Body. According to officials of the Chennai Metro Water, SGS India, the consultant has prepared the assessment certificate after validating the level of Green House Gases Emission and the efforts of generating electricity from sewage. About 32MW or 32000 units of electricity is generated from a total of 264 million litres of sewage received in a day in the Sewerage Treatment Plants. This meets the power requirement of the facilities. Nearly 61200 Tonnes of Green House Gases is estimated to be reduced per annum through the initiative.

The project has been approved by the Ministry of Environment and Forest. The consultant would register with the United Nations Framework Convention on climate Change shortly by paying Rs 4.5 lac to obtain Emission Reduction Certificate. This would help earning carbon credit under the " Clean Development Mechanism". The water agency has saved electricity worth nearly Rs 23 crores since August2005. It will generate a revenue of 4.4 crore per annum by trading its credit in International Market, said a senior official of the Metro Water. The water agency expect to receive the incentive within six months.

"We will implement the Eco-Friendly project in four of the remaining five projects in a phased manner. A comprehensive package has been provided to install equipments to generate electricity in the upcoming Sewarage Treatment Plants" said the official.

– Source: **The Hindu**

IN THE NEWS

C S R Disclosures Made Mandatory

Making it mandatory for India to disclose its C S R activities to stakeholders, the Government has released a set of guidelines for all business including MNCs.

Observance of these would be voluntary. " We can keep making rules and people will keep circumventing them. We do not want to work with a stick, because if the end goal is not achieved, the purpose itself is defeated" said Mr R P N Singh, Minister of State for Corporate Affairs. The M C A also felt that the scope of the term C S R is limited and it has been renamed as Responsible Business.

There are nine broad principles in the National Voluntary Guidelines on Social, Environmental and Economical Responsibilities of business. These are the well beings of Employees, human Rights, Environmental Consideration, Equitable Development, Safe and Sustainable Goods and being responsive towards stack holders.

The standing committee of Finance had suggested that two percent of average of net profit for the preceding three years of companies be made mandatory for companies with a net worth of Rs 500 or more or those that have an annual turnover of atleast Rs 1000crores or companies with a net profit of Rs 5 crores or more.

While reporting the Responsible Business, the Government suggests making disclosures on the recyclable raw materials used, total number of contractual employees, percentage of women employees, energy efficient technologies and total water consumed among other things.

Lauding the Public sector units for whom it is mandatory to spend two percent profit after tax on C S R activities, Mr Murli Deora, Minister of Corporate Affairs said, “The private corporate sector has come a long way from the days of Adhoc Charity”.

Source: **Business Line**

HEALTH TIP

STROKE IDENTIFICATION: A neurologist says that if he can get to a stroke victim within 3 hours he can totally reverse the effects of a stroke...totally. He said the trick was getting a stroke recognized, diagnosed, and then getting the patient medically cared for within 3 hours, which is tough.

RECOGNIZING A STROKE: Some don't die. They end up in a helpless, hopeless irreversible condition instead.

Remember the '3' steps,

STR. Read and Learn!

Sometimes symptoms of a stroke are difficult to identify. Unfortunately, the lack of awareness spells disaster.

The stroke victim may suffer severe brain damage when people nearby fail to recognize the symptoms of a stroke.

Now doctors say a bystander can recognize a stroke by asking three simple questions :

S * Ask the individual to SMILE ..

T * = TALK. Ask the person to SPEAK A SIMPLE SENTENCE (Coherently) (eg 'It is sunny out today').

R * Ask him or her to RAISE BOTH ARMS .

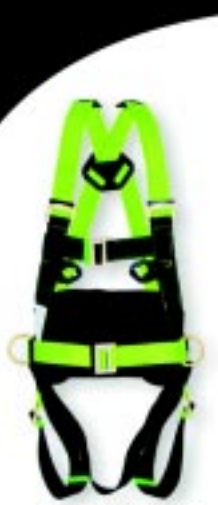
If he or she has trouble with ANY ONE of these tasks, call the ambulance and describe the symptoms to the dispatcher.

Another 'sign' of a stroke is

1. Ask the person to 'stick' out their tongue.

2. If the tongue is 'crooked', if it goes to one side or the other, that is also an indication of a stroke.

www.karam.in



FALL PROTECTION

EYE PROTECTION

HEAD PROTECTION

EAR PROTECTION

WELDING PROTECTION

KARAM a brand with a strong manufacturing base, and an exhaustive range of products covering all aspects of protection from "Head to Toe" has over the years became a trusted name in the field of personal protective Equipment. With a comprehensive range of products that are finest in quality (certified as per CE & ISI standards) KARAM seeks to provide complete Safety with ultimate comfort.

KARAM®

RETRACTABLE BLOCK

CONFINED SPACE ENTRY

FOOT PROTECTION

PROVIDING LONG LASTING

SAFETY SOLUTIONS

CE

For further details on all our products contact below:-

KARAM Industries

CORPORATE OFFICE: D-95, Sector-2, Noida- 201301, Delhi NCR, India. Ph.: 0120-4734400, e-mail: karam@karam.in

BRANCH OFFICES: **BANGALORE:** Phone: 080-41661080, Mob.: 09845339953, e-mail: bangalore@karam.in, **CHENNAI:** Phone: 044-42620314, Mob.: 09840754642, e-mail: chennai@karam.in, **DELHI:** Phone: 0120-4734400, Mob.: 09350550560, e-mail: delhi@karam.in, **HYDERABAD:** Phone: 040-27807675, Mob.: 09392366600, e-mail: hyderabad@karam.in, **KOLKATA:** Phone: 033-32476830, Mob.: 09748738307, e-mail: ritesh@karam.in, **MUMBAI:** Phone: 022-27753553, Mob.: 09323123468, e-mail: mumbai@karam.in, **VADODARA:** Phone: 0265-2416108, Mob.: 09624777669, e-mail: vadodara@karam.in, **RAIPUR:** Phone: 0771-4099937, Mob.: 9826357823, e-mail: vinods@karam.in