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Asia

Experts in Environment, Health & Process Safety

Newsletter, December 2008

2008 Issue 2

In this edition, we cover Process Safety Testing to assess your powder's Fire and explosion hazards, Suitability of Mechanical equipment in hazardous area, Adequacy of lighting protection systems, Electrostatic Charge-Neutralisation and other updates on Past/Upcoming Events by Chilworth India in 2nd Half of Year 2008.

Mr. P K Sharma
DIRECTOR
Chilworth Asia Pacific

Dear Friends,

Happy New Year 2009,

Chilworth Group's, Indian offices have successfully completed five progressive years of operation. We thank our valued customers in Asian region for their trust in us and their valuable feedback in making our services more effective. The growth of interest in Process Safety in our country is a good sign of awareness and commitment of the corporates towards protection of its employees, property and the surroundings.

With the new arm opened at Chennai, we wish to bring you the Global Expertise of Chilworth Group to your doorstep, tailormade to suit individual requirements.

Through our regular Newsletters our endeavour is to keep you updated about the progress made at Chilworth the progress made at Chilworth.

If you need expert advice on how to enhance your Safety capability and be proactive, make Chilworth your trusted HSE partner. You can your queries/ feedback / suggestions to me at pksharma@chilworth.co.in

News Bites

Round table workshop on 'Behavior Based Safety'

A round table workshop was conducted by Ms. Rekha Sharma of Chilworth India at Hotel GRT Grand, Chennai in October, 2008

Ms. Rekha Sharma gave a presentation on BBS in Technical Seminar of Industrial Safety and Health Management at FICCI, New Delhi in November, 2008.

Recently Held Events

Round - table Seminar on Process Safety Management Conducted By Mr. **Ravi Hariramani (VP, Technical),** an approved HAZOP leader and Safety Professional.

- In Delhi :-16th December,2008 At **Chilworth Office, Vasant Kunj**
- In Mumbai :- 18th December, 2008 At **BJN Banquets, FUN Republic**

Points of Discussion:-

- **Background - why process safety?**
- **Personal safety v/s Process Safety**
- **Overview of Process Safety Management Standards**
- **Elements of PSM-OSHA standard**

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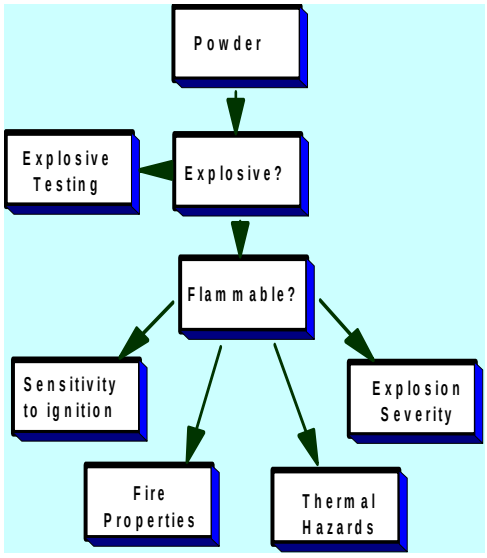
TESTING TO ASSESS YOUR POWDER'S FIRE AND EXPLOSION HAZARDS

Do you know how easily your powders can be ignited? How strong would the spread of fire and explosion and how much damage would be caused once ignited in industrial powder handling operations? If answers of these questions are not known, the safety of the plant cannot be determined correctly and it can't be ensured that your powders won't ignite or that your plant could withstand the explosion hazards.

In India/Asia region, many powder processors incorrectly interpret fire and explosion test results or rely on published test results rather than test their own powders or rely on old test results even though their powder or process are different. Recent dust explosion investigations illustrated this point. In one case, a chemical manufacturer was milling an intermediate powder when a severe explosion occurred. Two workers were injured and the plant was seriously damaged. In another, an explosion occurred in a fluid bed dryer processing a pharmaceutical. The explosion sent pressure and flame into the work space, which damaged the equipment and the plant, even though the dryer had been equipped with explosion relief panels. These two incidents share a common cause: Plant personnel incorrectly interpreted the fire and explosion test results used to assess each powder's safety hazards.

The first step in a multi-step approach to identifying and eliminating fire and explosion hazards in your process would be to obtain powder's fire and explosion hazard characteristics. The test results will help you complete the other steps to ensure your process is safe. In addition to generating powder test data using correct test methods and standards, it is equally important that the data are interpreted and applied correctly to establish safety of the plant equipment or operations.

The following diagram and table will help you to understand what test data is required and why?



PARAMETER	SOME TYPICAL TEST
Flammable	A / B Classification test
Sensitivity to ignition	- Minimum ignition temperature Layer ignition temperature - Minimum ignition energy
Fire properties	Burning behavior - BZ number
Explosion severity	20-L explosion test for Pmax, dP/dt, Kst, St Class
Thermal Hazard	- Bulk powder test - Aerated cell test - Air over layer test - Basket test - SADT

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SUITABILITY OF MECHANICAL EQUIPMENT IN HAZARDOUS AREA:

Published statistics indicates that the highest percentage of fire or explosion experienced in process industries is due to mechanical friction or heating, yet these are one of the least evaluated ignition sources. Generally, process industries are more vigilant in making correct choice of electrical equipment in hazardous areas to prevent ignition due to malfunction of the equipment in flammable atmosphere. However the assessment of suitability of mechanical equipments (for e.g. clutches, brakes, bearings, drives, flame arrestor etc) for the use in hazardous areas is highly ignored. At present, the measure to avoid the ignition due to mechanical heating or friction is relied on good design, construction and maintenance of the equipments and no certification requirement or additional protection measures is employed. Hence a detailed risk assessment is necessary to ensure that ignition risk due to mechanical equipments were adequately controlled in hazardous areas in terms of acceptable tolerable safety limits and the consequences of an ignition were reduced to an acceptable level.

Non-Electrical, Mechanical Equipment Ignition Risk Assessment (MEIRA) starts with the identification of all possible ignition sources that would or could arise in, normal operation, expected malfunction or rare malfunction which was cross referenced to the equivalent equipment category definitions (Category 1, 2 & 3) for any hazardous zones using Chilworth's bespoke assessment template. The assessment is carried out in three phases, focusing on each category of equipments for efficient identification of equipment with inherent ignition sources and the current level of risk which enables to create new or modified inspection needs within the maintenance management system. Critical in this assessment is having in place an effective hazardous area classification within the plant and develop safety management systems (SMS) that allow the safe use of non-electrical equipments in these areas.

MEIRA helps to identify and understand the mechanical sources of ignition for equipment in zoned areas, and to evaluate how the plant equipment operates and what fault conditions can reasonably occur in normal and overload condition. And if fault circumstances occur, what ignition sources can arise and if so, what mitigation measures exist to deal with such situations. In this assessment, the risk assessment process for non-electrical equipment need to be fully documented along with the recommendations for applying new procedures, measures or safety functions to the equipment, in order to ensure that ignition sources are prevented or effectively controlled. It also helps while specifying, selecting, installing, maintaining and inspecting the equipment, to ensure that it is suitable for use in specified hazardous area and it maintains its safety performance during its operating life.

Chilworth can offer assistance for the generation of non-electrical equipment ignition risk assessments based on our specialist qualitative risk assessment methodology to perform a structured assessment of the equipment hazard and risk. After the review we were able to make recommendations for safe operation including modifications and minimal replacements as appropriate.

Chilworth's Latest Technical Publications:

1. **Article On Rock Solid Safety**

2. **Fire & Explosion Hazards in Dust Collection Systems**

3. **Hazard & Risk Assessment or HAZOP? – Article**

4. **Expanded Range of Testing Services**

For getting the above articles, please write us at info@chilworth.co.in

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LIGHTNING PROTECTION SYSTEMS

Lightning can strike anywhere on earth-so Industries are of no exempt!!! Lightning is responsible for more death and property loss than hurricanes and floods combined, but of these violent forces of nature, lightning is the only one we can economically protect ourselves against.

A lightning protection system provides a means by which electric discharge may enter or leave earth without passing through and damaging non-conducting parts of a structure, such as those made of wood, brick, and tile of concrete. A lightning protection system does not prevent lightning from striking; it provides a means for controlling and preventing damage by providing a low resistance path for the discharge of lightning energy.

Some structures are inherently more or less at risk of being struck by lightning. The risk for a structure is a function of the size (area) of a structure, the height, and the number of lightning strikes per year. For example, a small building will be less likely to be struck than a large one, and a building in an area with a high density of lightning strikes will be more likely to be struck than one in an area with a low density of lightning strikes.

A properly installed lightning protection system performs the simple, yet invaluable task of providing a network of low resistance paths for lightning current to follow in preference to other parts of a structure. While the concept behind lightning protection is relatively simple, the requirements for proper installation are specific and often complex. The single best way to ensure proper system design and installation is to specify compliance with the nationally recognized safety standards for lightning protection. The Indian code of practice: IS 2309:1989-Protection of Buildings and Allied Structures against Lightning-Code of Practice (Reaffirmed in 2005)-outlines the general technical aspects of lightning, illustrating its principal electrical, thermal and mechanical effects. Guidance is given on how to assess the risk of being struck and it offers a method of compiling an index figure as an aid in deciding if a particular structure is in need of protection. Recommendations are made for special cases such as explosives stores and temporary structures, for example, cranes, spectator stands constructed of metal scaffolding. Where current carrying conductors are directly associated with structures coming within the scope of this Code, certain recommendations relating to them are included.

Indian Standard on Lightning Protection (IS 2309) provides the methodology to assess the lightning protection requirement for structures and buildings.

International standards:

British Standard 6651 (1999): Code of Practice for Protection of Structures against Lightning (This code will be replaced by BS EN 62305 (Parts 1-4) in August 2008)

American Petroleum Institute (API) Recommended Practice 2003-Protection Against Ignitions Arising Out of Static, Lightning and Stray Currents. The Chapter 5 discusses direct and indirect effects of lightning as well as protection of specific equipments.

National Fire Protection Association NFPA- 780: Standard for the Installation of Lightning Protection Systems. It describes minimum standard to residential, commercial and industrial facilities.

Oil Industry Safety Directorate (OISD) 180- Strict compliance with the requirements of these standards is essential to proper system performance. As is true with any safety system, ensuring correct installation the first time is a must, since waiting for nature to send down a bolt of lightning to test the system's quality can catastrophic results.

ELECTROSTATIC CHARGE NEUTRALISATION

Electrostatic charge on materials often leads to problems with their handling and control of electrostatic charge on them. Charged powders may stick where they are not wanted and be difficult to move to where they are wanted. The solution is usually to encourage the charge to dissipater naturally by conduction through the material, however, there are occasions when this will not work and the only answer is electrostatic charge neutralization.

CHARGE ACQUISITION

Materials handling and processing operations involve surface contact, separation, and movement, which

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are all contributors to the generation of electrostatic charge. When two materials make contact with each other, the difference in molecular or atomic structure will almost always ensure that electrons move across the interface at any point of contact. When the two materials are separated, the displaced charge has a tendency to move back through the last point of contact by conduction, to restore the original state of neutrality for both materials. However, if the separation is rapid compared with the rate of charge transfer by conduction, this may not happen fast enough and some or all of the charge will be carried away with the separating materials. One material will then be positively charged and the other negative, though which is which depends on the precise chemical nature of the contacting materials.

The magnitude of the total charge acquired in this way also depends on the area of contact, which at a microscopic level depends on the physical nature of the surfaces, the pressure of the contact, the number of repeated contacts, and the relative velocity of the two materials.

PROBLEMS DUE TO ELECTROSTATIC CHARGE

Having acquired charge, materials can exhibit problems such as sticking and not going where they are required. These are especially apparent with thin films and the powders, though whole tablets and even larger objects may also be affected. Typical problems include:

Clogging of hoppers and powder pneumatic conveying systems, resulting in repeated and significant downtime. Tablet and dust adhesion to various surfaces of tableting machines, resulting in product loss and machine down-time for cleaning. Incomplete blending of pharmaceutical powders, resulting in non-conforming product.

Four main types of static eliminator are in use today: Passive, Active AC, Active DC and Radioactive. In addition, various manufacturers have their own preferred enhancements for most of these. However, given the four main types of static eliminator, the various sub-types and the fact that some are suitable for use in the presence of flammable atmospheres, it can often appear that there are a very large number of possible devices available. In reality, though, only one or two may be best suited for a particular application. Furthermore, the location of installation can be often be crucial, making all the difference between a system working failing to work, or even making things worse. In a few situations, it is even possible that an inappropriately installed static eliminator could introduce a hazard where previously there was none.

Few Examples

- Powder / dust adhesion to surfaces of plastic packaging, creating sealing problems and damaging printed labels.
- Sieve blinding.
- Dust adhesion to process webs, resulting in out-of-specification product.
- Electrostatic discharge during wet coating and dipping operations, resulting in wet fires.

CHARGE DISSIPATION

In principal, the solution to the above problems is removal of the charge that has been acquired. For some materials, this can be accomplished by allowing the charge to dissipate naturally by conduction via an earth connection. However, for many materials this process is far too slow to be of practical help, in which case a more active approach is required – Charge Neutralization.

CHARGE NEUTRALISATION

Charge neutralization (otherwise known as static elimination) involves generating ions in air and directing the opposite sign of ion towards the charged material. For example, a negatively charged item would have a stream of positive ions directed at it so that, with the appropriate controls in place, the material is just taken to electrical neutrality, at which point the problems cease.

Chilworth's expert engineers are able to help design and install suitable static elimination systems and have independent consultants we are able to recommend the most appropriate equipment from a wide range of possible manufacturers.
If a suitable static eliminator for a special application can not be found off the shelf, Chilworth has both the expertise and experience to design a special unit from scratch. This is precisely how the special stainless steel and PTFE static eliminator (image overleaf) was developed, originally for a particular pharmaceutical application, through it has since found additional applications in a number of other processes.

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New Joinees at Chilworth

- Ms. Sharmili Gangopadhyay - Dy. Manager- Environment
- Ms. Jaya Paul – Admin. Officer
- Ms. Shweta Arora - Exe. Bus. Development
- Ms. Neha Bhagtani- Exe. Bus. Development
- Ms. Amudha Pravin- Admin. Officer
- Dr. M. Radhika – Consulting Engineer
- Ms. Sathyapriya – Consulting Engineer

Chilworth Safety & Risk Management P. Ltd.

Delhi Office:

Muskaan Complex
Plot 3, Block 2,
Vasant Kunj,
New Delhi – 110070
Tel: + 91- 11 – 2613 6979
Fax: + 91- 11 – 2613 5979

Mumbai Office:

D – 12, Rishabh Complex,
Opp. Fun Republic, New Link Road,
Andheri (W), Mumbai – 400053
Tel: +91- 22 – 6694 2350/51
Fax: +91- 22 – 6694 2352

Chennai Office:

146/3, Habibullah Road,
Near Canara Bank,
T. Nagar, Chennai 600 017
Tel: +91- 44 - 42125445/46
Fax: +91- 44 - 42125447

Email: info@chilworth.co.in
Visit us at: www.chilworth.co.in