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Chilworth Process Safety News

NEWS!: *Risks in managing risks (see opening article), Emergency System Survivability Analysis (ESSA), A list of forthcoming training course, Flash Fire Explosion Hazards, New additions to the Chilworth Family and services available from the Group.*

Jitendra Kumar

Vice President
Chilworth, India

RISKS IN MANAGING RISKS

The Baker panel report after the BP incident specifically recommended that a member of the board in chemical units must be someone who understands the process safety issues and can communicate the risk to the rest of the members of the board. But this is yet to happen.

With our experience of over 25 years, a lot has been written about process safety management and its statutory requirements. Usually financial risk management is given priority over process safety management. In recent times, with an increase in statutory requirements for a more stringent implementation of safety rules & regulations in the manufacturing industries, Safety should be applied as core to the operation of the company. Process Safety Management in any manufacturing company must take into account the technical, asset integrity and manpower competency risks. Risk matrices when presented to the board often do not really communicate the risks the company is facing. It is this failure in communication that is most worrisome. We have noticed that there is a huge gap between what is happening at the ground level and the top management's perception of process safety.

It is not a question of culture. It is a question of commitment. Without commitment there is no culture.

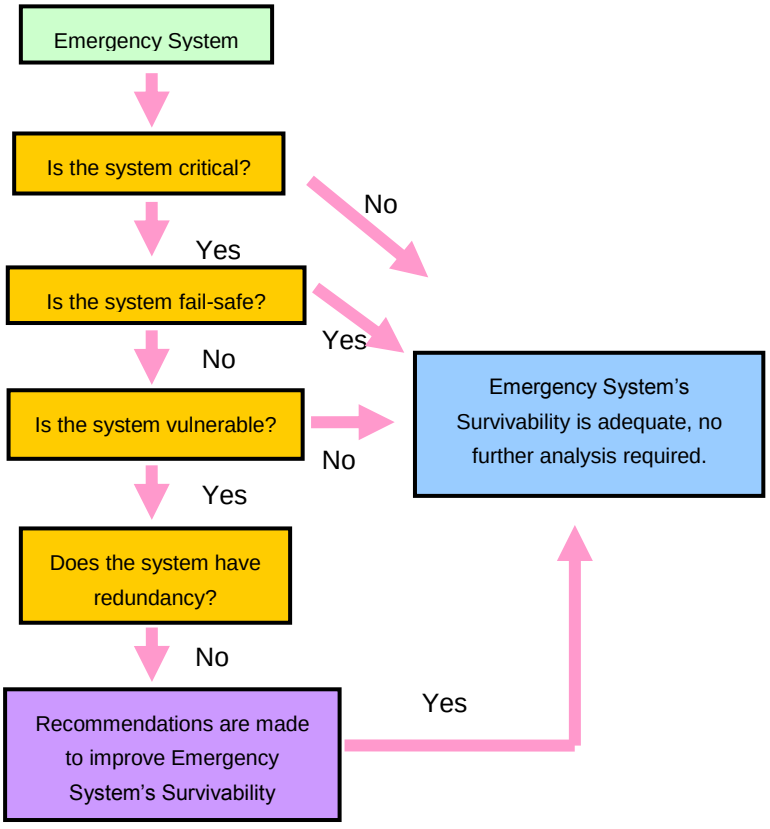
The role of Chilworth is to be a centre for Process Safety expertise & learning. To make us your partners, email me at info@chilworth.co.in

Jitendra Kumar

Emergency Systems Survivability Analysis (ESSA)

An ESSA examines and ascertains the capability of each emergency system on a facility to fulfill its intended functions during Major Accident Events (MAEs). The emergency systems of an installation are defined as those which under certain accident circumstances could be critical to the safety of personnel on board. Emergency systems are utilised for the control and/ or mitigation of hazardous events.

The figure below illustrates the ESSA methodology employed for typical facility.



Emergency systems and MAEs are identified from the Hazard Identification (HAZID) study. Each of the emergency systems identified is assessed to establish whether the system is "critical".

Non-critical systems are not subjected to further analysis.

The critical emergency systems are then assessed to determine whether each of the systems is fail-safe in fulfilling its intended

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function even if one or more of its components are impaired. Critical emergency systems which are fail-safe are deemed to be adequate. Hence, no further analysis is required.

Systems which are not fail-safe are further assessed to ascertain its vulnerability i.e. whether the system function is likely to be impaired in a potential MAE.

Systems which are assessed to be not vulnerable to MAE are deemed to be adequate, and no further analysis is required. For critical emergency systems which are not fail-safe and vulnerable to MAEs, assessment of systems redundancy is required to determine whether the system is provided with back-up. Safety critical systems which have complete redundancy are deemed acceptable.

Hence, the acceptability criterion of an emergency system's survivability is that the emergency system must either be fail-safe or non-vulnerable or redundant. As the emergency systems comprise various components, it is acceptable for some parts of the system to be fail safe and other parts to be non-vulnerable, or in other combinations.

Recommendations are made to improve the emergency system's survivability if the impairment frequency of the system does not meet the acceptance criterion.

Upcoming Training Courses 2011

Chilworth Process Safety Academy

Date & Day	Location	Topic
February 25th, 2011 Friday	Mumbai	Risk Management – Exploration & Production
April	Hyderabad	Risk Based Process Safety Management

For more information, please email us at shweta@chilworth.co.in / neha@chilworth.co.in

Download our In-Company training courses & Training Calendar for 2011: Training Calendar 2011 or visit www.chilworth.co.in

FLASH FIRE AND EXPLOSION HAZARDS

Statistics clearly shows that fire/explosion hazards could exist in any plant/equipment that handles or processes flammable liquids, gases and combustible dusts. Fire and Explosions in the process industry are treated as rather private affairs by most companies. After all, which company would like to have their new snack or drink associated with explosions and stigma attached? In general, it is only those events of sufficient consequence that get reported to the authority. Yet, it is important for everyone to know what can go wrong, where it can happen and what the consequences can be. Everyone has a vested interest in preventing explosions and fires, be it on ground of health and safety or good business sense to avoid loss of customer confidence and loss of market share caused by an extensive plant down time situation.

The Factories Act has placed stringent requirements on process industries to take necessary preventive or mitigation measures to avoid or minimize the occurrence of such events. The key to this is the robustness and thoroughness of the assessment procedures employed by the industries.

There are a number of potential causes of rapid overpressure events in process plants. Most commonly these arise from dust, gas and vapour explosions; detonation or deflagration of highly energetic materials; rapid decomposition of thermally unstable substances or mixtures; and runaway exothermic chemical processes. In handling flammable, explosive or thermally unstable substances or conducting chemical reactions there must be a defined mechanism for avoiding or protecting against the intrinsic hazard of the material or process. This might be a single safety system (e.g. explosion relief vent) or a combination of measures which collectively protect the plant, personnel and environment from the consequences of all foreseeable undesirable events. These individual or collective measures – which can be a combination of both organisational and technical measures – are defined as the Basis of Safety for the plant or operation. For explosion hazards, potential Basis of Safety include,

Prevention methods:

- Avoidance of flammable atmosphere
- Avoidance of ignition sources

Protection methods:

- Containment
- Explosion Venting
- Explosion Suppression

Any Fire/Explosion hazard and risk assessment, irrespective of the nature of the hazard or risk, requires a methodical strategy involving:

- Understanding the flammability, ignition sensitivity, thermal instability and electrostatic characteristics of the materials (dusts, gases and liquids).
- Identification of locations where flammable dust clouds and/or flammable vapour/gas atmospheres could be present during normal and abnormal conditions.
- Identification of all potential ignition sources including static electricity that could be present under normal and abnormal conditions.
- Review the fire & explosion prevention measures and protection measures for flammable vapour, gas and dust handling operations/processes.
- Recommendation - appropriate practical measures to eliminate and/or control the occurrence of fires and explosions.
- Recommendation - measures to protect people and plant against the consequences of fire and explosion hazards.

Fundamental to the provision of a sound Basis of Safety is a thorough understanding of the process and the properties of the materials involved. For assessing the dust, gas and vapour explosions and detonation or deflagration of highly energetic materials the following properties of the materials may be required.

Classification of Data	Test Parameters	
	Dusts/Powders	Gases/Vapours
Ignition sensitivity	• Minimum ignition energy (MIE) • Minimum (cloud) ignition temperature (MIT) • Layer (5 mm) ignition temperature (LIT)	• Minimum ignition energy (MIE) • Auto ignition temperature (AIT)
Explosion severity	• Maximum explosion pressure (Pmax) • Explosion severity constant (Kst)	• Maximum explosion pressure (Pmax) • Explosion severity constant (Kg)
Flammable range	• Minimum explosible concentration (MEC) • Limiting oxygen concentration for combustion (LOC)	• Upper and Lower explosive limits (UEL and LEL) • Limiting oxygen concentration (LOC) • Flash point
Static electricity	• Volume resistivity • Charge relaxation time	• Conductivity

Flammability properties of the material may be available from reliable literature sources for gases and vapours, where as it is not available in case of dusts and powders. Almost all organic or metal powders, when finely divided and dispersed, are capable of igniting and propagating an explosion. Even for a given substance, the moisture content, particle size and even particle geometry can have a profound effect on the ignition sensitivity and / or explosion severity. Only the tests needed to specify and confirm the acceptability of the Basis of Safety are required. Not all parameters may be essential for the ultimate basis of safety. Powders can be much less sensitive to ignition than gases or vapours.

This systematic assessment helps the process industries to achieve the effective basis of safety in plant operations. This article seeks to provide an overview of the decision making and assessment process, highlighting areas where flash fire and explosion hazards can occur.

Chilworth Global provides safety services to industry to prevent the Flash Fire & Explosion Hazards and to protect against their effects. Chilworth Global has ISO 17025 certified laboratories for conducting all the tests of the materials for material characterization.

Addition to the Chilworth Family

Manish Saroha: A graduate in Chemical Technology. He is a Consulting Engineer with Chilworth. His responsibilities include execution of process risk and safety consultancy projects. He has a good experience of conducting safety studies like HAZOP, SIL, QRA, Dispersion, FERA, etc. for Oil & Gas and Petrochemical industries.

Sakila Bhadu: She has joined Chilworth India as Sr. Consulting Engineer in process safety and risk management team. She is a graduate in Chemical Technology. In her 4 yrs working experience, she worked on safety studies like HAZOP, SIL, QRA, EERA, RAM, Bow Tie, HAZID, Safety Audits and Dispersion etc. for oil & gas and petrochemical industries.

Ashwini Ganvir: She has joined Chilworth India as Consulting Engineer. She has completed her B. Tech in Chemical Engineering. She is also a Diploma holder in Industrial Safety. She has 2 years experience in Process Safety and Production. She has working knowledge of HAZOP, HAZID, QRA, FTA, Hazardous area classification, Fire and Explosion Index for various chemical and petrochemical industries.

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Chilworth Consulting Capability

Organisation & compliance
- Safety Management
- Regulatory Compliance Support

Technical Specialist Areas
- Hazard Assessment and Risk Analysis
- Explosion Prevention & Protection
- Modelling
- Chemical Reactions
- Energetic Materials
- Electrostatics
- Fire Prevention & Protection
- Occupational Health & Safety
- Reliability

Protection & Equipment
- Inert Gas Protection
- Instrumentation and Equipment
- Pressure Vessels

Project Engineering

Incidents & Support
- Incident Investigation
- Litigation Support

Insurance Risk

Environment

Testing Capabilities

Process Safety
- Special Testing
  - Laboratory Testing
  - Field Tests (Large Scale)
- Explosion (Deflagration)
  - Dust
  - Gas / Vapour
  - Hybrid
  - Aerosol
- Thermal Stability / Chemistry
  - Chemical Reaction Hazards
  - Powder Thermal Stability
  - Chemical Process Optimisation
- Explosion (Detonation)
  - Propellants / Pyrotechnics
  - Explosives
- Fire
  - Mattress / Furniture
  - Custom Tests
  - Full Scale Simulation

Electrostatics
- Process Problems
- Applications
- Safety Test

Regulatory
- UN / DoT Transportation
- Classification Packaging Labelling (CPL)
- MSDS
- Notification Registration Evaluation
  - REACH

Training Capabilities

Organisation & Compliance
- Process Safety Management
- Process Safety Culture
- COSHH
- OSHA Dust Explosion Prep Training
- ATEX 137 / DSEAR
- Environment / Integrated Management Systems
- Process Hazards Analysis

Technical Specialist
- Dust Explosion Prevention & Protection
- Control of Static Electricity
- Gas & Vapour Explosions
- Chemical Reaction Hazards / Thermal Stability
- Hazardous Area Classification
- HAZOP

Protection & Equipment
- IEC 61508/11 SIL Levels
- ATEX 94/9
- Hazardous / Electrical Area Classification
- Vent Design (Explosion, Pressure, Reactor Protection)

Instrument / Equipment Supplies (Chilworth Systems & JCI)

Process Safety Laboratory Equipment (Chilworth Systems)
- Special Equipment
  - Large Scale Explosion
  - High Pressure / Temperature
  - Custom Design
- Explosions
  - Dust / Gas / Vapour
  - Explosion Testing
- Thermal Stability Chemistry
  - Reaction Hazard Screen Tools
  - Adiabatic Calorimeter
  - Powder Thermal Stability
- Fire
  - i-Cal (Fire Calorimeter)

Electrostatic Equipment (JCI)
- Laboratory Equipment
  - Electric Field Meter / Volt Meter
  - Charge Relaxation Time
  - Charge Measurement
- Field Test Equipment
  - Lightening Warning
  - Adverse Conditions Equipment

Regulatory (Systems)
- Physical or Chemical Properties Measurement

Client Base:

The client base of Chilworth Group covers well over 55 countries and 800 companies. The client base of CTPL covers many Asian countries and includes companies in the sectors such as petrochemicals, refineries, fine chemicals, pharmaceuticals, bulk organics, food stuffs, paints & resins, dyestuffs, pigments, agrochemicals, soaps & detergents, oil and gas, buildings. Over last 6 years CTPL has worked for more than 200 reputed companies; **to name few –**

Jubilant Organosys, Hikal Ltd., **Ranbaxy**, Nicholas Piramal, **GSK**, Matrix Labs, **Arch Pharma**, Actavis, **Astra Zeneca**, Reliance Industries, **Greater Nile Petroleum Operating Company (Sudan)**, Petroleum Development of Oman, **Abudhabi Oil Company**, Merck Ltd., **Tata Chemicals**, Dr. Reddy's, **Syngenta**, United Phosphorus, **Pidilite**, Sandoz, **MGL**, IOCL, **ONGC**, HPCL, **GAIL**, Atul, **GE India**, MEOF, **Adani Petronet**, Maruti Suzuki India Ltd., **Technip**, Crain Energy, **HCL**, ACC