



# Is your Organisation competent in Process Safety?

Use the Process Safety Expert to provide experiential training!



More than 85% of incidents in the Chemical Process Industry are due to Human error

**"They did not know what they did not know"**  
– Late Dr. Trevor Kletz about the Flixborough disaster



## The Faculty

### Mr B Karthikeyan, Process Safety Management Expert

Mr. Karthikeyan is a Chemical Engineer from Madras University, with over 35 years experience in the Chemical Industry in Operations, Technical Services, Process Safety, OHS and Environment Management. He has worked in India and abroad. His extensive practical experience includes the implementation and auditing of Process Safety Management System as per OSHA CFR 1910.119, EPA's 40 CFR 68 Risk Management Program, Environmental Management System as per ISO 14001, and Occupational Health and Safety Management system as per OHSAS 18001. He has provided process safety consultancy and training services for many organizations in India, Germany, South Africa, Greece, Malaysia, Abu Dhabi and Jordan.

He is a lead auditor for ISO 14001 and OHSAS 18001 systems. He is also an emergency responder for chemical plants and has undergone extensive emergency response and rescue training abroad. He has investigated numerous catastrophic chemical process plant incidents using ECFA, M-T-O and barrier analysis techniques and is an expert on human factors and abnormal situation management.

He has worked at senior management level with leading organisations like Madras Fertilisers Limited, Murugappa Group, (as Dy. General Manager for Process Safety Management) and internationally with National Methanol Co., Saudi Arabia (a SABIC and Celanese joint venture).

He has carried out over 350 audits of Process Safety Management Systems in both continuous and batch processes, conducted many HAZOP studies and conducted over 400 training sessions on management systems for Process Safety.

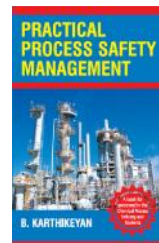
He has published many papers in leading magazines on Process Safety management and presented many papers on Process Safety Management in national and international seminars.

He blogs regularly on process safety topics at <http://indiaprocesssafety.blogspot.com>

He is also the author of the book "Practical Process Safety Management", the proceeds of which are donated to the surviving victims of the Bhopal gas disaster.

His LinkedIn profile can be accessed at

<http://www.linkedin.com/in/karthikeyanprocesssafety>





## Process Safety Culture and Human Factors Lessons for Leadership - 1 day

### What it covers

- How Human Factors affect Process Safety Culture - A comparison of human issues in incidents in World Class Companies in the last decade
- Why management systems alone cannot avoid incidents
- Learning to balance budgets, manpower attrition and safety culture
- Risk based approach to Process Safety Management – Managing Operational Risk
- How to use Incident Investigations to identify organizational issues
- Role of top management in developing and sustaining process safety culture
- Usage of leading indicators to manage Process Safety
- How Corporate Management Audits can measure Process Safety Performance

### Who should attend?

- Chairmen, Managing Directors, Directors, CEO, CFO, CRO, Senior Management –Operations, Maintenance, Finance, HR, Safety etc.

### Benefits

- Understand how process safety culture is a powerful risk management tool
- Understand the cost benefits of developing and sustaining a robust process safety culture
- Understand how to manage budgets and manpower attrition without compromising process safety culture

### For details, contact....

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## Elements of Risk Based Process Safety Management - 2 days

### What it covers

#### Day 1

- Background of Process Safety Management (PSM) system as per US OSHA 1910.119 PSM rule
- Business case for PSM – A tool for risk management and culture change – current best practices
- Description of following elements of Risk Based PSM:
  - Top Management Involvement and Commitment
  - Institutionalizing Risk Based Approach
  - Process Safety Knowledge Management
  - Process Safety Competency
  - Employee participation
  - Process Safety Information
  - Process Hazard Analysis
  - Operating Procedures
  - Management of Change
  - Pre-Start up Safety Review
  - Safe work practices (Work Permit Systems)
  - Training
  - Asset integrity
  - Contractor control
  - Process Incident Investigation
  - Emergency response planning
  - Measurement and Metrics
  - Compliance audits
  - Trade secrets
  - Management Review

#### Day 2

- Case studies of incidents and how PSM could have prevented them
- How the PSM system meets the requirements of Process Safety code of Responsible Care®
- How to integrate requirements of PSM into existing EHS management system
- Benefits of PSM

### Who should attend?

- Top management, Plant Operating and Maintenance personnel, Safety Managers, Process Safety Coordinator etc.

### Benefits

- Develop a understanding of the requirements of OSHA CFR 1910.119 PSM standard
- Understand how PSM is a powerful risk management and culture change tool
- Understand the process safety management gaps in your system

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## Process Safety for Plant Operators – 1 day

### What it covers

- Process safety information in P & ID's and Material Safety data Sheets
- Hazards of Runaway Reactions
- Design basis of relief valves and flare systems
- Rupture discs and their safe operation
- Hazards of vacuum
- Basics of electrical area classification
- Basics of static electricity and its prevention
- Shift handover and take over techniques
- Types of soft and hard changes and their management
- Process Safety in shutdown and start ups
- Case studies of process safety incidents

### Who should attend?

Plant operators, Plant operator trainees, Engineer trainees, Safety personnel

### Benefits

- Gain practical process safety knowledge
- Learn technical aspects of process safety

- Learn the types of changes to be managed
- Understand the process safety design aspects of chemical plants

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## Management of Change - 2 days

### What it covers

#### Day 1

- Why managing change is necessary to avoid hazards (with discussion of incidents)
- Detailed requirements of management of change as per US OSHA 1910.119 PSM rule and risk based PSM of CCPS, USA
- Case studies of incidents due to inadequate management of change
- Types of changes to be managed
- Management of “soft” changes
- Developing a management of change system

#### Day 2

- Competency requirements for managing change
- How management of change links with other elements of risk based process safety management
- Group exercise: development of management of change flowsheet
- Case study on management of change – Group exercise
- Written Test

### Who should attend?

- Plant engineers, Plant managers, Plant operators, Process engineers, Inspection engineers, Safety Managers, Maintenance managers, Maintenance Engineers, Process Safety Coordinator etc.

### Benefits

- Understand why management of change is necessary to avoid major incidents
- Understand the types of changes (hard and soft) that may impact process safety
- Learn how to develop an effective management of change system

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## Process Incident Investigation: Root Cause Analysis - 2 days

### What it covers

- Definition and types of incidents
- Classification of root and contributing causes of incidents
- Step wise methodology of root cause analysis
- 5 Why Technique
- Events and Causal Factor Analysis
- Barrier Analysis
- Introduction to Human Performance Evaluation / MTO-Analysis, including videos of accidents involving human factors.
- Root cause analysis methodology
- Case study discussion and workshop on identifying root and contributing causes of incident

### DAY 2

- Presentation of video case studies of incidents and group exercise on identifying root causes of the incident using the methodologies taught.
- API tiers of Process Safety Incidents
- Root cause analysis of process incidents using case study
- Developing appropriate recommendations to address root causes

- Pitfalls to avoid in incident investigation
- Written Test

### Who should attend?

- Plant engineers, Plant managers, Plant operators, Process engineers, Inspection engineers, Safety Managers, Maintenance managers, Maintenance Engineers, Process Safety Coordinator, Incident investigating teams, etc.

### Benefits

- Develop clear understanding of root cause analysis of process incidents
- Understand human factors and their importance
- Learn how to develop an effective incident investigation system

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## Hazard and Operability (HAZOP) Study as per IEC 61882 - 2 days

### What it covers

#### Day 1

- Introduction to Process Hazards
- Introduction to the HAZOP method and guide words
- Understanding HAZOP study sequence
- HAZOP study preparation requirements
- Requirements of Process Safety Information for HAZOP study
- Preparing nodes for HAZOP Study
- The importance of design intent in HAZOP study
- Applying HAZOP Guidewords
- Judging the effectiveness of existing administrative and engineering controls
- Conducting the HAZOP study and recording of study
- HAZOP team dynamics
- Understanding human factors
- Understanding facility siting
- Group exercise : Conducting HAZOP study using case study

#### DAY 2:

- Using risk matrix for risk rating of recommendations
- Case study Video and group discussion on identification of process hazards and human factors
- Treating utilities in HAZOP study

- Group exercise: Conducting HAZOP study using case study
- Making effective HAZOP recommendations
- Follow up of HAZOP study
- Pitfalls to avoid during a HAZOP study
- Examination

### Who should attend?

- Process engineers, Plant Engineers, Plant operators, Safety engineers, Inspection Engineers, Maintenance personnel, HAZOP team members etc.

### Benefits

- Develop clear understanding of HAZOP technique as per IEC 61822, including requirements of US OSHA 1910.119 PSM rule
- Learn practical tips on conducting effective HAZOP studies.

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## Hazards of non - routine operations (including work permit systems) - 1 day

### What it covers

- Types of non routine operations that cause process incidents
- Case studies of incidents caused by improper management of non routine operations
- Hazards of confined space and requirements of US OSHA standard CFR 1910.146
- Hazards of hot work
- Hazards of on line leak sealing and hot tapping
- Hazards of radiography
- Hazards of vehicle movement
- Case studies
- Non routine work control during shutdowns

### Who should attend?

- Plant engineers, Plant managers, Plant operators, Inspection engineers, Maintenance managers, Maintenance Personnel, Process engineers, Safety Managers Process Safety Coordinator etc.

### Benefits

- Understand the hazards of non routine hazards and how to control them as per best practices

- Understand whether your existing work permit system addresses all the hazards of non routine operations

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## Developing and improving your Asset Integrity program - 2 days

### What it covers

#### Day 1

- Introduction to the Risk based PSM system and role of Asset Integrity element
- Asset Integrity lifecycle
- Integrity operating windows and its importance
- Risk Based approach towards asset integrity
- Standards and RAGAGEPS
- Identification of safety critical equipment
- Classification of safety critical equipment

#### Day 2:

- Developing Inspection test and maintenance plans
- Asset Integrity procedures
- Integration of Asset Integrity program with other elements of Risk Based Process Safety Management
- Administration of the program
- How asset integrity element could have prevented incidents – case studies
- Pitfalls to avoid

### Who should attend?

- Maintenance (Mechanical/ instrumentation/ electrical civil) Engineers, Inspection Engineers, Process engineers, Plant Engineers, Plant managers, Safety engineers, Process Safety Coordinator

### Benefits

- Develop clear understanding of requirements of Asset Integrity Program as per requirements of US OSHA 1910.119 PSM rule and CCPS Risk Based PSM.
- Learn practical tips on effective implementation and continual improvement of the Asset Integrity program.

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“The passing of time without a process accident is not necessarily an indication that all is well. Workers and supervisors can increasingly rely on how things were done before, rather than on sound engineering principles”  
– Baker Panel report on BP Texas refinery fire



## Writing effective operating procedures - 1 day

### What it covers

- Introduction to the PSM system and requirements of Operating Procedures element
- Requirements of operating procedures from a process safety viewpoint
- Mandatory information in an operating procedure
- Writing tips for effective operating procedures
- Validation and revision system for operating procedures
- Writing Temporary operating procedures
- Human factors associated with operating procedures
- Management of change for operating procedures
- Capturing organizational memory in operating procedures

### Who should attend?

- Plant managers, Plant engineers, Process Engineers, Safety engineers, Process Safety Coordinator

### Benefits

- Develop clear understanding of requirements of Operating Procedures as per requirements of US OSHA 1910.119 PSM standard.
- Learn practical tips on writing effective operating procedures

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