Process Safety Management (PSM)

For the hazardous process industries
Overview

Delivering excellent process safety performance is a must for any operating company in the hazardous process industries.

This is essential for:
- Protecting their people
- Protecting their license to operate
- Eliminating or minimising the risk of incidents
- Meeting ever more demanding regulatory requirements
- Raising stakeholder and public confidence

There is also general acceptance that any operating companies putting in place the systems to manage production safely, will also create a well controlled and efficient operation - ‘a safe operation is an efficient operation’.

Process safety needs to be considered throughout the asset lifecycle; design, construction, operation, maintenance, modification and closure.

Operating companies need to be able to answer ‘yes’ to the following three questions:
- Do we understand what can go wrong?
- Do we know what systems we have to prevent this happening?
- Do we have sufficient information to assure us these systems are working effectively?

To be able to answer ‘yes’ to these questions means having good risk identification and assessment processes, comprehensive risk controls in place and reliable monitoring of these risk controls.

ABB helps to answer these questions, to identify any shortfalls and put necessary improvements in place. We have expert knowledge of all aspects of process safety, engineering specialists to help implement solutions, rigorous processes to complete comprehensive studies efficiently and an operational heritage to develop pragmatic solutions.

"The inspector remarked that the process safety documentation flowed well and told a coherent story, in fact he did not challenge a single element of our LOPAs or fault trees and was very happy to allow us to continue on without further intervention. An excellent result.”

Operations Safety Manager, Chemical Manufacturer

The benefits of improved process safety

The key benefit from and main justification for improving process safety performance is in the inherent value of reducing harm to people and the environment, by reducing the likelihood of a major incident occurring.

Additional benefits for PSM

While the key drivers for safety are social and ethical our experience shows that there are significant financial and operational benefits from improving safety.

Process safety incidents are rare events, their cost can reach into billions of USD, so there is real financial value in improving safety performance.

The value of reduced risk can be calculated, so reducing the likelihood of a $1.5bn USD incident (the cost of the Buncefield incident) occurring from once in 10,000 years to once in a 100,000 years gives a ‘mathematical value’ of $135,000 USD worth of risk reduction per year of operation.

However, the key financial benefits come from improving the way a process is controlled and operated and to attribute a proportion of plant downtime to incidents that can be prevented through safety improvement actions.

Improved safety requires a well controlled, well operated and well understood process. Running an operation in a safe way reduces variability and gives operators more time to optimise performance.

40% of production loss is related to preventable operator error and if improved PSM reduces this by even 1 incident it is worth a significant increase in revenues. In reality many aspects of improved PSM contribute to reducing the amount of lost production time.

"This is what success looks like. One train alone had 6 trips last year compared to 25 the year before. This has significant business value.”

Operations Manager, Gas Processing Plant
What ABB offers

The management of process safety can be broken down into the following areas.

License to operate
We support full technical authoring of safety reports (onshore) or safety cases (offshore), completing specialist sections, providing data for reporting requirements, helping to prepare for regulatory inspections etc. Regulators and Business Insurers use the information provided in the safety report / case during their interactions with operators, so we align our approach in all PSM areas to the safety report / case. This makes it easier for operators to demonstrate they are managing safety, along the lines of their license to operate.

PSM systems, policies and procedures
The ‘right’ goals for any PSM / Functional Safety Management (FSM) improvement program will be influenced by many diverse factors including corporate tolerance to risk, Incident history, inherent risk in the operation, current state of PSM / FSM arrangements etc.

ABB provides pragmatic advice, knowledge of Industry best practices and performance, experience of similar PSM / FSM programs and delivers an independent and realistic view of current state and priority areas for progress. ABB also provides a bespoke FSM fingerprint service to align existing FSM procedures against the relevant safety and security standards IEC 61508 / IEC 61511 / IEC 62443 and for supporting the mandatory requirements of a stage 4 Functional Safety Assessment (FSA).

We can help evaluate and improve existing management systems and procedures or provide templates for best practice management systems. Leadership and workforce engagement play a key part in successful delivery of PSM / FSM programs and we can help with leadership models and developing an effective safety culture.

Risk assessment
Understanding major accident hazard risks that are present in an operation is vital to managing them effectively, so this is one of the key areas of process safety management. There are many types of risk assessment and they are applied throughout the lifecycle of a production process during conceptual studies, detailed design, before start-up, and periodic intervals during normal operation and importantly when any significant change impacting a process occurs.

- PSM system audit
- Deep dive audit
- Specialist technical audits
- Functional safety assessments
- Process Safety Performance Indicators (PSPI) barrier dashboard
- Incident Investigation (RCA)
- Bowtie analysis
- PSM / FSM systems compliance audit
- Functional safety fingerprint (stage 4 FSA)
- Project HAZOPs
- Retrospective Hazard Reviews (HAZOP)
- Process Hazard Review (PHR)
- Risk quantification
- Consequence modelling
- Occupied Building Risk Assessment (OBRA)
- Environment risk assessment (CODIF)
- HAZOP / risk assessment action close out
- Static hazard assessment
- Functional safety (IEC 61511)
- SIL determination (LOPA)
- Bowtie analysis
- Human factors
- Human error probability
- Cyber security risk assessment (IEC 62443)

Implement
- Alarm management
- Bowtie analysis
- Functional safety (IEC 61511)
- Achieved SIL
- SIL testing
- Operational human factors
- Electrical, control and instrumentation assessment
- Radio frequency assessment
- Electrical power system reviews
- Hazard area management (ATEX / DSEAR)

Design and engineering
- Human factors integration plan
- Safety critical task analysis
- Control room assessment
- Integrity management
- Emergency response
- SCE barriers - performance standards
- Relief and flare assurance
- SIL 3 capable safety devices and controllers for SIS (IEC 61508)
- TÜV Rheinland SIL 3 certified SIS project execution and healthcare centres
- Compliance audits and assessments; to confirm that systems are operating as designed
- Deep dive audits and assessments; to confirm in detail that the key risk controls for specific major accident hazards are being managed effectively

Sustain and improve
- PSM / FSM systems, policies and procedures
- Human factors integration plan
- Safety critical task analysis
- Control room assessment
- Integrity management
- Emergency response
- SCE barriers - performance standards
- Relief and flare assurance
- SIL 3 capable safety devices and controllers for SIS (IEC 61508)
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What ABB offers

The following automation and safety system agnostic software applications are available to support our customers process safety processes and the delivery of ABB process safety services.

Operational Risk Dashboard (ORD)

- Structured approach utilizing existing organisational/process and functional safety and operations and maintenance management systems, industry and regulatory research reports and extensive plant operational experience.
  - Process safety audits
  - Functional safety assessments
  - Operation and maintenance fingerprint
  - Benchmarking of proof test practices

Demand reporting

- Intuitive and time saving engineering modules for hazard identification and risk assessment focused on helping customers answer the first 2 questions (Do we understand what can go wrong? Do we know what systems we have to prevent this happening?) through the identification and risk assessing of Major Accident Hazards (MAHs) using methodologies such as:
  - Hazard and Operability studies (HAZOP)
  - Process Hazard Review (PHR)
  - Safety Integrity Level (SIL) determination
  - Layer of Protection Analysis (LOPA)
  - Risk graph
  - Fault Tree Analysis (FTA)

Bypass management

- Structured approach utilizing existing organisational/process and functional safety and operations and maintenance management systems, industry and regulatory research reports and extensive plant operational experience.
  - Process safety audits
  - Functional safety assessments
  - Operation and maintenance fingerprint
  - Benchmarking of proof test practices

Alarm analysis / KPI reports

- Structured approach utilizing existing organisational/process and functional safety and operations and maintenance management systems, industry and regulatory research reports and extensive plant operational experience.
  - Process safety audits
  - Functional safety assessments
  - Operation and maintenance fingerprint
  - Benchmarking of proof test practices

SIF performance

- Structured approach utilizing existing organisational/process and functional safety and operations and maintenance management systems, industry and regulatory research reports and extensive plant operational experience.
  - Process safety audits
  - Functional safety assessments
  - Operation and maintenance fingerprint
  - Benchmarking of proof test practices

Alarm Rationalisation Tool (ART)

- Structured approach utilizing existing organisational/process and functional safety and operations and maintenance management systems, industry and regulatory research reports and extensive plant operational experience.
  - Process safety audits
  - Functional safety assessments
  - Operation and maintenance fingerprint
  - Benchmarking of proof test practices

SIF Designer

- Structured approach utilizing existing organisational/process and functional safety and operations and maintenance management systems, industry and regulatory research reports and extensive plant operational experience.
  - Process safety audits
  - Functional safety assessments
  - Operation and maintenance fingerprint
  - Benchmarking of proof test practices

Human Reliability Analysis (HRA) tool

- Structured approach utilizing existing organisational/process and functional safety and operations and maintenance management systems, industry and regulatory research reports and extensive plant operational experience.
  - Process safety audits
  - Functional safety assessments
  - Operation and maintenance fingerprint
  - Benchmarking of proof test practices
Working with ABB

We can help operating companies with every aspect of managing process safety.

We can take full responsibility for activities or provide advice and support in delivering tasks.

Process safety needs to be considered throughout the asset lifecycle; design, construction, operation, maintenance, modification and closure.

At all stages of our involvement we work with customer teams to ensure we maximise the use of local operational experience and to share our skills and experience. This approach provides optimum solutions by combining best practice knowledge with a true understanding of operational needs. We also find that operating teams benefit from our approach by gaining a better understanding of the risks and risk controls in the process.

“An excellent piece of work and I am certain that in the future this will be seen as a key milestone document in the management of alarm systems.”

Instrument and Control - Technical Authority, Oil and Gas Operator

Where to start?

Any operating company looking for a partner to work with, helping to drive process safety performance needs to have absolute trust and confidence in that partner: the partner needs expertise across all relevant areas of safety; they need to understand the process and PSM systems and they need to be responsive etc. This trust has to be built up over time and through experiences of working together.

ABB’s first engagement with a new customer can come about in many ways and typically involves the delivery of one or more of our services from around the safety lifecycle; e.g. a risk assessment for a new project, support in investigating a specific issue or incident, a training course, an alarm management health check. However we get started, we will be there to support the full beneficial implementation of a solution. Once a good relationship is developed we can look to build a broader partnership and would typically start with an overall assessment of PSM - to develop a prioritised and risk based improvement plan, built around site risks, capabilities etc.

Why choose ABB?

ABB’s operational heritage allows us to understand the practicalities of operational environments so we can offer pragmatic solutions.

Robust PSM systems delivered cost effectively is an operational goal that requires effective people, plant and processes working together. Plant and equipment must be of an appropriate design, to the right standard and be adequately maintained. Procedures and systems must be fit for purpose and practicable. People must be competent, well led and work within a positive culture.

A key contributor to developing competency is the extensive programme of technical training and events that we run, attended by over 3,000 delegates each year. All courses are run by experienced tutors, with many years of experience. Many of our courses are accredited by professional bodies such as the Institute of Chemical Engineers (IChemE). Our highest feedback ratings are for the practical knowledge of the tutors and the interactive nature of the practical case studies used on the courses.

Our approach is always risk based, putting effort where it is most valuable and not applying the same level of detail in all cases. This ensures that work is carried out efficiently making best use of busy operations and technical staff.

The ABB approach to process safety is built on achieving sustainable risk reductions, through delivering proven solutions that can be practically implemented in potentially hazardous operations.

One of the keys to ABB’s success is our people - their experience, knowledge and desire to do an excellent job for their customers. ABB’s consultants and engineers are widely respected as thought leaders in process safety: developing new methodologies and approaches, presenting at key industry events, sharing their considerable learning and experience from working across many hazardous process operations.

“ABB contacted me last week informing me that the HAZOP found a high risk action that they wanted to make us immediately aware of. This excellent spot enabled us to take immediate action and send the relevant information to the offshore asset within 24h.”

Process Engineering Supervisor, Upstream Oil Production