Hazard identification and risk assessment
For the hazardous process industries
Overview

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

This is essential for:

- Protecting their people
- Protecting the local community and environment
- 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 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 Consulting 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 specialist 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 value of comprehensive risk assessments

Process risk assessment or Process Hazards Analysis (PHA) lies at the heart of Process Safety Management (PSM) and underpins many of the elements of the PSM system.

A robust and reliable risk assessment supports safe operation, but a shallow or unreliable assessment undermines the basis of safe operation. Unidentified risks can lead to a lack of protection against the hazards and leave the operation exposed.

Assessing risk robustly is not easy; too many false positives i.e. risks that are not credible, add complexity and cost to studies, but it is even more important to not miss any credible risks. Good risk management takes experience, sound processes and broad knowledge of incidents that have happened.

One of the biggest differences between a good risk assessment and a poor one is the ability of the leader to know when to ‘push’ the team harder to uncover issues and when to move on in order to make progress.

The elements of a good risk assessment include:

- Clearly defining the risk assessment scope
- Identifying the most suitable approach and methodology
- Engaging the right team - The team should collectively have good knowledge of the design detail and intent; process knowledge, detail of operating practices, ways of working etc.
- A strong leader who can identify any lack of certainty or knowledge, have no conflict of interest with timescales for completing projects, withstand pressure to cut corners
- Recording any follow on actions (e.g. a LOPA or relief calculation following a HAZOP) in a way that helps the completion of those actions effectively and efficiently and passing on the intent of the risk assessment team
- Accurately assessing consequences
- Accurately assessing likelihood
- Provide thorough risk evaluation - following the hierarchy of risk control principles and ALARP principle
- Recording findings in a clear, auditable way including thorough consideration of human factors

Risk assessment covering major accident hazards is also a legal requirement under the Safety Case Regulations 2015 and under the Control of Major Accident Hazards (COMAH) regulations 2015. Risk assessment is also an effective business improvement tool supporting continuous improvement. Rigorous risk assessment can also lead to a reduction in insurance premiums.
What ABB Consulting offers

A key factor for an effective risk assessment process is the selection of the most appropriate technique.

Hazard studies including HAZID and HAZOP
A rigorous team based study to identify credible hazards and assess their likelihood and consequences. Used for new designs, modifications and periodically to review existing operations. ABB conducts a whole series of hazard identification studies from the early R&D phase through to ongoing operation. Every project gives unique challenges and we can help you to select the right study. ABB's hazard study methodology has been developed and refined over many years, building upon our experience of countless studies and learning from international standards and industrial incidents from around the world.

Process Hazard Review / Environmental Hazard Review (PHR / EHR)
A team based hazard identification and risk assessment technique for existing operations. A system-by-system approach that focuses on significant loss of containment, release of energy hazards and environmental performance. Making good use of operational experience, PHR requires significantly less time than performing a full HAZOP.

Retrospective HAZOP
HAZOPs can be applied retrospectively to existing facilities in order to revalidate the process design and operation. These in-depth studies are required by companies concerned about the robustness of their current risk control measures, and wanting re-assurance that all aspects have been considered.

CHAZOP
A team based methodology utilising structured reviews to examine potential hazards from failures of Basic Process Control Systems (BPCS), used where complex control systems need to be evaluated.

SIL determination / LOPA studies / HAZAN
We have a highly structured approach to Safety Integrity Levels (SIL) determination for Safety Instrumented Systems (SIS), involving an initial assessment using a calibrated risk graph in order to screen out ungraded systems. This is followed by the use of Layers Of Protection Analysis (LOPA) for SIL rated systems with a fully quantified hazard analysis for high risk scenarios deploying fault tree analysis.

Quantified Risk Assessment (QRA)
Used when a detailed analysis of particular risks is required e.g. for the most severe risks or where risks have to be confirmed to be ALARP.

ATEX / DSEAR
Assessing the risks relating to equipment operating in potentially explosive atmospheres. We carry out area classification studies and risk assessments of both mechanical and electrical equipment.

Human factors risk assessment
Focused on safety critical operating and maintenance tasks that contribute significantly to the risk of major accident hazards, either as initiating events or as responses to the escalation of an incident. We provide a range of qualitative techniques including ‘human-HAZOP’ and quantitative methods including ‘HEART’.
**Consequence modelling**
Used to estimate the extent and severity of hazardous events. This technique is required to assess the impact of fires, explosions and toxic releases. ABB carries out these studies using industry standard modelling software.

**Bow tie analysis**
Safety Critical Element (SCE) / barriers, that protect against major incidents are often displayed in the form of a bow tie diagram, which is a clear and simple way of communicating the key SCE’s in an operation. We build up the ‘bow tie’ using fault and event trees using industry standard software.

![Bow tie diagram illustration](image)

**Occupied Buildings Risk Assessment (OBRA)**
We provide a complete range of services to carry out an occupied building (facility siting) risk assessment identifying what, if any, improvements to buildings are required, and then demonstrating the basis of safety for the occupied building in accordance with CIA (UK) and API (US) guidelines. We can also design required changes to the building if required.

**COMAH risk assessment**
We provide HAZID leadership, selecting major accident hazard representative sets and undertaking ALARP assessments and cumulative / societal risk assessments forming part of the predictive aspects section of COMAH safety reports.

**Action close out**
Most risk assessments generate a large number of actions particularly on operational assets that often lack the resources to effectively manage all the actions. In the UK and overseas regulatory reviews of PHA programmes highlight that many actions remain unresolved or uncompleted. ABB provides an action close-out service using rigorous project management procedures to ensure that actions are effectively closed out in a timely manner and at the same time meeting the need to demonstrate compliance with ALARP.

**Training**
We offer a broad range of training in risk assessment techniques. [www.abb.com/uk/consulting/training](http://www.abb.com/uk/consulting/training)
Hazard Identification and risk assessment
A vital component of PSM

ABB supports all areas of Process Safety Management (PSM).

While risk assessment is at the heart of effective PSM it is only the start of the process. Having assessed a risk for a new or existing facility and determined the need for a new safeguard, it still needs to be designed, installed and have people trained in its operation and support. ABB supports all parts of the lifecycle for safeguards, assessing the benefits, designs to meet required standards, installation, training people, and auditing effectiveness.

PSM policy and systems
ABB helps to select the optimum PSM policies, systems and goals. We do this by providing advice, knowledge of industry best practices and performance, our experiences of similar programs and an independent and realistic view of current state and progress.

License to operate
We support full technical authoring of safety cases (or COMAH reports), completing specialist sections, providing data for reporting requirements, helping to prepare for regulatory inspections etc.

Protective systems
ABB provides services for individual protective systems or across all of the layers of protection for a particular event. Our services include; designing systems, checking / reviewing existing designs or new ones done by others, providing design procedures & standards & training, providing maintenance & testing procedures, performing barrier health checks or tests.

Sustaining and improving performance
Having put an effective process safety management system in place it is important to review this on an ongoing basis to make sure it is working as intended and that it is still fit for purpose. ABB supports auditing, performance measurement, incident investigation and PSM systems review.

“The various components of the ABB offer results in a fully fledged and very pragmatic management system around PSM. ABB always strives to make sure you get what works. Highly experienced and articulate team members are always contactable and this helps greatly when there are issues”

Process Safety Director, Steel Producer.
Why choose ABB?

ABB’s team of process safety risk assessment leaders have vast industrial experience across the process industries and receive extensive formal training, coaching, mentoring and competency validation.

Our process safety consultants have extensive industrial experience across a range of industrial sectors, meaning that we have seen many hazards and know what is credible and not credible. This experience is used during studies to suggest additional risk areas that the team may not identify or to ensure that time is not wasted on scenarios that are not credible.

ABB’s leaders ensure that

- The most effective risk assessment technique is selected
- Pragmatism is applied with the focus on major accident / high risk scenarios
- Assessment records and associated recommendations are clearly and concisely recorded
- The principles of ALARP are fundamental to the risk assessment
- Human factors are covered comprehensively as part of the risk assessment

We are able to apply our own methodologies or use our client’s methodologies.

Our consultants are also experienced in managing meetings to know when and how to dig deeper to test safeguards or uncertainties. This is one of our key values.

We deploy proven methodologies, meaning not only that outcomes are robust but also allowing the next steps to be taken without losing time or understanding of the risks. Our processes are designed to work together with all areas of PSM.

“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