



**ABB Eutech's Support to
Process Safety Management (PSM)**

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1 THE NEED FOR PROCESS SAFETY MANAGEMENT (PSM)

Operators of process plant all over the world have a duty to ensure that the health and safety of people who may be affected by their operation are safeguarded. In many countries the regulatory authorities demand that operators provide evidence that the potential for incidents which could adversely impact on people or the environment are identified, are understood, that adequate measures are in place to prevent, as far as reasonably practicable, such incidents occurring and that provisions are in place to limit the consequences.

Responsible operators from many different countries generally recognise that in order to carry out this duty in a sustainable way a holistic, systematic and methodical approach is required. Effective PSM ensures that all aspects of operations essential to safety are properly designed, constructed, tested, operated, inspected and maintained.

ABB Eutech, a group specialising in a range of consulting services in manufacturing operations and engineering, is able to support its Clients in all aspects of Process Safety Management, in part based on the collective experience that developed within the ICI Group going back over many years.

2 PROCESS SAFETY MANAGEMENT & REGULATORY REQUIREMENTS

ABB Eutech's approach to PSM is founded on the experience of ICI as a global chemical company with operations in countries all over the world. It has for many years been a leading force in the development of systems and tools to assure safety. For example, ICI were the pioneers in developing HAZOP, now widely used in many industries to help design safe plant. The challenge of ensuring consistent high levels of performance in many different cultures and regulatory environments has demanded that ABB Eutech's system is robust, effective and simple to use.

Following major incidents many nations have, over recent years, developed legislative frameworks for regulating the process safety area. Notable regulatory requirements are those of the United States OSHA 1910 Regulations and the European Community contained in European Directive 96 / 82 / EC, the 'Seveso II Directive', (implemented as the COMAH Regulations in the UK).

All have very similar overall objectives in demanding that operators demonstrate that they are undertaking their duties of care for safety in a proper manner.

ABB Eutech's approach to PSM, originally developed and refined in ICI, has a proven track record of meeting the needs of all these regulatory requirements.

3 ABB EUTECH & PSM

Over many years companies operating major hazard assets have been committed to continuous improvement in their approach to the management of process safety. This led to the development of safe systems of work for both operations and maintenance including Permit To Work systems, Modification Control Procedures etc. In the early 1970's the drive to improve the inherent safety of plant and processes led to the development of systems and techniques to enhance the safe design and operation of new or modified process plant, the most widely known development being that of HAZOP in ICI. As ICI gained further experience with these approaches it recognised the need to develop a more comprehensive and adaptable set of techniques. More recently the need to provide periodic safety assurance for existing plant has led to yet further developments and these tried and tested procedures and tools have been integrated into a complete system to provide effective Process Safety Management. Via its roots in ICI, ABB Eutech have been at the forefront of leading these developments and, via its consultancy services to its wider client base, has worked to continue to develop them and adapt them to different client needs. PSM is built around twelve key elements which are described below.

3.1 Process Safety Information

Provision of information critical to the safety of the process is the foundation for effective PSM. This requirement will cover information on materials e.g. toxicity, flammability etc.; information on the process itself e.g. inventories, process technology and information on the equipment being used e.g. pressure systems. ABB Eutech has developed a comprehensive checklist-based methodology for identifying key information needs at the earliest stage of any process development or change. In addition, ABB Eutech has extensive access to databases and expertise covering a wide range of materials, process technologies and process equipment.

3.2 Process Hazards Analysis (PHA)

PHA, including the necessary prerequisite of hazard identification, is already widely in use in industry. PHA is essential if the potential for incidents and their consequences are to be fully understood. From hard-earned experience ABB Eutech recognised that analysis of process hazards cannot be effectively carried out using a single tool in all circumstances. As valuable as HAZOP is, the need for tools to address hazards at the earliest stages of projects and to undertake reassurance of existing plant has led to the development of a range of flexible methodologies.

Developed tools include the eight stage Hazard Study Methodology, PHR and risk screening. The techniques combine a mixture of What If, Checklist, HAZOP, Failure Mode & Effect Analysis (FMEA) and fault trees to suit the needs of the problem. An implicit feature in all the techniques is the ability to track actions through to satisfactory completion and where necessary includes the design and support of HSE critical engineering controls.

ABB Eutech are able to provide both consultancy and training in the application of these techniques which will enable customers to ensure that their teams are able to undertake these requirements in the medium term.

3.3 Operating & Maintenance Procedures

The provision of 'operator focused' operating procedures to sustain safe operation during normal and emergency situations is easily understood but harder to deliver. Our engineering team have extensive experience of operations which allows us to audit and help develop procedures which will ensure that operations teams are left 'in control'.

An equally important area, but often overlooked, is the need for procedures to ensure safe maintenance. As plants increasingly operate with integrated teams the expertise developed in ABB Eutech over the years in generating effective operating procedures is used to good effect in providing maintenance procedures. This aspect is closely linked to the provision of safe systems of work.

ABB Eutech work with clients to help demonstrate to the authorities that critical equipment is managed in line with the necessary Regulations and good practice. In many cases, ABB

Eutech have identified opportunities to reduce the impact of legislation on manufacturing yet improve equipment performance and maintenance practices.

ABB Eutech work at all levels in the client organisation to deliver benefit, tailoring our proven approaches to incorporate client experience.

ABB Eutech have helped many companies improve the effectiveness of their maintenance activities by addressing:

- Maintenance assessment – how effective are existing practices and organisation, and what are the key areas for improvement?
- Maintenance strategy – how maintenance activities are managed in an integrated way to provide the focus and common understanding for improvement
- Maintenance organisation development – establish a reliability-focused, competent and motivated team.
- Maintenance optimisation – improve equipment reliability by establishing cost-effective maintenance practices
- Turnaround excellence – reduce turnaround durations and maintain the right equipment at the right time

3.4 Safe Systems Of Work

Many of the activities undertaken on process plants can have the potential to cause unsafe events. A key safeguard is the provision of systems for the control of work, such as hot work permits, permits to work, entry into confined spaces. ABB Eutech has developed templates for these safe systems, which are proven across the world and readily tailored to suit the local need of an operator.

3.5 Management Of Change

Worthy of special attention is the need to ensure that modifications to the plant, the process or its operation (including systems, procedures and organisational aspects) do not lead to the degradation of the safety envelope. ABB Eutech offers a proven approach to the

'Management Of Change'. One of ABB Eutech's consultants has been responsible for leading the production of the training package 'Modifications - The Management Of Change' for the UK's independent professional body, the Institution Of Chemical Engineers.

3.6 Contractor Control

The increasing use of contract resource in the process industry not only creates a wider group of people to be advised on the potential hazards in the plant and process but often the nature of their work gives them the potential to be the cause of an incident. The duty of care to contract staff is, as a consequence, onerous and demands the provision of effective training and information. In some countries legislation now demands specific requirements to be met (e.g. CDM Regulations the UK). ABB Eutech have extensive experience in the safe management of contract staff undertaking a wide range of complex and hazardous activities.

3.7 Pre Start Up Safety Review

One of the most hazardous times for process plant operation is during start up, whether during commissioning of a new plant or equally during a start up after a major shutdown. As part of ABB Eutech's Hazard Study Methodology, a structured checklist-based procedure for this critical phase is offered, which has been proven in a wide range of industries.

3.8 Mechanical Integrity

Clearly a major contributor to the safety performance of process plant is the mechanical integrity of the plant and equipment. This is influenced by the quality of design as well as the ongoing maintenance and inspection once in service. Consultants within our team are experts in all aspects of pressure systems, machinery and structural systems from both a design and maintenance support role. These skills are backed up by structured systems to ensure a sustainable safe performance from critical machines and pressurised systems. ABB Eutech's consultants have been extensively involved in the drafting and implementation of pressure systems regulations to meet European legislation. The expertise available from our in-house in-service inspection team and materials laboratory provides customers with a unique one-stop shop for all aspects of mechanical integrity assurance.

ABB Eutech have extensive experience of helping clients set up cost effective mechanical integrity programs. Using risk based approaches, we work with clients to identify the critical equipment items and systems and ensure appropriate steps are taken to improve equipment reliability and reduce likelihood of failure. By using appropriate, focussed inspection techniques, the effectiveness of inspection programmes can be improved, whilst ensuring effect on operations is minimised. In addition, many clients have benefited from our capabilities in fitness for service assessments, problem diagnosis and repair specifications.

ABB Eutech help clients improve the effectiveness of their safety critical protective systems. We have considerable experience of the implementation of the new international standard IEC 61508.

3.9 Incident Investigation

ABB Eutech's approach to safety management is one of continuous improvement. A key process for continuous improvement is effective incident and accident investigation. Much can be learned from the analysis of what did and what might have happened. When coupled with effective action implementation and communication this can be a major contributor to improving safety performance. ABB Eutech can provide both procedural guidance in establishing effective processes as well as training to help influence the organisational culture in its approach to safety.

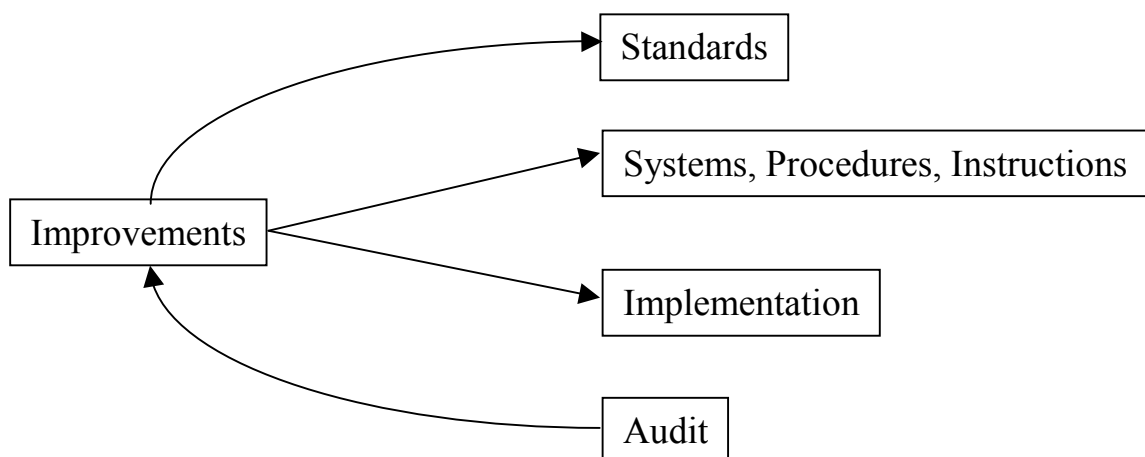
ABB Eutech use cause tree analysis as a simple yet effective technique for teasing out the basic (or root) causes to an accident. All accidents result from multiple causes, and the investigation process can become confused and disorganised unless a logical framework is used to structure the analysis and separate out the basic causes. Cause trees provide this logical framework.

It is effective during the three stages of an investigation. Firstly in helping the investigator to structure the questions and approach to find out relevant facts and pinpoint which areas need deeper investigation, secondly to help the investigation team to focus on immediate and basic causes so that suitable remedial measure can be recommended to prevent a recurrence, and thirdly to demonstrate clearly that the incident has been thoroughly investigated.

Including a cause tree as part of an incident investigation report enables managers to quickly see the logic behind the investigation process and the relevance of the recommendations.

ABB Eutech offer a 3 hour training course to teach cause tree analysis to first-line and middle managers. It starts with a role-play exercise to identify the difficulties of unstructured investigations and issues such as accountability and blame which can easily cloud investigation meetings. After presentations to explain how cause trees are used, including advice and pitfalls to help produce trees, the course continues by examining basic causes, and the management control model as shown below:-

Management Control Model



3.10 Emergency Planning & Response

Even in the best run organisations risks can never be totally eliminated. There will always be a need to establish effective contingency plans in the case of an incident occurring.

Linked with the hazard study process, ABB Eutech can identify and assess accident and incident scenarios, often using appropriate consequence assessment models. ABB Eutech's gas dispersion software DISCOVER is specifically tailored for emergency planning purposes and can be used to model accidental releases in real time, based on stored scenarios and actual wind / weather conditions, especially for more sensitive locations such as schools, hospitals and old peoples' homes.

ABB Eutech's alliance with LINK Associates Ltd enable us to offer a fully comprehensive service in structured techniques for emergency planning and response as well as in emergency response training, via LINK's simulation facilities based at Derby.

3.11 Compliance Audit

Implementing PSM is not a small undertaking and is not a once-off activity. A key attribute is that it is sustainable and indeed can be improved continuously. A vital activity which drives the improvement is auditing. ABB Eutech's PSM offer includes extensive guidance on best practice in auditing and the procedures and guidelines that can be made available are themselves designed to be audited. ABB Eutech's consultants are trained auditors and are able both to help identify areas for improvement as well as helping to develop the client's own capability to undertake internal auditing.

ABB Eutech offers a programme of periodic site surveys, audits and assessments to facilitate management system improvement programmes. ABB Eutech offers a broad spectrum of specialist audits covering key areas of HSE and asset management. ABB Eutech consultants are experienced System and Compliance Auditors.

3.12 Training

However good any arrangements for PSM are and however comprehensive the associated procedures and guides, the system in the end succeeds or fails dependent on the quality of the implementation. Probably the most vital element to ensure success is effective training. This can range from general training seeking to raise commitment and a change in cultural behaviour toward safety. Equally it could take the shape of detailed technical training in tools and techniques for say, HAZOP. ABB Eutech have a long history in providing a wide range of training and development events in all aspects of Process Safety Management. These events, which can be tailored to suit an organisation's needs, are based on best practice, are highly interactive and seek to have a direct effect on the delegates performance in the workplace. The role of on going support and mentorship is a key aspect of the developed programmes.

4 INTEGRATED PSM FRAMEWORK

A key strength of ABB Eutech's PSM portfolio is the capture of the entire system within an integrated documentation framework. This framework contains policies, procedures and guidance and is implicitly designed to provide a system that will support continuous improvement. In essence this framework forms the overall structure within which the key elements of PSM can be implemented and against which comprehensive compliance auditing can be carried out. Each of the aspects covered above can be addressed on an individual basis but there are many proven benefits available from an integrated approach.

5 FURTHER SPECIALIST EXPERTISE

Many of the elements of PSM are supported by other specialist expertise within ABB Eutech. For example in the area of fire safety ABB Eutech is able to provide both consultancy in best practice, specialist auditing as well as training and documentary support to tackle this important topic. Other specialist topics include pressure relief and hazard studies.

6 WHAT ABOUT HEALTH & ENVIRONMENT?

There is increasing recognition that the issues tackled in implementing PSM are also relevant to safeguarding the occupational health of employees and the environment. A combined approach to Safety, Health and Environment has proven to be highly effective in many organisations. A further strength of ABB Eutech's PSM portfolio is that it is readily extended to cover all the essential elements forming part of an integrated Safety, Health & Environmental Management System.

7 HOW CAN ABB EUTECH HELP?

Any or all of the elements above can be provided, in essence ABB Eutech can provide:

- i) consultancy to help examine existing arrangements and help provide a benchmark together with options for improvement.
- ii) consultancy, training and support to implement any of the elements of the portfolio or issues that customers face arising from managing process safety.
- iii) help in implementing comprehensive arrangements for PSM in a structured and phased manner into any organisation.

The benefits to ABB Eutech's customers from use of the ABB Eutech's PSM services are:-

- 1 ABB Eutech is able to tap into the vast array of knowledge and learning on safety management that has been developed over many years in one of the world's largest chemical companies. which means customers can be assured that it is tried and tested.
- 2 ABB Eutech is able to provide a one-stop shop to help provide all aspects of PSM to suit specific needs. This means there is no need to manage a vast array of potentially confusing and conflicting advice.
- 3 Our expertise has been developed and applied in real practical process environments both as operators and advisors. This ability to view things from a real operational perspective means the solutions we will provide will be of immediate application and benefit.

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