

Power station risk assessment

Following incidents such as the BP Texas City and Buncefield Explosions in 2005, there is growing concern in the power generation sector that similar major accidents could occur.

Background

Process safety is very important on power stations due to hazards such as: fires or explosions following loss of fuel, explosions in high pressure steam equipment, catastrophic rupture of high speed machinery, or explosions in HV equipment. Such events have the potential to cause multiple major injuries or fatalities on-site or off-site, in addition to serious damage to equipment and extended loss of production.

Scottish & Southern Energy (SSE) recognised the need to carry out detailed process safety risk assessments at their Peterhead power station. They wanted to identify potential hazardous events and assess the adequacy and robustness of their risk reduction measures. This information and the associated action plan would provide a platform for improvement across the power station and help with development of key risk control procedures within the Process Safety Management (PSM) system. A major concern was the time required using a familiar technique such as HAZOP and the fact that busy operations staff would need to be heavily involved.

SSE talked to ABB Engineering Services about their unique Process Hazard Review (PHR) technique that was developed in the early 1990's for the rapid assessment of process safety hazards on existing plants. PHR has been used extensively on plants throughout the process industries and particularly in recent years for sites coming under the COMAH regulations. It provides a detailed yet high level assessment of the whole process, focussing on areas of concern and helping to demonstrate continuous improvement in process safety. ABB has used PHR successfully within the power generation sector, and made developments to include assessment of high voltage power systems.



SSE is now working through a prioritised action plan for the Peterhead site that will provide an assurance that process safety risks are under suitable control.

Benefits

- Rapid identification of process safety hazards across the entire power station
- Assessment of current safeguards and development of a list of prioritised recommendations for reducing risks to as low as reasonably practicable
- Efficient use of busy operations staff whose detailed knowledge was essential in ensuring that concerns were identified
- Agreed review methodology that can be applied consistently across all power stations owned by SSE
- Use of the structured PHR technique that is well proven throughout the process industries and valued by the regulatory authorities



Solution

ABB provided a PHR leader and scribe to work with a team of SSE staff over a 4 week period covering all process systems on the Peterhead site. The SSE team consisted of knowledgeable operations and technical staff with day-to-day experience of the systems under review and a wider understanding of standards at Peterhead.

Following an initial site tour to gain an understanding of the scale of operations, a team scope meeting explored the nature of process safety hazards on the site and identified shortfalls in the overall management arrangements. For example, a concern was raised over the standard of the process piping and instrumentation diagrams. These drawings are an essential element of process safety information and a recommendation was raised to update the existing drawings to 'as-built'.



The main part of the PHR involved a structured review of each process system on the power station, starting with the high pressure gas supply. A set of guide words was used to help the team identify credible ways in which hazardous events could occur, mostly related to loss of containment or sudden release of energy. For each event the severity of the possible consequences was assessed, considering harm to people, the environment or damage to SSE assets / reputation. The full range of measures to prevent, control and mitigate each event were then assessed to ensure that they are robust and fit for purpose. This stage gave the opportunity to identify any key concerns with the existing layers of protection and make recommendations for improvement.

Each scenario identified on the PHR was rated for severity and likelihood using the SSE standard word models and risk matrix calibrated to SSE corporate tolerability of risk criteria.

This helped to prioritise the recommendations raised by the team, with 1 scenario rated 'very high' risk, 61 at 'high' risk, 214 at 'medium' risk, and 81 at 'low' risk. High risk issues were raised on the following systems reflecting the high hazard potential:

- Gas supply and pressure reducing station
- Heavy fuel oil receipt from jetty and circulation
- Fuel gas supply to gas turbines
- Hydraulic and lube oil systems
- Steam raising systems and steam turbines
- Fuel gas and oil burner systems
- Hydrogen system
- Demin treatment chemicals
- Site transformers and LV/HV switch rooms

SSE is now working through a prioritised action plan for the Peterhead site that will provide an assurance that process safety risks are under suitable control.

“We were very pleased with the way the study was conducted and the quality of the results obtained in so short a timescale”.

For further information please contact:

ABB Engineering Services

Daresbury Park Business Centre
Daresbury
Warrington
Cheshire, WA4 4BT
United Kingdom
Phone: +44 (0)1925 741111
Fax: +44 (0)1925 741212
E-Mail: contact@gb.abb.com

www.abb.com/consulting

ABB Engineering Services as part of ABB Global Consulting provides technical services to improve performance in the areas of compliance, operations and engineering to customers in the chemical, petrochemical, oil & gas, power, life sciences, metals and consumer industries worldwide.