The client runs an oil and gas reception terminal which acts as a hub-process to a multi-installation complex. Any failure in this facility clearly has a major impact on every installation it serves, not to mention its own profitability. After a recent, unplanned, three-day outage, management had concerns about the plant’s overall vulnerability and the possibility of unknown or unexpected issues causing other, similar incidents.

Even after conducting a number of specific studies in the issue, the client still had concerns about vulnerability and exposure to unplanned events. They needed to identify and confirm necessary expenditure as quickly as possible, as plans had already been provisionally drawn up. Confirmation that they were focusing on the right areas was also of great importance to them, as was identification of all vulnerabilities (within reason) and their being catered for within the budgets.

Another need for speed on the project was driven by the fact that a major shutdown was coming up and the client wished to incorporate any recommendations or actions into the pre-shutdown planning already taking place.

ABB were asked to provide an independent evaluation of their approach and plans.

“ABB showed an excellent and in-depth understanding of the issues and our requirements, worked with us at short notice to tailor a study to meet those requirements and delivered a wide-ranging study as promised to a demanding timescale.”

Solution
ABB have vast experience in evaluating and benchmarking performance using a variety of studies such as:

- Reliability-centred maintenance studies
- Failure mode effect analysis
- Asset health and care studies
- Criticality assessment studies
- Asset life and Risk Based inspection (RBI) studies

These studies aim to discover the current position against standards they apply, highlight any gaps and generate an action plan to implement improvements.
Many of the approaches used in these circumstances are bottom-up by necessity, as they gather detailed information and build up to conclusions based on conventional thinking. The approach required at this client’s facility, however, was different. They already had the necessary detail and they also possessed a very good understanding and control of maintenance, inspection philosophy and routines. Many critical items had been inspected and re-inspected. There was little the client didn’t know about them, despite the fact that the recent, unexpected shut-down had shown that the plant was vulnerable to one-off failures.

The client needed to know what they didn’t know: would the facility function robustly and reliably? Our experience of other studies and our knowledge of the facility and its immediate circumstances told us that a top-down approach and a rapid response were needed.

To deliver this study within three weeks required a radical approach. Key people’s collective knowledge had to be utilised, perceptions and views had to be challenged and the areas where there was less knowledge and understanding, or where a slight change in emphasis could yield a better return on investment, all needed to be identified fast.

The study was undertaken in two phases, which ran consecutively.

**Phase 1 - Holistic review to identify key vulnerabilities**

The first part of this phase was aimed at providing an overview of the plant, the background of the issues identified by the client, and the actions they were taking.

To aid the necessarily condensed process, we split the facility into a series of ‘vulnerability streams’ in order to identify specific potential risk areas for outages.

The process was framed around six key questions for each of the vulnerable streams:

- Function of the system
- Concerns for unreliability
- Constraints of the system
- Time issues
- Perceived vulnerability issues
- What could be done to qualify or quantify the issue

Then we held workshops with facility personnel in plenary session, building on understanding which was already there, working towards identifying gaps and highlighting unrecognised areas of vulnerability.

With vulnerability streams already ascertained, their functions and interdependencies were tested and understood. The key to this part of the study wasn’t to concentrate on areas already covered by existing work by the client, it was to drill into less well-understood aspects.

**Items highlighted for further consideration were:**

- Electrical: high and medium voltage distribution, emergency shutdown and start-up systems
- Specific machines and pump issues
- Piping generally, but specifically infrastructures and utilities
- Boiler and flares systems
- Certain aspects of pressure systems
- Jetties and shipping

**Phase 2 - Detailed analysis of vulnerabilities**

This second phase involved a series of one-to-one interviews with key people in operations, maintenance, inspection and planning. It also entailed detailed examination of records and drawings, plant tours and assessments where appropriate.

Final reports which covered individual aspects, detailed findings, assumptions made and providing recommendations for action, were issued. An overall report was compiled which pulled together the common themes.

As a result of the study the client has reversed a decision that they had made to run a three-stream plant as a two-stream plant, as this was shown to lead to increased vulnerability.

The client subsequently nominated ABB for a ‘supplier of excellence’ award.

**Benefits**

- Reduced risk of unplanned downtime through a better understanding of where vulnerabilities lie
- Inspection is now driven by a risk-based inspection approach which ensures that resources are focused on the right areas
- Better budgetary planning: cost estimates and data can be fed into current and next years’ expenditure, maintenance and shutdown planning