Fundamental flaws in the process design of operating plants often lead to unacceptable risks of major accidents or losses of production. Recent incidents show that the basis of safe operations can be unknowingly undermined during plant design or modification.

Many things can contribute to design errors including:

- Creeping change - where many minor changes, perhaps not hazardous by themselves, combine to create an unsafe situation
- Design errors - made more likely by increasingly tight project timescales and complex projects with large numbers of design interfaces
- A skills shortage of experienced process safety engineers in engineering and operating companies

This leaves many operators lacking in confidence about their basis of safety.

What we offer

ABB offers an independent 3rd party review of the basis of safety for high hazard plants. The review helps to increase confidence in safe design and suggests specific actions to reduce the risks of major incidents. The risk based assessment can be carried out during the design development stage of a project or modification (FEED), the detailed design phase or while a plant is operating.

Our approach is flexible and tailored to fit a particular operations risks or requirements, but a typical approach is illustrated in the figure opposite. The assessment starts with a review of the basic process safety data, (P&IDs, data sheets, reaction data etc.), often termed Process Safety Information (PSI). In this stage we are confirming the data is adequate, consistent, produced by appropriate methods, checked appropriately etc. Where there are gaps we can generate the required data if appropriate.

In parallel the assessment reviews the safety-related philosophies and strategies for the plant. They help realise a safe design and ensure that the detail design is done in such a way as to ensure safe operation.
The review looks at the adequacy and appropriateness of these documents as well as confirming that the design follows the defined philosophy. These would often include relief philosophy, control philosophy and isolation philosophy.

We then analyse the risk assessment carried out (e.g. a HAZOP) for the design and assess whether it was adequate. We review the composition of the team, the PSI analysed and the progress in closing out actions. We also do a repeat review of some parts of the risk assessment and nodes used as part of the analysis.

Following on from the risk assessment we analyse the safeguards (or layers of protection) designed to protect against the hazards identified. These would typically include safety instrumented systems and relief & blowdown design.

Finally the review looks at the adequacy and completeness of the safeguards and we check a representative range of calculations. Other parameters influencing protection can also be included e.g. area classification, fire protection systems etc. The assessment reviews the safeguards against client and international standards as well as ABB’s best practice guidance.

Ongoing safe plant operation also requires engineering design verification and ongoing control of management of change systems etc. Some of these elements can also be included in the review. ABB understands that the design basis must be reflected in the detailed design and operating practices and recommendations are formatted to facilitate this. Additional elements may include detailed verification of piping systems, safety instrumented functions etc. Operational reviews may include offering the robustness of management of change systems, PSI updating etc.

**Recommendations and follow up**
The assessment results in a number of specific recommendations that should be carried out to improve the basis of safety. The recommendations will be assigned a category and prioritised. The categories specify how significant and how urgent the risk reduction recommendations are.

**Features of the assessment**
The assessment is a risk-based approach - where the majority of the effort is put into the areas of greatest risk. For example the level of detail checking can be adjusted to suit the situation, the level of risk involved, previous findings, the make up of the team involved, changes to standards etc.

**Benefits**
- Increased confidence in the basis of safety
- Unsafe or flawed designs identified
- Helps to meet international and company standards
- Specific recommendations for improvements
- Aids in developing safety cases for regulatory bodies
- The early identification of errors prevents costly corrections being made later in the project

**Why ABB?**
The benefits of using ABB are:
- We bring cross industry experience and knowledge of hazards
- Practical and pragmatic recommendations, based on our operational heritage
- Our experienced consultants apply engineering judgements when assessing designs and making their recommendations
- We have a full range of skills and competencies to cover all aspects of verification
- Deep technical expertise in hazardous industries
- We can also support customers in implementing recommendations