A large oil and gas company invited ABB to carry out a flare and blowdown assurance study for a Floating Production Storage and Offloading (FPSO) facility.

The need for this study arose from the operator’s global requirements for assets to meet minimum safety expectations.

To meet these requirements, ABB was asked to build and validate a simulation of the flare disposal system, modelling its behaviour under various relief and blowdown scenarios.

The aims of this study were:

- To build and validate an AspenTech Flare System Analyser (Flarenet) model for the flare disposal facility
- To provide assurance of the flare system’s design basis by using the model to identify non-conformances with the company’s practices and international standards
- To identify any integrity risks and deficiencies from pipework and relief sources within the flare system

The flare study was on a tight timescale, as it was part of a bigger safety study.

ABB understood the safety critical nature of the study and the short schedule allocated to the work.

Solution
ABB has a wealth of experience within the field of pressure relief and used a 5-phase methodology for the project, as shown below:

- Asset plan and data gathering
- AspenTech Flarenet model build
- AspenTech Flarenet model validation
- Relief and blowdown scenarios workshops and generation
- Risk and improvement action identification
In order to meet the project objectives within the time constraints, ABB identified the required design data at a very early stage in the project. This enabled the client to gather the data efficiently, allowing ABB to perform the tasks within the required schedule.

This study had a particular requirement to model a staged ground flare with a multiple curve characteristic. ABB identified a method of overcoming the Flarenet constraint, of only modelling a single curve characteristic, to enable representative modelling of the ground flare to be achieved.

ABB formed a close working relationship with the client in order to gather information for the study. This relationship was of utmost importance to the success of the project, as it allowed ABB to fully identify and meet the client’s needs and expectations.

Once all required data had been received, the Flarenet model was produced in accordance with the guidelines detailed by the client, using up-to-date relief conditions on all single source relief cases and multiple sources relief cases. As well as providing the client with a complete Flarenet model, ABB also produced a detailed model description, allowing the client to run the model in the future. Validation of the model was conducted, by an independent peer review, and a report detailing sensitivity analysis, accuracy and safety margins of the model was produced.

For each system a collaborative workshop was conducted to review the original relief scenario defined from the flare and blowdown philosophy, and to identify any new scenarios which could involve multiple relief streams in the header and disposal system.

These relief and blowdown scenarios were then run on the model, allowing the identification of deficiencies in the flare systems; such deficiencies could include relief valve inlet / outlet pressure drops, header velocities, and the suitability of the flare knock out drums. From previous identification of the client’s conformity criteria, any warnings arising from the model were reviewed. A gap report was produced highlighting a prioritised action list, any integrity risk or improvements required arising from the warnings generated and details of the worst case relief scenarios.

ABB ensured that the client was kept up to date with the progress of the project by holding monthly technical reviews. In addition, weekly summary reports were produced, outlining the latest model status, the focus for the next time period, and highlighting any issues or constraints to the project. The success of the project was defined by quality, timing, client involvement, and cost. The communication procedures outlined above ensured the client was aware of the project progress and involved in key technical decisions at all times.

**Benefits**

The benefits of this project to the client were as follows:

- Delivery of the project to the tight timescale
- Compliance with company practices and international standards
- Ownership of a complete and validated suite of AspenTech Flarenet models of each flare header system. This provided a better understanding of the flare system, interactions and potential issues under varying source loading
- Ability to use the models is the future to simulate proposed changes
- Identification of integrity risks and deficiencies along with a prioritised action list