

Skanska Whessoe

Skanska Whessoe protect LNG import terminal from unwanted pressure surge using Flowmaster

The use of CAE techniques to understand and improve piping system design is gaining acceptance worldwide. Skanska Whessoe bought Flowmaster to quantify the magnitude of pressure surges in Liquid Natural Gas (LNG) import lines for a range of operating conditions.

Robin Mellanby, Technical Integrity Manager explains “due to LNG being a boiling liquid at ambient temperatures it is transported, in this case at -167 degrees Celsius, by ship from the field and unloaded into storage tanks ready to supply the UK gas market. To keep the LNG in its liquid state we need to ensure that any rapid changes in pressure in the import lines, due to emergency operating cases such as rapid valve closure or pump trip, don't allow the vaporisation pressure of the liquid to be reached and so allowing the LNG to change state and boil. We also wanted to quantify the pressure surge at pipe support locations so that we could quantify the loads exerted due to pressure surge.”

Modelling Technique

To accurately model the fluid dynamics of the system, the Flowmaster model incorporated:



- Ship pumping system
- Unloading arms with power assisted emergency release couplings (PERC)
- Parallel 36 and 14 inch import lines with emergency shutdown valves (ESD)
- LNG Tank Farm

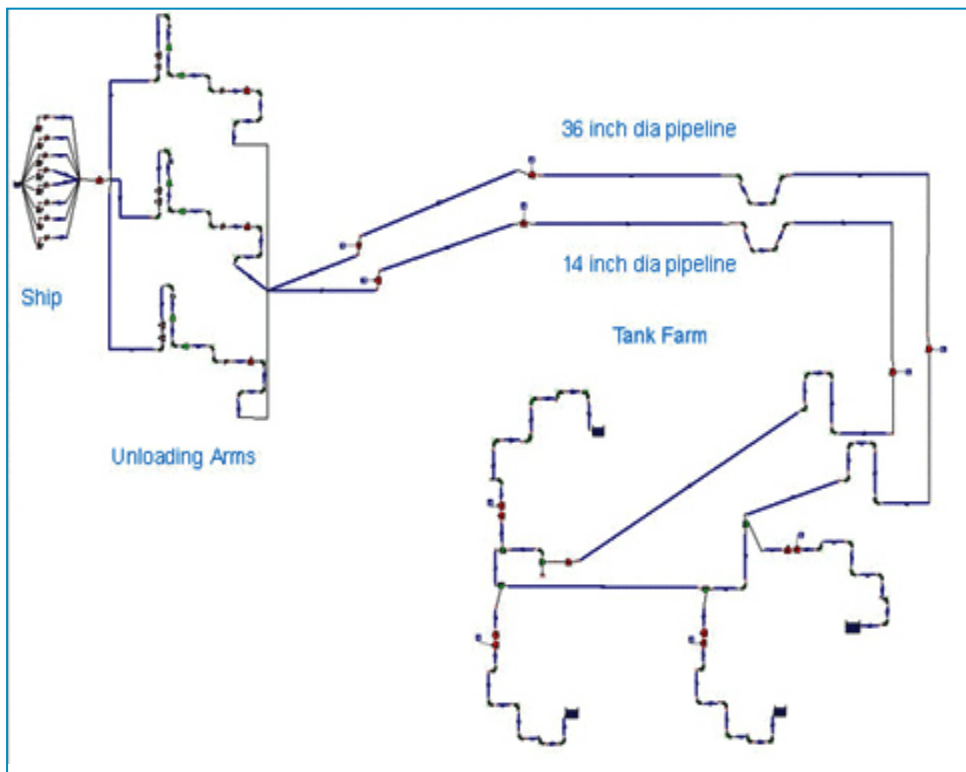


Figure 1: Flowmaster network

One of the operating cases analysed was an emergency shutdown of the system. This operating condition simulated heavy sea conditions and the event of the ship breaking away from its moorings. In this circumstance the PERC physically de-couples the three unloading arms from the ship so that no damage occurs to either the ship or the unloading platform. The rapid closure of the valve can lead to a pressure surge throughout the system both on-board the ship and in the downstream import pipeline.

To dampen the pressure surge under this condition there are ten ESD valves, three on the 36 inch pipeline and three on the 14 inch pipeline and one on each of the four storage tank feeds, that automatically close when the pressure signal from the unloading arm manifold drops below a prescribed level.

Result

After successfully using Flowmaster on this project Skanska Whessoe will be using Flowmaster as a design tool on future LNG projects.