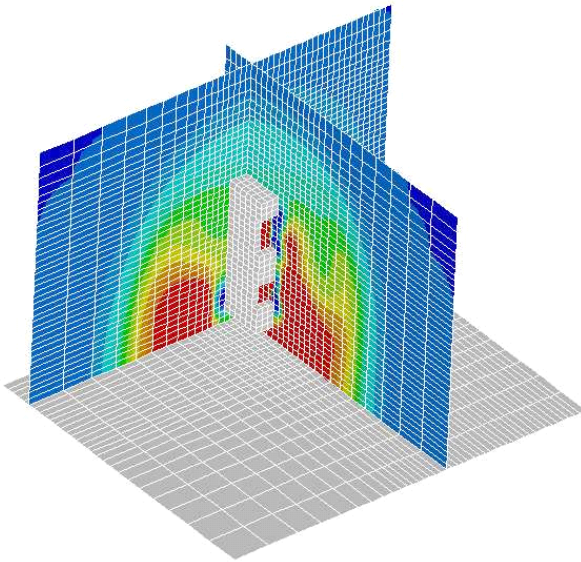


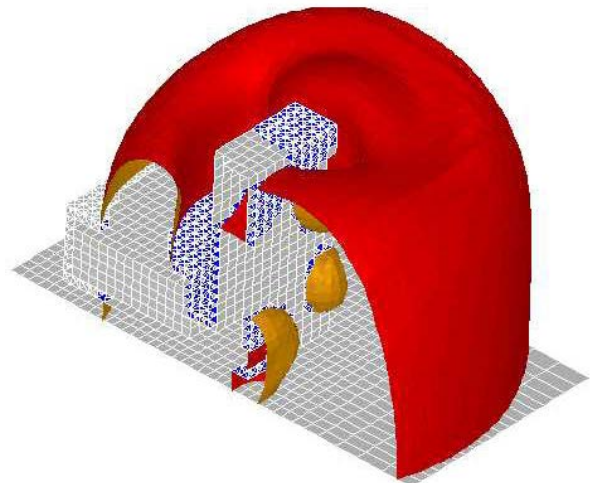
The ability to predict the potential of a vapour cloud explosion and its effects on structures and equipment is a key component in the design of oil and gas and petrochemical facilities. Knowledge of the potential risks and their consequences can be introduced early into the design cycle to ensure safety and integrity of equipment, structures, and personnel.

MMI engineering utilises tools, such as the Multi-Energy Approach, pioneered at the TNO Prins Maritus Laboratories, The Netherlands, to calculate the effects of blast loading. Starting from plant and piping layouts and knowledge of vapour chemistry and concentration, the magnitude and duration of potential blast pressure waves are determined. In cases where the blast response is dependent on structural components (blow out of panels or in heavily confined explosions), the blast calculations are performed concurrently with structural analyses. Calculations may be based on analytical solutions or, when problems are sufficiently complex, on software tools such as AutoReaGas, a finite volume computational fluid dynamics code, and structural finite element codes, such as ABAQUS and LS-DYNA.

Structural calculations are then performed using the blast load results to determine building and equipment integrity using either finite element or classical structural analysis methods. Results can also be used for assessment of, and modifications to, plant layout to reduce potential risks per regulatory or owner-specified guidelines. Our engineers have also served as expert witnesses for the resolution of litigation in this area.



Pressure contours from internal explosion following failure of structural panels



Isobar (surface of constant pressure magnitude) during blast propagation