Case Study

Pressure Vessel Design

Introduction

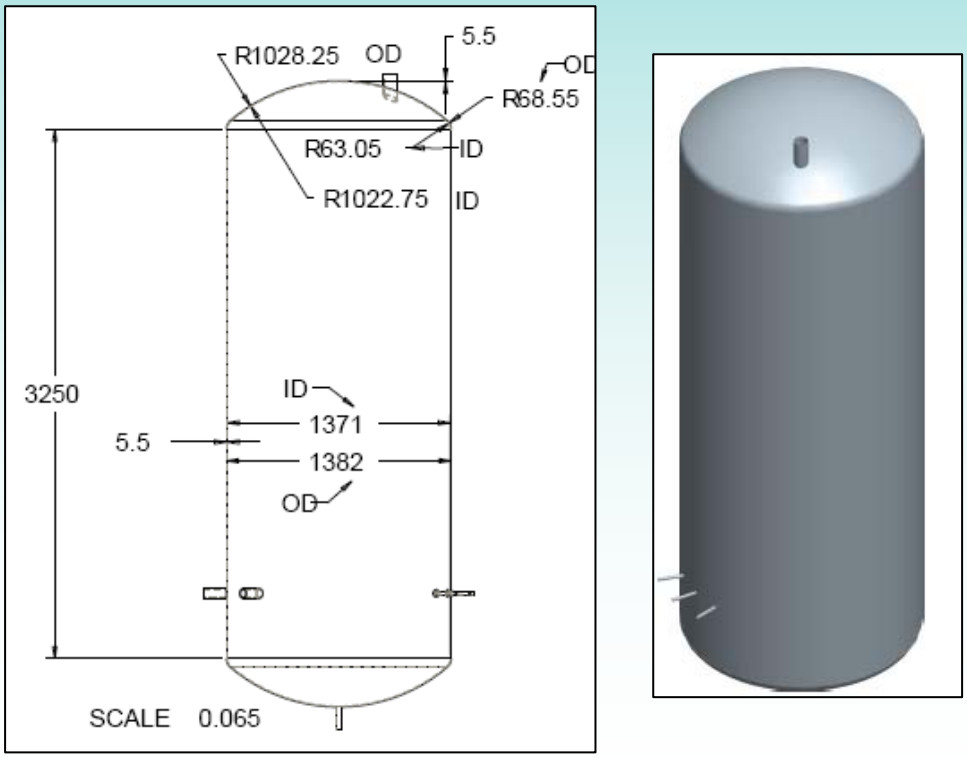
Pressure vessels are used widely in industry and they are designed according to the requirements of standard codes such as PD5500 [1] and ASME [2]. Jesmond Engineering has been tasked to design and assess various pressure vessels.

Case Study

The client supplied overall design requirements for a welded-construction steel vessel. These included:

- basic dimensions and nozzle positions
- operating fluid
- operating pressure & design pressure
- operating temperature & design temperature
- minimum capacity
- materials
- corrosion allowance

Design to PD5500 was specified, and the vessel was sized accordingly and drawn. An extract from the final drawing and a view of the CAD model are shown below.



Pressure Vessel, skirt excluded. Drawing extract (left) and CAD model (right)

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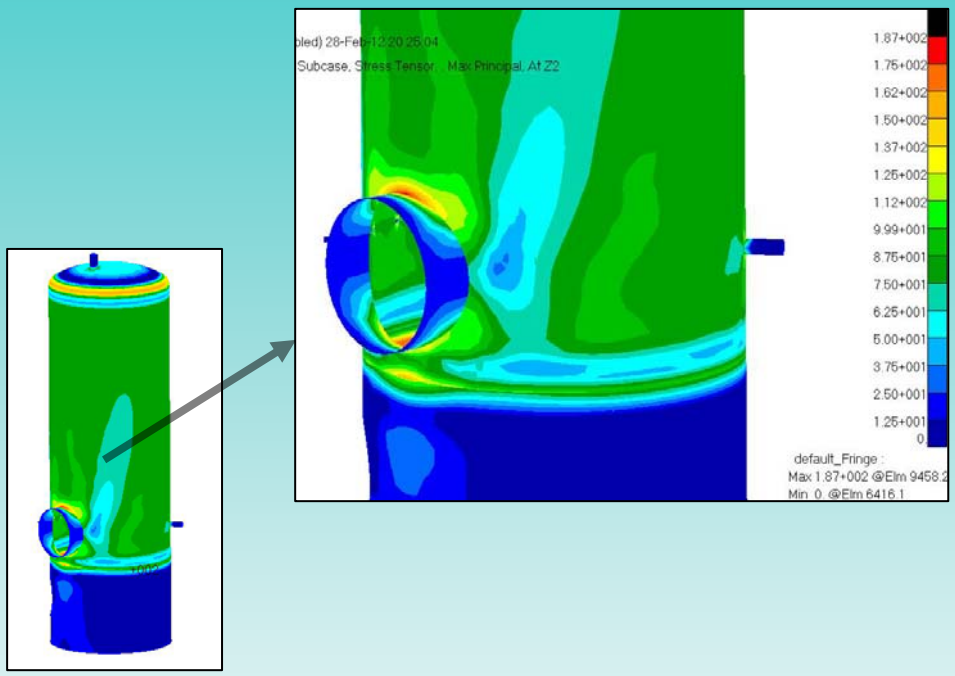
Finite Element Analysis

It was decided to check some features of the vessel via finite element analysis and an extract from the results is shown below. This demonstrated good agreement with the PD5500 analysis.



Stress Fringe Plot from Pressure Vessel Finite Element Analysis

In addition to the manufacturing drawings, a report was compiled documenting the analysis methods and results. This enabled the design to be approved and the vessel constructed.

References:

[1] PD5500:2009 “Specification for unfired fusion welded pressure vessels”, Fourth edition, BSI, 2009.

[2] ASME BPVC-2010 “American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPVC)”, 2010.

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