

PROFORM SOLUTIONS SLIMLINE POLYETHYLENE TANKS

Non-Linear Geometric Analysis

Date: January 2010

Client: Proform Solutions

Project Description:

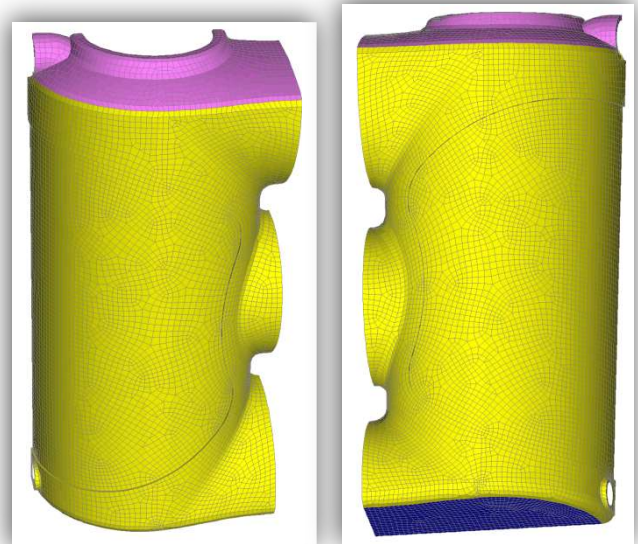
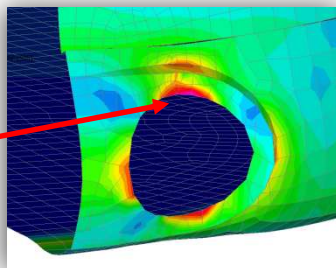
David Beneke Consulting was commissioned by Proform Solutions to undertake a finite element analysis (FEA) of two slimline above ground water storage tanks - one of 600 litre capacity and the other of 1,050 litre capacity. These tanks are manufactured from linear low density polyethylene (LLDPE) using the rotational moulding process. The purpose of the FEA was to determine the minimum constant wall thickness for each tank which satisfied the requirements of AS/NZS1170.0 and AS/NZS4766.

The geometry for each tank was imported into Strand7 FEA software and meshed using QUAD4 plate/shell elements. Penetrations at the inlet, outlet and overflow holes were included. Only a 1/4 FEA model was created given that the tanks were doubly symmetric about the two orthogonal vertical planes. The material properties for the LLDPE material were essentially linear elastic. However, the values adopted were based on long term creep occurring in the material over a 20 year period.

Based on a series of non-linear geometric analyses, the minimum wall thickness was derived which satisfied -

- * Minimum wall thickness requirements for AS/NZS4766,
- * Ultimate limit state stress limits
- * Buckling instability at ultimate load &
- * Serviceability deflections

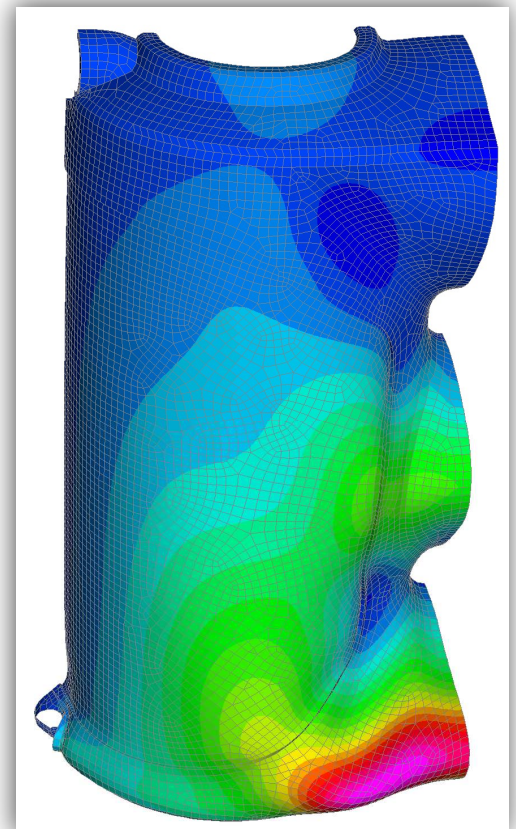
Ultimate von Mises stresses around the outlet hole at the base of the tank.



Outside View

Inside View

FEA Model of the 1,050 litre slimline tank



Contour plot of transverse serviceability deflections.

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