

YARRAWONGA PLASTICS SLIMLINE POLYETHYLENE TANKS

Non-Linear Geometric Analysis

Date: February 2010

Client: Trymak

Project Description:

David Beneke Consulting was commissioned by Trymak product development to undertake a finite element analysis (FEA) of two slimline above ground water storage tanks - one of 2,200 litre capacity and the other of 3,200 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.

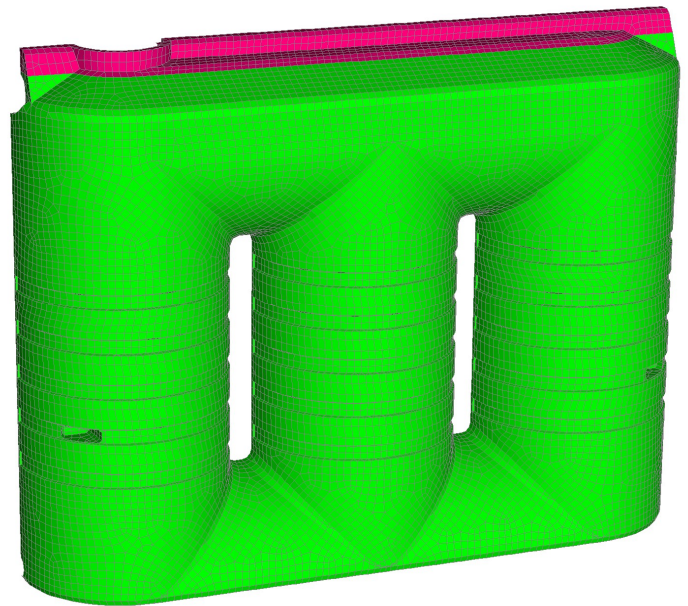
The geometry for each tank was imported into Strand7 FEA software and meshed using QUAD4 plate/shell elements. Penetrations at the inlet, outlet and overflow holes were included. Only a half FEA model was created given that the tanks were symmetric about their longitudinal axis. The material properties 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 -

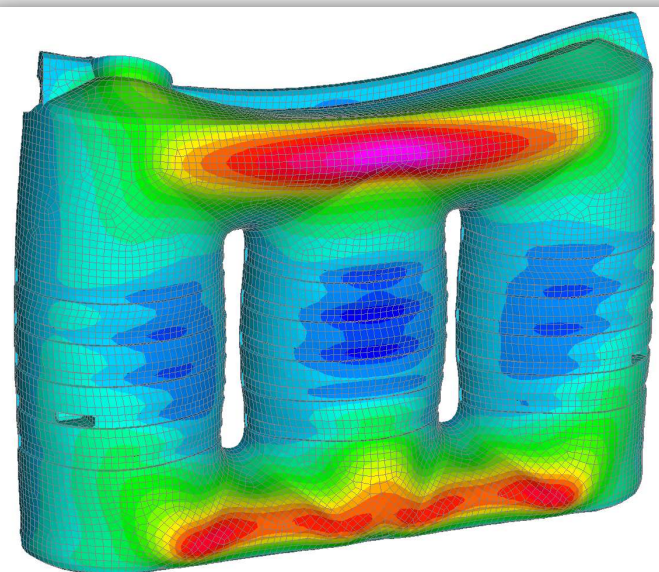
- * Minimum wall thickness requirements for AS/NZS4766,
- * Ultimate limit state stress limits
- * Buckling instability at ultimate load &
- * Serviceability deflections

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FEA Model of the 3,200 litre slimline tank - outside view



Distorted shape of the 3,200 litre slimline tank with governing transverse deflection contour plot displayed.