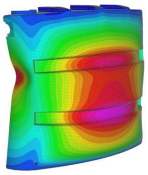


David Beneke Consulting

Finite Element Analysis for Engineering

VISCOUNT 2,000 LITRE SLIMLINE POLYETHYLENE TANKS
Non-Linear Geometric Analysis with Visco-Elastic Material

Date: October 2019

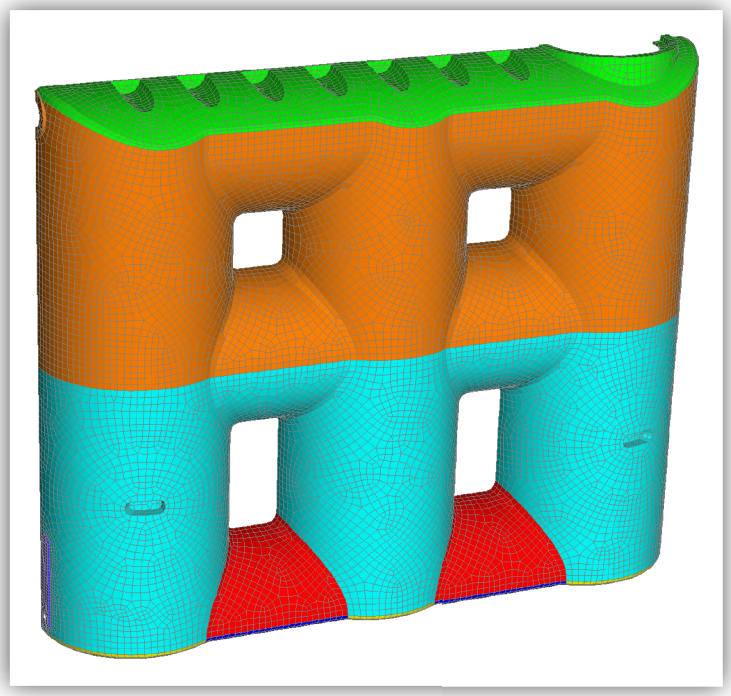
Client: Viscount Plastics

Project Description:

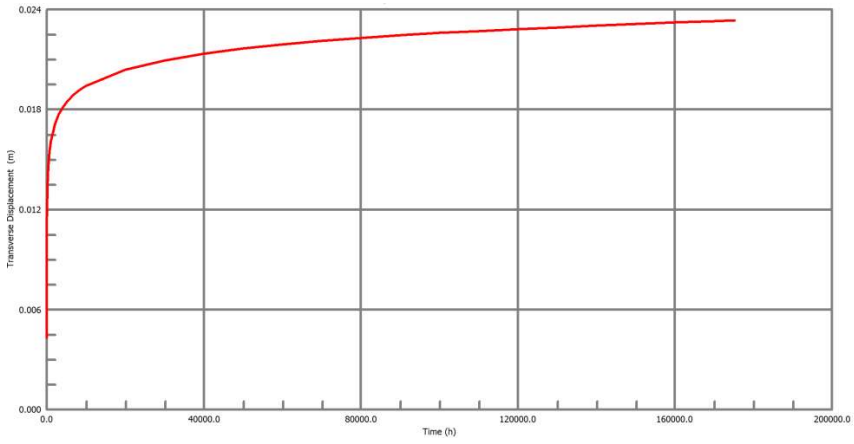
David Beneke Consulting was commissioned by Viscount Plastics to undertake a finite element analysis (FEA) of a 2,000 litre capacity, above ground water storage tank rotationally moulded from linear low density polyethylene (LLDPE). As opposed to previous analysis work where the creep modulus was constant over time the analysis conducted in this case incorporated a visco-elastic (VE) material model.

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 VE material model which was specifically developed for the grade of LLDPE, used a time stepping analysis which allowed for calculation of creep strain as a function of both applied stress (within the FEA model) and time.

The results of the analysis indicate that the more advanced VE material analysis allowed for visco-elastic redistribution of stress. The effect of this was that in peak stress zones stresses were reduced, overall deflections were reduced as with the final shot weight.



FEA Model of the 2,000 litre slimline tank - outsdie view



Transverse displacements in the side wall of the tank over time displaying creep behaviour of the LLDPE material.

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