

40,000 Litre Large Cylindrical above ground Water Tank Non-Linear Analysis – Geometric

Date: March 2025

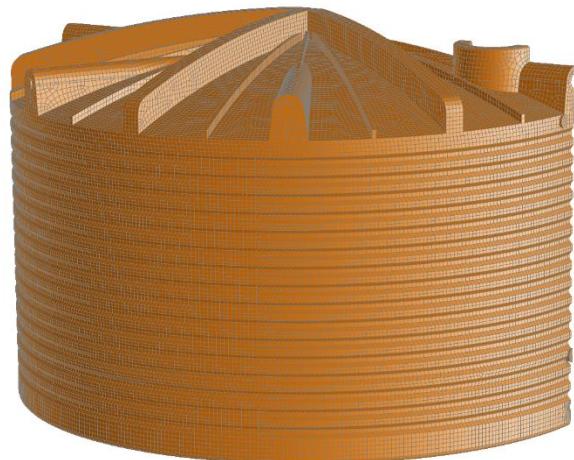
Client: Clark Tanks

Project Description:

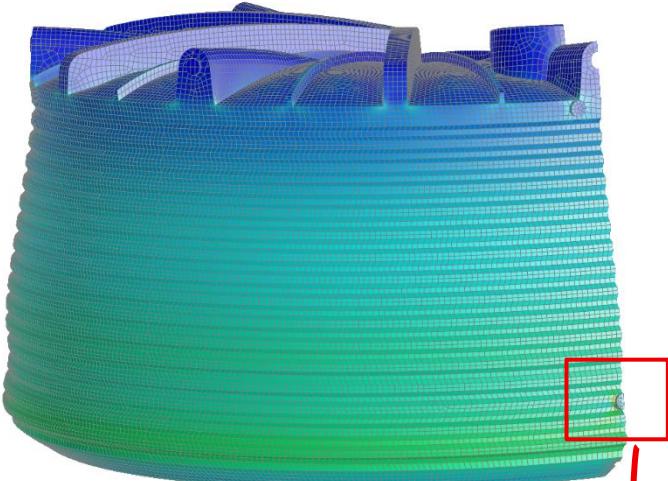
David Beneke Consulting was commissioned by Clark Tanks to undertake a finite element analysis (FEA) of a 40,000 litre above-ground water tank rotationally moulded from Matrix Eco+ or Eco+ HD polyethylene. This tank is so large that optimising the material thickness is of paramount importance in terms of reducing the manufacturing cost of the tank. A thickness reduction as low as 0.1mm can significantly reduce the cost borne by the moulder.

Our analysis was focused on assessing the tank for Dead Load (G) and Live Load (Q). The dead load consists of the self-weight of the tank and the live load consisted of the internal pressure loads from the stored liquid (water with $Sg=1.0$). Load combinations were applied in accordance with AS/NZS4766-2020A1. In the material thickness optimisation process we allowed for a constant thickness roof with variable thickness side wall & base.

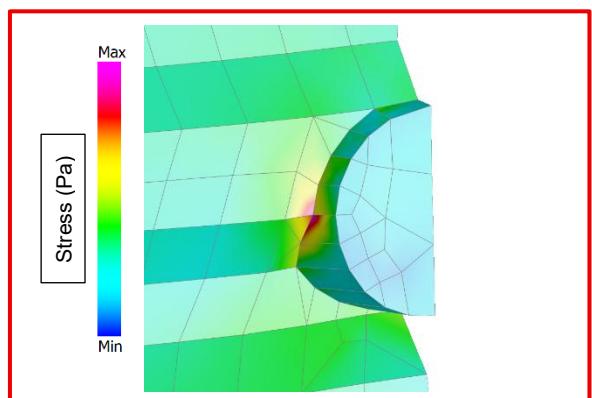
Strand7 was utilized to conduct a finite element analysis (FEA) of the tank. Using non-linear geometric analysis with linear elastic material properties, we optimised the wall and floor thickness of the tank ensuring that the derived minimum material thickness produces a tank that satisfies the requirements of Ultimate & Serviceability limit state design.



FEA Model of the 40,000 Litre water tank (Outside View)



FEA Model of the 40,000 Litre water tank (Outside View)
Result under critical load case combination



Close up view of the outlet under critical load case combination.

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