

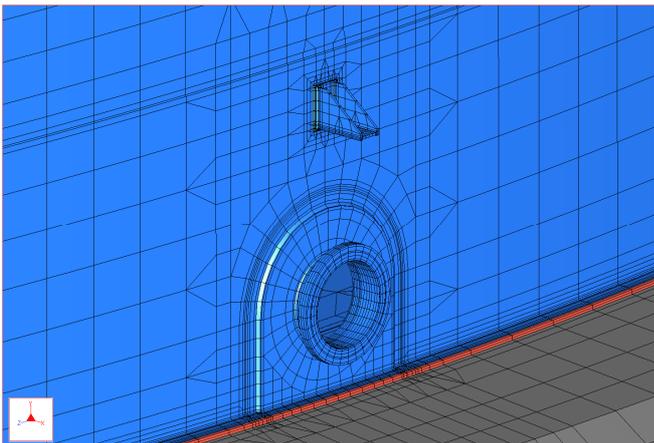
WAIVER OF HYDROTEST

It is frequently the case that changes in operating duty and/or the identification of shortcomings in the original design require the subsequent modification of in-service equipment. Where such modification involves new welding in the pressure envelope, Code rules normally mandate that a repeat hydrotest be performed subsequent to completion of the work. Although this requirement may be of little consequence for small items of equipment that may be easily isolated, the costs and timescales incurred in the testing of large items of equipment can be very significant. In such cases, the preparation of a fitness-for-service assessment can provide sufficient additional confidence in the design to permit waiver of hydrotest, and may represent an extremely effective means to reduce overall project costs.

In an example of such work, FCL were approached by an operator in the Middle East who required an engineering critical assessment to be carried out for a 72m diameter hydrocarbon storage tank, with the aim of enabling hydrotest of the tank to be waived following the addition of two 30" nozzles for side-entry mixers in the first course of the tank.



This was achieved by mechanical design substantiation of the new nozzles against the requirements of BS 2654 and relevant client standards, together with an assessment of critical defect sizes at selected weld locations at and adjacent to the new nozzles which was carried out in accordance with BS 7910.



FCL based this work on the results of finite element stress analyses carried out using Pro/MECHANICA (now CREO/Simulate) finite element software, which considered the influence of self weight, liquid inventory, design over-pressure and externally applied loading acting at the mixer mounting points. In recognition of the proximity of the new nozzles to the base of the tank shell, explicit consideration was also made of the interaction between the tank floor and underlying foundation using contact analysis methods.

With the benefit of FCL's formal report and using guidelines given in EEMUA Publication 223, our client was able to successfully demonstrate the integrity of the modified design without performing a further hydrotest, which permitted an overall cost saving in excess of one million US dollars.