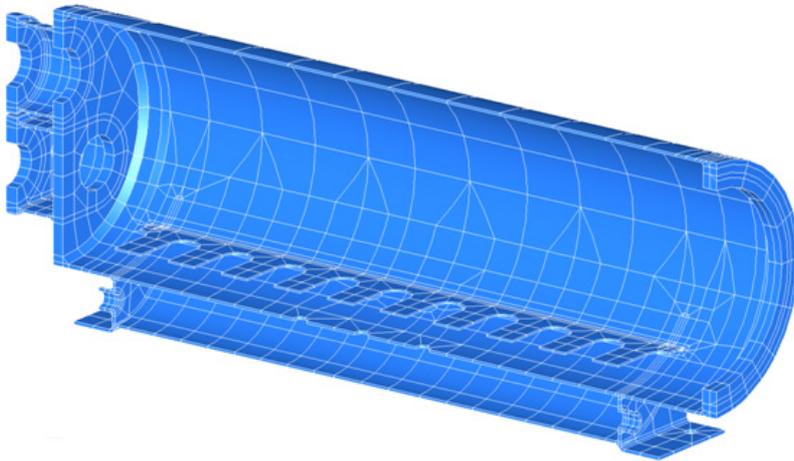


DESIGN OF TACTICAL AIRCRAFT REFUELLING TANK

FCL staff have significant experience in fatigue assessment of pressurised equipment, which has often enabled us to provide our clients with a solution after the discovery of premature fatigue cracking in existing equipment. In one such example, FCL were contacted by a supplier of Tactical Aircraft Refuelling (TAR) systems. An integral part of the refuelling system consisted of a pressurised tank, capable of supplying fuel at a rate of 150 GPM, which had been found to suffer from premature fatigue failure due to in-service pressure fluctuations.

This tank had a number of atypical features, of which the most significant was a sump running the majority of the length and formed by the addition of a semicircular shell to the outside of the main cylindrical shell. The tanks had previously been provided with an array of angle section braces welded across the bottom of the main shell to reinforce this sump, and fatigue cracking had been observed to originate at welded joints in these braces.



Initial linear elastic stress analysis of the existing design confirmed the presence of high stresses at these locations and a series of further analyses were therefore carried out to evaluate potential design modifications. After careful review of the performance of each option, a modified design incorporating a perforated stay plate in place of the braces was selected as offering the most effective solution to the fatigue problem.

FCL's work was completed by preparation of a formal report incorporating mechanical design substantiation and fatigue assessment of the modified design carried out in accordance with PD5500 Annexes A & C. The results of this work confirmed the acceptability of predicted stress levels and also demonstrated that the tank would be able to safely withstand the most onerous anticipated cyclic operating pressures for in excess of twenty years of continuous service.

