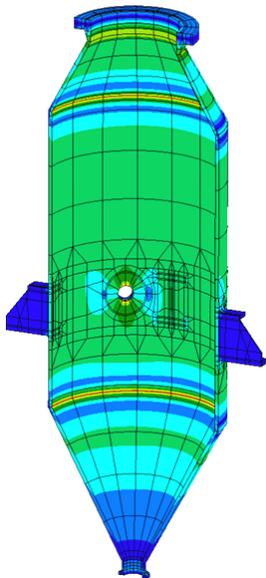
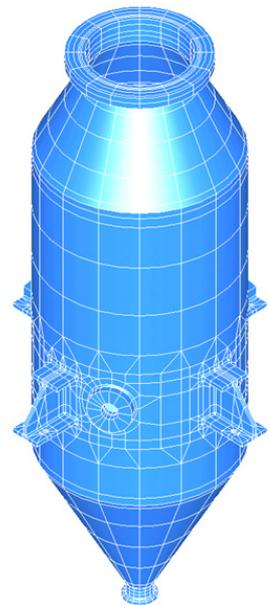


SPRAYNET COLUMN DESIGN

FCL staff pride themselves on their ability to obtain a detailed understanding of the structural behaviour of complex systems which, allied with their experience, has often enabled the solution of long-standing problems for our clients. In one such instance, FCL were approached by the UK's leading producer of instant coffee to develop a design for a replacement set of four spraynet process columns. These columns essentially perform as giant coffee percolators, producing liquor that is subsequently freeze dried to produce instant coffee powder. The cyclic nature of the process results in a severe fatigue duty with a significant number of pressure and temperature fluctuations. Over time this had led to repeated severe cracking in the existing columns at the support brackets and adjacent to the outlet nozzles. A number of previous attempts had been made to cure this cracking, which had included modifications to the supports, but these had not been successful and at the time of FCL's involvement the columns were deemed to be beyond further economic repair.

FCL's detailed review of the existing design identified a number of potential causes of the observed cracking, including excessive radial constraint at the supports, a lack of insulation over the support brackets themselves and inadequate support for the attached outlet pipework, which allowed resonances to be set up under liquid slug loading. As a result of this review, the new design incorporated fully insulated support brackets equipped with low-friction slide pads with integral thermal breaks to reduce stress levels arising both due to local temperature differences and due to the constraint of radial expansion. Detailed supporting analysis of the attached pipework system, carried out using CAESAR II piping design software, also demonstrated that the addition of 'snubbers' would provide an effective means of adding sufficient rigidity to prevent the short term dynamic loading associated with liquid slugs, without impeding the necessary thermal expansion of the pipework.



Having introduced these conceptual changes, FCL moved on to produce a full set of documentation underwriting the new design against the requirements of PD5500 and the European Pressure Equipment Directive, including mechanical design calculations, supporting finite element stress analysis, fatigue assessment and production of detailed fabrication drawings. The replacement columns have now completed approximately 10 years in service without the discovery of a single crack and in subsequent work for the same client the same degree of success has also been achieved on further sets of similar columns.