

## Case Study

January 2008

**Project:** Civa modelling for assessment of the effectiveness of the inspection procedures applied to complex geometry welds in a high pressure pipework system.

**Problem:** A large number of welds that were part of a high pressure pipework system were designated for inspection. The welds would normally have been inspected using radiography, however ultrasonic inspection was permitted on the basis of compliance to ASME B31.3 Code Case 181. Sonomatic were approached in order to carry out inspection modelling to provide an assessment of the capability of ultrasonic inspection, as per a set of existing procedures, and to identify conditions under which the code requirements may not be satisfied.

**Solution:** In order to assess whether the proposed ultrasonic inspection of the high pressure pipework met the requirements of Code Case 181; several cross sections based on the varying geometry of the pipework were created in the Civa modelling software (an example is shown in Figure 1).

Flaws with different orientations were created within the weld (as shown schematically in Figure 2) and results were simulated using shear wave inspection as per the procedures proposed, (Figure 3 shows the results from a single scan).

The results from the various geometries and flaws were analysed in order to determine if an ultrasonic inspection would be compliant with Code Case 181.

**Benefits:** Analysis of the results determined that flaws in some of the locations considered could be overlooked using the existing procedures. As such, it was recommended that a number of changes to the inspection approach were necessary in order to satisfy the requirements of the Code Case. The results obtained gave the operator a basis to request that the inspection vendor make changes to the approach to provide assurance that the inspection performed would meet the code requirements for this safety critical equipment. This was achieved in a cost effective manner without the need for extensive additional test samples with artificial flaws to be manufactured.

Figure 1:



Figure 2:

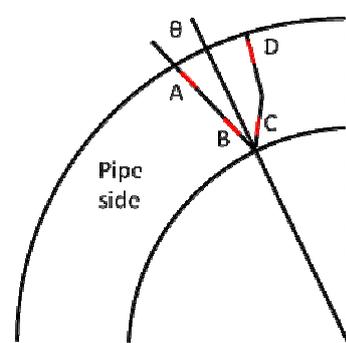


Figure 3:

