# Pipe Weld - Validation Brief

This brief describes the validation of QustomWeld by reproducing a model described in paper presented at the in the Computational Materials Science journal.

Dean Deng, Hidekazu Murakawa, "Numerical simulation of temperature field and residual stress in multi-pass welds in stainless steel pipe and comparison with experimental measurements", Computational Materials Science 37 (2006) 269-277.

Model Creation

The pipe consists of two beads in the center of the pipe with a reasonable mesh on the weld itself, but a mesh biased to quickly coarsen further away from the weld. The model was reproduced in 2D and 3D models, with the 3D model analyzed with continuous bead placement, 10 chunk placement, and single chunk placement of both beads. The double-ellipsoid, Goldak model is used to model the flux from the torch.


Outside Thermocouple Nodes

Inside Thermocouple Nodes
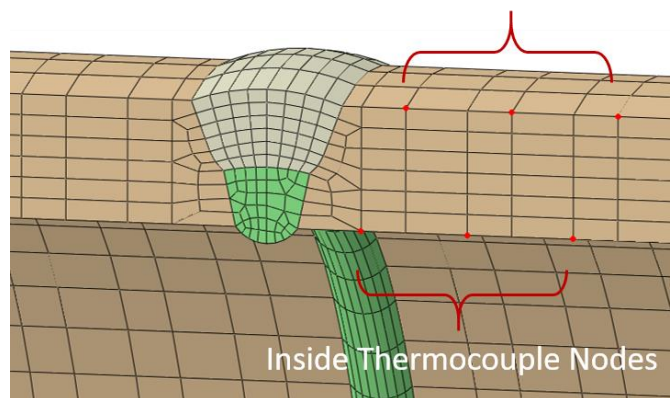
Temperature History Plots

Below is shown a temperature history of the inside thermocouple nodes for the continuous bead placement case. Very good agreement is achieved between all four models and the temperature thermo couples.
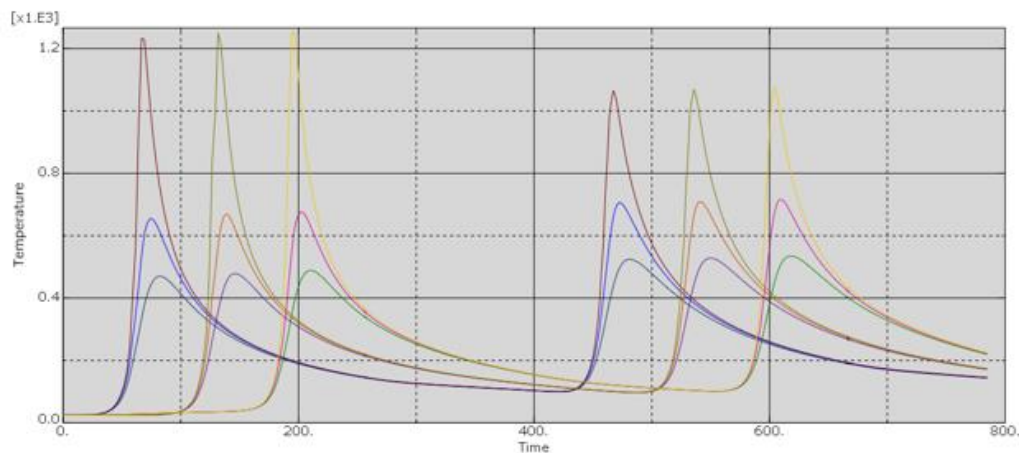
Measured Stress/Strain Data

A path plot of the line of nodes along the interior of the pipe is displayed below. The black dots represent experimental data. The four models each show consistent agreement between one another and somewhat underpredict the stresses in the peak area of the bead, possibly due to the exact shape of the top of the weld not being known.
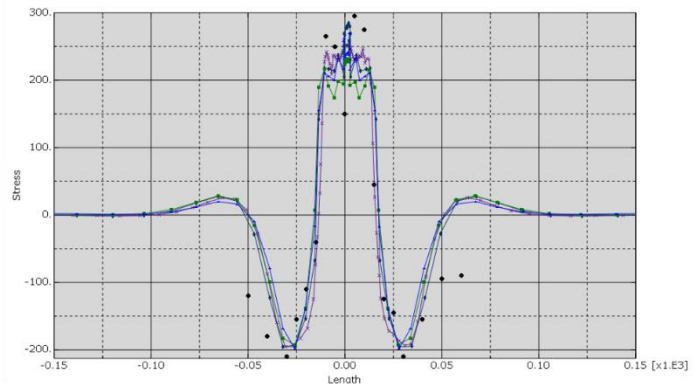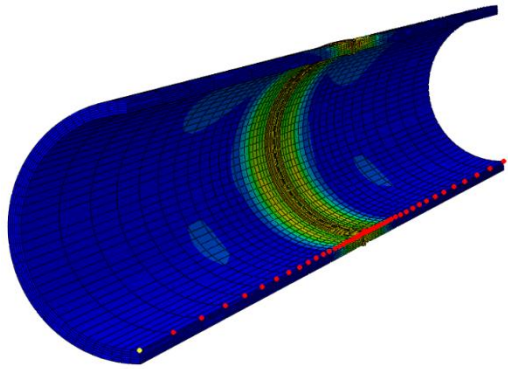
Hoop Stress (Inner)

Two path plots of the axial stress along the inner and outer line of nodes are displayed below. Again, there is very good agreement between the four models, although the peak at the center of the weld is off slightly. The drop of the stress at the weld center of both plots is captured nicely.
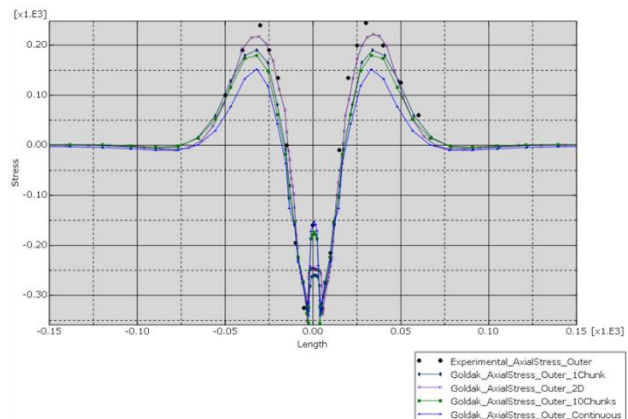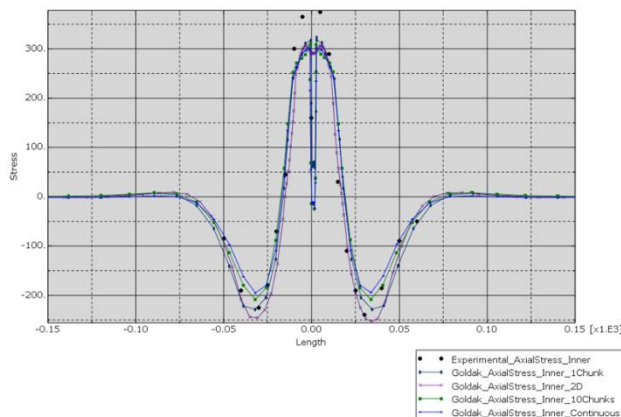
Axial Stress (Inner and Outer)

For More Information:

Please visit the QustomApps.com website for more details. For questions, contact Mike Shubert, sales@QustomApps.com, +1 469 968-7494.

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