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Residual Stress Experts

VEQTER is an engineering company providing excellence in the measurement and management of residual stresses. We are world leaders in our field and offer expertise on any aspect related to residual stresses in engineering components or structures.

Deep hole drilling simulation

Experimental measurements of residual stress are imperative to validate numerical models. However, measurement programmes can be time intensive and expensive so it is vital that the number of measurements and their location be optimised.

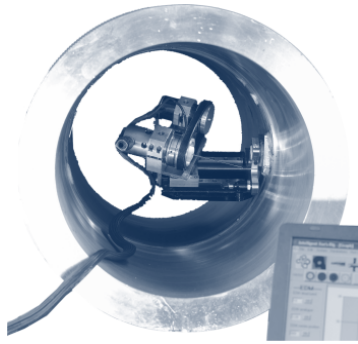
VEQTER Ltd is seeing increased use of measurement simulations as a mechanism for advising clients about measurement campaigns, particularly with respect to the mechanical strain relief techniques. Furthermore, by simulating measurements guidance may be provided on the importance of key parameters in the numerical model, such as material hardening, and likely impact of component geometrical features, such as intersections, on measurement results.

In short, measurement simulations equate to efficient time and project management and provide “added value” to measurement results.

To find out how VEQTER can help you please contact us on *+44 (0) 117 987 8015* or using *experts@veqter.co.uk*

Component and Objectives:

A measurement simulation is illustrated through application to a pipe girth weld. **Multiple deep-hole drilling measurements** were required to validate FEA, spanning the weld, the heat affected zone and the parent material.



Measurement set-up

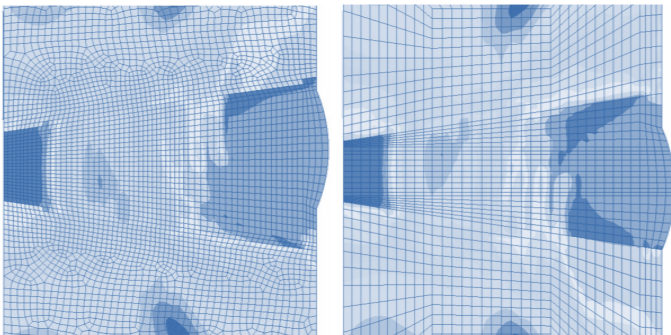
It was important to determine the **minimum spacing between deep-hole drilling** measurements to ensure no interaction.

An option also existed to drill from the pipe outer surface to the inner surface or *vice-versa*

Measurement Simulation:

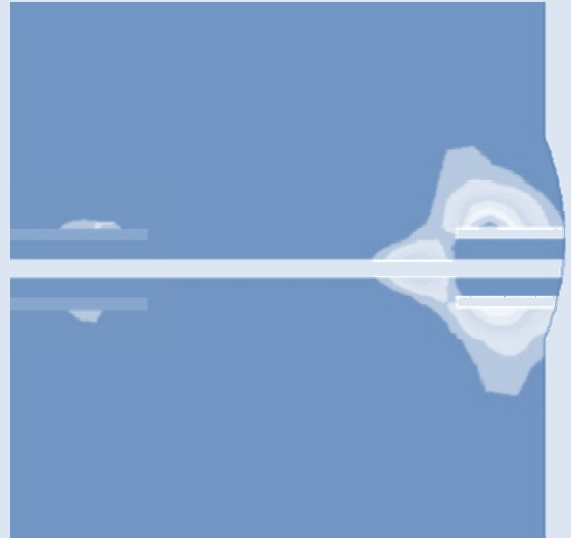
FEA results were mapped from an axisymmetric mesh to a full 3D mesh

The 3D **mesh was designed** to encapsulate the **features** of a **deep-hole drilling measurement** including the reference hole and trepanned core



Axisymmetric to 3D mapping

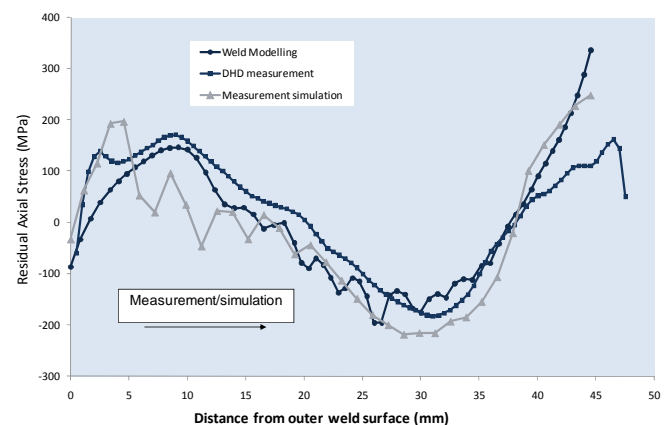
VEQTER Ltd has the **expertise** to replicate this procedure for **all mechanical strain relief techniques**. The simulation was conducted using isotropic, non-linear kinematic and mixed hardening material models. An incrementally introduced core was simulated



Measurement simulation

Results and Advice Provided:

- Our clients were advised over the minimum distance to leave between deep-hole drilling holes
- Simulations revealed that by drilling from inside to outside, i.e. starting the measurement away from the weld, potential measurement perturbations caused by material homogeneity could be eliminated



Measurement modelling result