

# **Accurate and reliable characterization of weld residual stresses**

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## **Résumé :**

The residual stresses developed during the welding process can have major impacts on the long term structural performance of welds. Major examples within the civil nuclear field are high temperature “reheat” cracking of thick section AISI 316H welds in AGR boilers, and primary water stress corrosion cracking in PWR primary circuit dissimilar metal welds.

The accurate prediction and measurement of weld residual stresses is a key enabler for the understanding of weld structural performance. This talk first examines recent advances in accurate characterisation of weld residual stresses made in three key areas :

- Weld heat source modelling
- Modelling the constitutive behaviour of austenitic stainless steels, particularly weld metal
- Modelling of solid state phase transformation in ferritic steel welds

The research is taking place within international collaborations with the NeT European Network and the Australian Nuclear Science and Technology Organisation. Then future directions of weld structural performance research at Manchester, covering the New Nuclear Manufacturing EPSRC Programme Grant, the role of the EDF Modelling and Simulation Centre, and research on Generation IV reactor systems, will end the discussion.