

STRESS SCANNING

Investigation of residual stresses in new materials for the development of aircraft turbines



THE PROBLEM to solve: residual stress

Nickel-based superalloys are particularly suited for use in turbine components, given their unique combination of high temperature strength and high fatigue strength.

Their production, however requires water-quenching directly after forging, leading to much higher residual stresses than under standard air cooling. This can result in distortion of the work piece during the machining of the disc into its final shape.

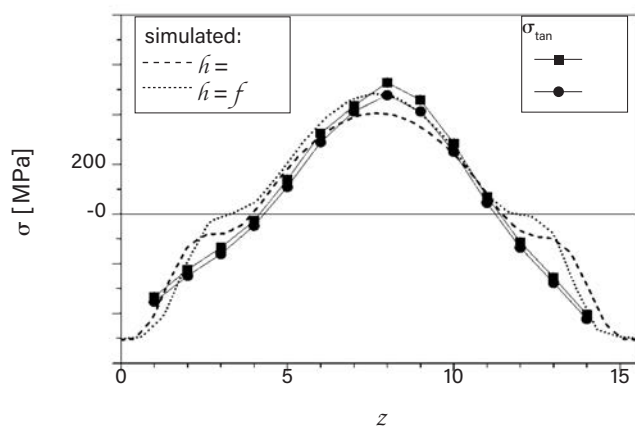
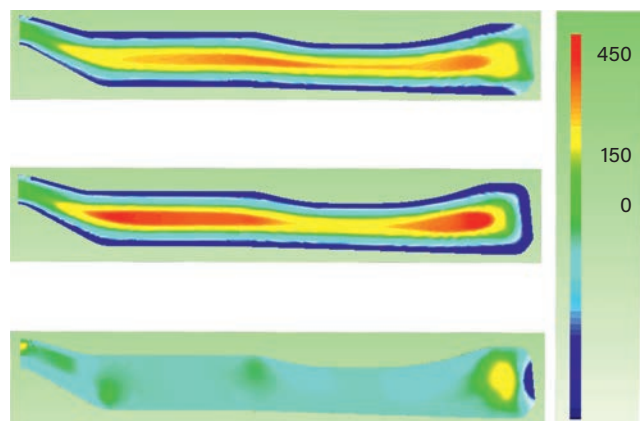
A step towards THE SOLUTION

Neutron diffraction techniques have been used to examine the residual stress distributions in a water quenched IN 718 compressor disc. With the results obtained, engineers were able to improve and validate the simulation models they use to predict residual stresses in their work pieces.

THE RESULT

Optimised simulation models allow subsequent treatments - such as turning to final shape - to be fine-tuned, thus minimising unwanted distortion and deformation effects.

- (a) Residual stress distributions on the disc cross-section after water quenching, as predicted by the FE model.
- (b) Measured and simulated residual stress distribution through the thickness of a disc at the radius.



REFERENCE

Cihak U., Staron P., Marketz W., Leitner H., Tockner J., Clemens H.; Z. Metallkd., 95, (7), 2004, 663-667.

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Proof-of-concept experimental beam time is being offered to Industry!

RAPID ACCESS

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