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

Figure NUMBER ONE

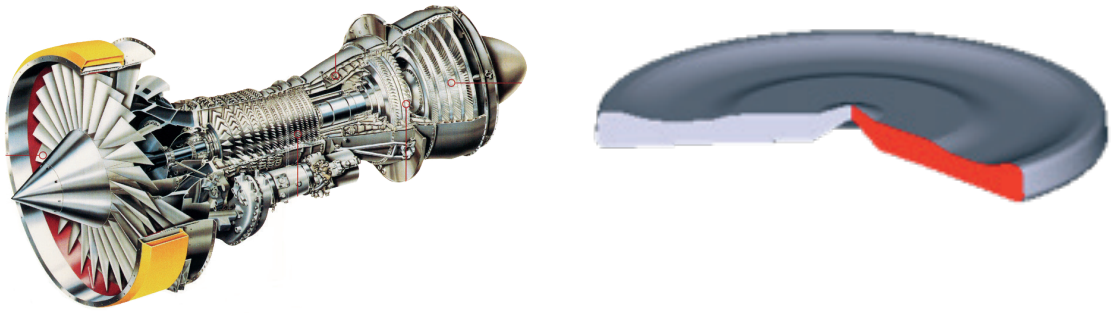

Figure 1 Compressor disc as used in a turbine

The Austrian company Bohler Forging is one of the leading manufacturers of high quality parts for aerospace applications, power generation and other high tech industries. The company supplies more than 200 technologically advanced customers world-wide. In cooperation with Helmholtz-Zentrum Geesthacht, Bohler Forging investigated residual stresses in commercially produced forged compressor discs.

Thanks to the unique combination of both high-temperature strength and high fatigue strength nickel based superalloys are highly suitable as turbine components. The production method for the components requires water quenching directly after forging, which leads to much higher residual stresses than with standard air cooling. This method can result in distortion of the work piece during the machining of the disc into its final shape.

Better insight minimizes unwanted effects

By using neutron diffraction, the residual stress distributions in a water-quenched IN 718 compressor disc were studied. Findings from the study provided better insight in the effects of the treatment and thus the optimization of subsequent treatments, which is necessary to minimize unwanted effects of distortion and deformation.

Figure NUMBER TWO

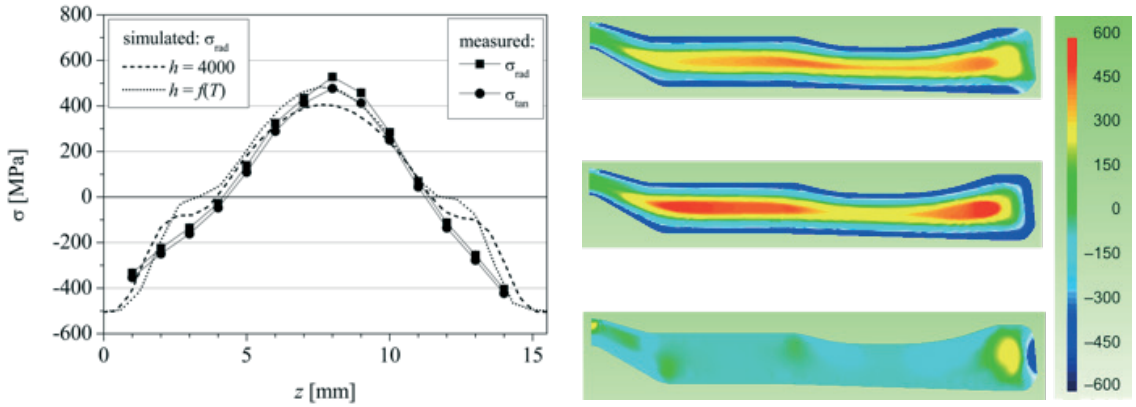

Figure 2 Left: Residual stress distributions on the disc cross section after water quenching as predicted by the FE model. Right: Measured and calculated residual stress distribution through the thickness of a disc at the radius indicated by the dashed line in the left figure.

Science Link is a network between leading research facilities of photon and neutron sources and its users. The project aims to support and encourage innovation and entrepreneurship in the Baltic Sea Region. Apart from the research facilities, the network also includes scientific institutes, universities and regional organisations that serve as service and promoting units. Science Link is part-financed by the European Union (Baltic Sea Region Programme) and involves 17 partners from 8 countries during the project period 2012 to 2014.

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