Method for determining the residual stresses in a component

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- More accurate measurement of residual stresses
- Shear stresses can be calculated
- Possibility to perform more complex evaluations
- Simplified simulation

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Service
Technologie-Lizenz-Büro GmbH has been entrusted with exploiting this technology and assisting companies in obtaining licenses.

Fields of application

For all components where residual stresses play a role and which are to be need to be monitored, e.g. in non-destructive material testing, in quality control or rapid prototyping.

Background

So-called "residual stresses" can occur in solids and components, both unintentionally (e.g., in the case of welding residual stresses) and intentionally (e.g., autofrettage in the case of high-pressure lines), since they are superimposed on the operating loads during operation of the component. Thus, they are locally increasing the stress of the component.

Particularly when a component is subjected to oscillating stresses, residual stresses can significantly influence the service life of a component, without this being visually apparent on the component.

Problem

For the determination of residual stresses over a larger cross-section, only destructive methods can be used at the time of writing. For example, the so-called "contour method". Here, a very fine cut is made through the component.

The disadvantage of this method is that the residual stresses can only be determined perpendicular to the section plane.

Solution

The first solution developed requires for the section to be cut in such a way that additional conclusions about in-plane deformations are possible. For this purpose, markings are introduced in the section plane. They are mainly based on the influence of the material removal with the help of different parameters such as current strength, wire thickness and movement of the wire. The stress profile is optimized so that it is as continuous as possible across the cut surface.

In a second possible solution, the planar cutting course is further maintained as in the previous methods (cross-section). Before cutting, holes are drilled in the component. These serve as markings to make the deformations in the cutting plane visible. With an optical inspection, the edges of the drill holes can be detected, reference points can be formed and the bore angle can be determined. By comparing the reference points before and after the cutting process the displacements in the plane can be measured.