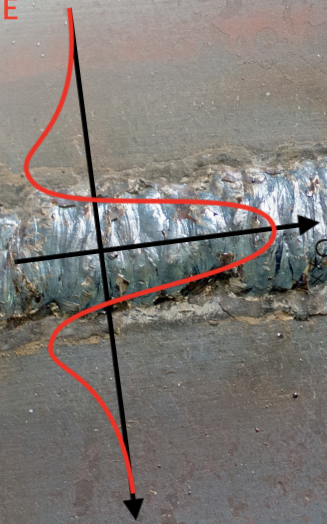
DANISH TECHNOLOGICAL INSTITUTE



Characterization of residual stress in metals

Ensuring reliable metallic components

Residual stress in metals

What is residual stress?

In any metallic material and component, residual stress is present. It arises and develops in any step of the manufacturing process and during operation. It can result from temperature gradients, e.g. during solidification and casting or welding processes, temperature fluctuations in operation, from mechanical impact in a cutting or milling process, or loading in operation.

Why should you care about it?

Residual stresshas a significant impact on the mechanical performance of a material, such as its fatigue strength and resistance to stress corrosion cracking, and thereby the lifetime of the product. Based on knowledge of the level and distribution of stress, it is possible to obtain better, more cost-effective and reliable products, e.g. by qualifying mitigation techniques or validating/providing input to finite element computational models.

How to measure residual stress

Residual stress is typically measured using (semi)destructive methods (e.g. hole drilling and contour mapping) where some material is removed, causing the component to distort whereafter the distortion is used to calculate what stress levels caused this distortion.
With diffraction based methods, we can measure the stress non-destructively using the interatomic distances in the crystalline as “internal strain gauges”. Using different setups, we can adapt the measurement depth, measurement resolution and probed stress directions.

How can Danish Technological Institute help you?

Let us have a non-binding general discussion about your residual stress related issues.

Our specialists can...

- advise on possible undelaying causes of the challenges - and possible mitigation actions
- advise on the most appropriate technique to measure the residual stress
- plan and conduct the measurements
- analyze, review, and report the measurements
- advise on how to implement the measurement results.

Hanna Leemreize
Senior Specialist
+45 72 20 26 02
hle@teknologisk.dk

www.dti.dk