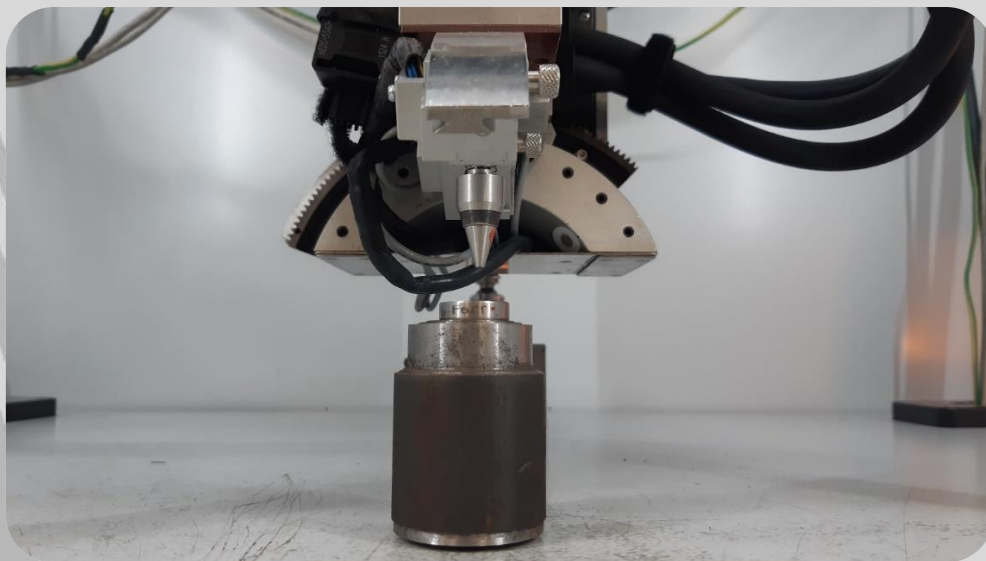


RESIDUAL STRESS ANALYSIS BY X-RAY DIFFRACTION

There are many ways to test for residual stresses, but one of the most widely accepted non-destructive testing method is X-ray diffraction. For our R&D projects, we invested an X-ray diffractometer, that is specifically designed for residual stress measurement.

This type of residual stress testing can be useful in many areas of industry, such as founding, additive manufacturing technologies, but is also required by internal regulations in many areas of the automotive industry. Based on these, we have started the accreditation of our laboratory according to ISO/IEC 17025, the first in Hungary in this field. Our equipment is also suitable for the measurement of retained austenite.



GENERAL ABOUT XRD

- XRD = X-Ray Diffraction
- Diffraction means the spreading of waves around obstacles. Diffraction takes place with sound; with electromagnetic radiation, such as light, X-rays, and gamma rays; and with very small moving particles such as atoms, neutrons, and electrons, which show wavelike properties.
- The phenomenon is the result of interference (i.e., when waves are superimposed, they may reinforce or cancel each other out) and is most pronounced when the wavelength of the radiation is comparable to the linear dimensions of the obstacle.
- A beam of X-rays contacts a crystal with an angle of incidence θ . It is reflected off the atoms of the crystal with the same angle θ . The X-rays reflect off atomic planes in the crystal that are a distance d apart. The X-rays reflecting off two different planes must interfere constructively to form an interference pattern; otherwise, the X-rays would interfere destructively and form no pattern.

RESIDUAL STRESS MEASUREMENT AND CALCULATION

- We only get a reflected beam if the crystal has a certain orientation. Since tiny crystallites are disordered in polycrystalline samples, there will always be some with the right orientation.
- Parts can be considered as polycrystalline samples, so residual stress can be measured the same way as in the case of powder samples. Residual stress changes the d -spacing of the planes, so we have to measure only this parameter.
- Measurement can be carried out in a variety of configurations and methods, the choice depends on the size and material quality of the part and the purpose of the measurement.

MEASUREMENT METHOD

- The measurement is performed according to EN 15305 "Non-destructive Testing – Test method for Residual Stress analysis by X-ray Diffraction" standard.
- If necessary, sample preparation is carried out by electropolishing.
- Electropolishing can be used for removing surface layers, without introducing new stresses. This method makes possible to create a depth profile measurement to see how residual stress changes from the surface to the inside of the material. For example this can be of relatively great importance for coated or hardened parts.



CONTACT DETAILS AND MORE INFORMATION

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