NEW

STRESS-X

ROBOTIC RESIDUAL STRESS AND RETAINED AUSTENITE X-RAY DIFFRACTOMETER

GNR OPTICA

ANALYTICAL INSTRUMENTS GROUP

25 years of technology

Stress-X allows to measure residual stress, providing a through non-destructive analysis of samples of any dimensions tank to the original mounting of the diffractometer head on a 6 anthropomorphic axis robot.
The robot and the related measuring head are mounted on a robust trolley made of steel which holds all the control electronics, water cooler for tube cooling and personal computer.
Robot allows an accuracy in positioning and repeatability of 20 microns.
It is possible to measure specimens positioned on the measuring platform on board or any other specimen positioned outside of the instrument basement at an optimal measurement distance of 500 mm from the robot centre.
Measurement target is defined by a combination of a Video camera for X-Y pointing and a laser for Z positioning.
Laser accuracy is less of 10 microns with a measuring range of 300+/-70 mm.
Thanks to the 6 degree of freedom the measurement positions and angular ranges are practically unlimited.

Principles

Residual stress is due to thermal treatments, mechanical processes, welding and surface treatments that the pieces undergo during the manufacturing processes. This type of stress permanently influences the piece's resistance, especially under strain, and often it is the cause of breaks that have no metallurgical justification. The importance of residual stress analysis is growing. Welded structures, gears, shot-or sandblasted parts, thermal and many other treatments can be controlled and monitored with the help of X-Ray diffractometer.
Measurements of stresses in metals are made by using the distance between the atoms plans, as a stress gauge. The distance is measured with the help of the diffraction of an X-ray beam on the analysed part.
The residual stresses influence fatigue resistance. Any machining produces residual stresses. Compressive residual stress improves fatigue resistance. Tensile residual stress reduces fatigue resistance

Even a small percentage of residual austenite (5%) can cause deformations that make the piece unusable.
An example can be given with ball bearing tracks and injector pins for diesel motors. Detection of their presence can optimise thermal treatment.

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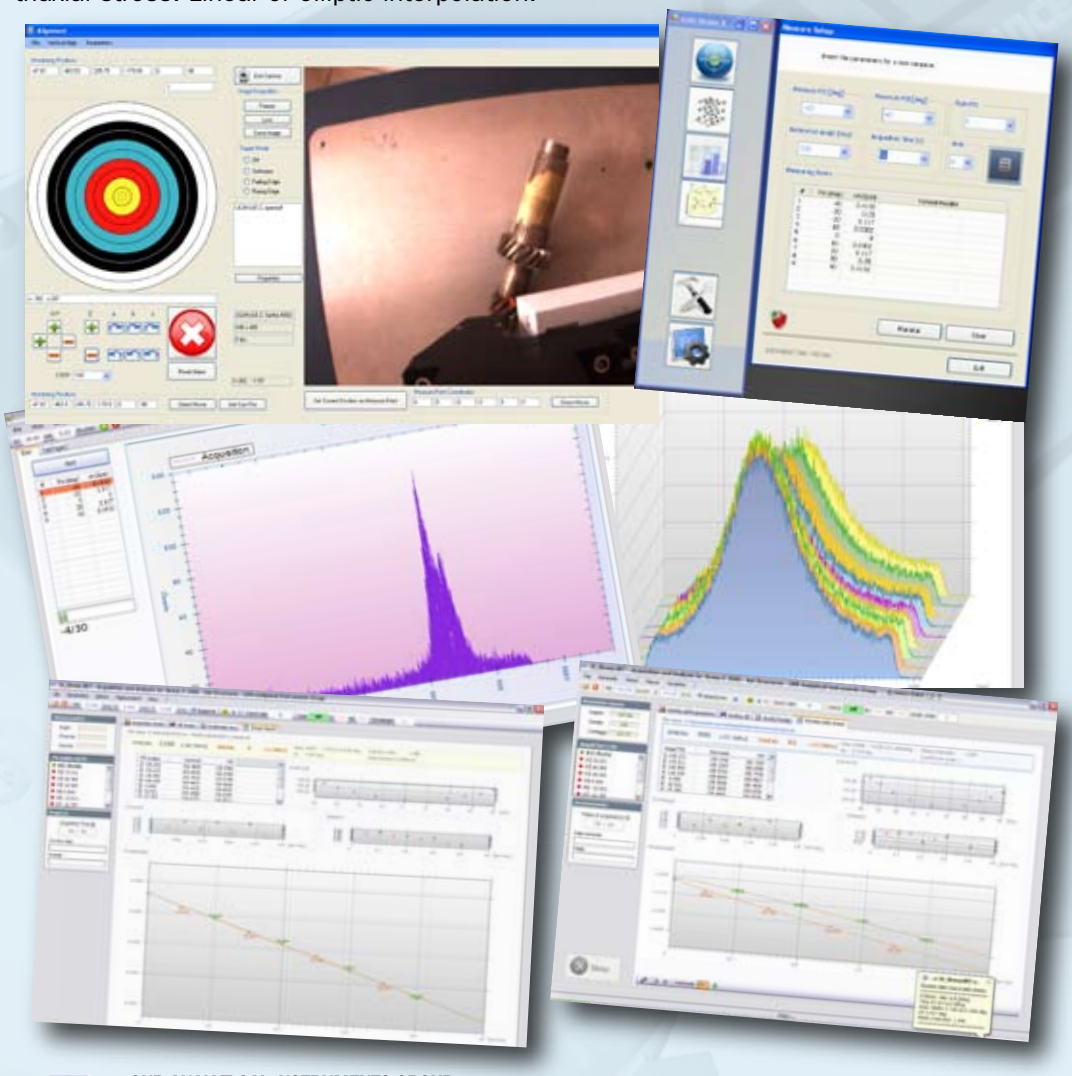
Applications

- definition of the quantity of retained austenite on bearings and parts of diesel motor injectors
- detection of residual stress on sprocket wheels
- detection of residual stress on car motor parts (cam axles, connecting rods, engine shafts, equalisers)
- detection of residual stress induced by deep drawing (household appliances, structural parts)
- detection of existing operational stress on gas conducts
- detection of operational stress on large tensioned structures
- measurement of efficiency of shot-peening and rolling of components subjected to stress
- detection of residual stress in castings (cast iron parts of tool machines and aluminium automotive components)
- detection of stress induced by (laser and electron) welding
- search for a correlation between residual stress and stress resistance of aluminium alloy car rims
- optimisation of working parameters for swarf removal to improve the stress resistance of mechanical components
- detection of residual stress on helicoidal and leaf springs
- search for critical zones after applying work loads (arms and aeronautics)

Acquisition and Stress Analysis

It allows to measure and calculate residual stress on any polycrystalline material. Different peak position methods (centroid, chord, Marquardt Fit) are available. Plane and/or triaxial stress. Linear or elliptic interpolation.



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