



METHOD RS PROFILER

NON-DESTRUCTIVE TESTING OF RESIDUAL STRESSES VIA EDDY CURRENT



RESIDUAL STRESS CONTROL OBJECTIVES USING EDDY CURRENT TECHNOLOGY

Optimisation of manufacturing processes / forming

Residual stresses are the self-balancing stresses in a piece when there are no external forces. **They can significantly affect the mechanical properties of materials and structural components**, such as fatigue resistance, dimensional stability, corrosion resistance or brittle fracture.

Their effect is not always beneficial, the **measurement and analysis of residual stresses** are therefore mandatory steps in the design of parts and structural elements to ensure **product quality**.

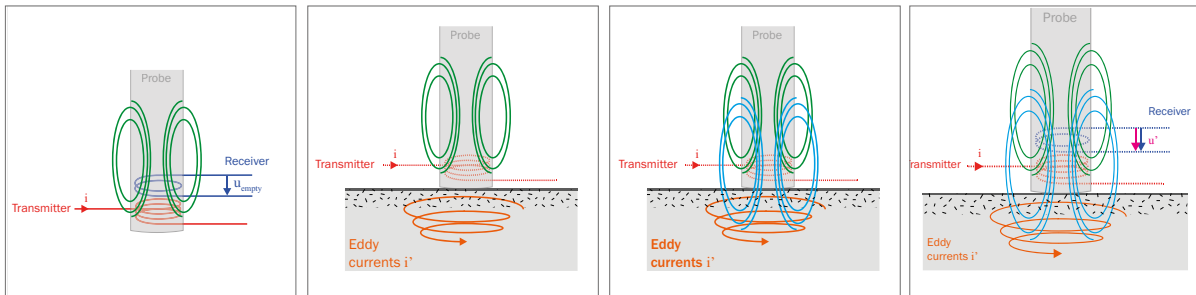
Control and qualification of products

The RS Profiler technique uses multi-frequency eddy current control. It is a non-destructive, innovative and fast technique allowing the control of residual stresses induced by manufacturing processes such as shot peening. For example, it allows for the complete and rapid control of production following a feasibility study or calibration phase.

PRINCIPLE OF THE METHOD: NON-DESTRUCTIVE MEASUREMENT USING EDDY CURRENTS

This method consists of measuring the impedance of a coil placed on the surface to be inspected. Residual stresses in the material influence the impedance measured across the coil. The current frequency is used to control the depth of the test.

Principle of the method



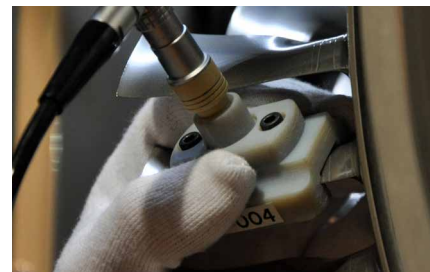
- 1** The transmitter coil generates an alternating magnetic field. The unloaded voltage of the receiver coil is measured.
- 2** The probe is placed on the part to be tested. Eddy currents form in the material being measured.
- 3** The eddy currents form their own magnetic field that opposes the initial field.
- 4** The voltage of the receiver coil is altered.

Advantages

- Non-destructive measurement
- Instantaneous measurement
- Measurement at various frequencies to build a profile as a function of the depth below the surface
- Correlation with residual constraints
- Portable equipment for on-site controls
- 100% control of production parts
- Control of the treatment uniformity on large parts
- Measurement on simple or complex parts - possible to create a specific tool for these parts



Measurement on customer sites



Creation of specific tooling for measurement of complex parts

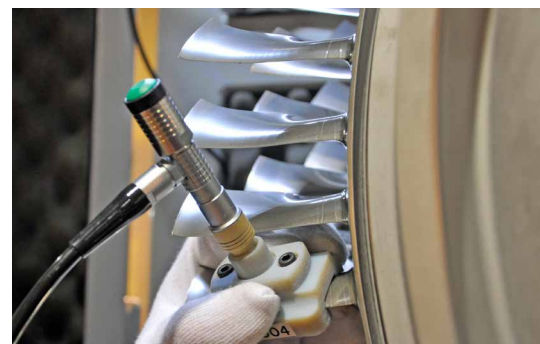
MEASUREMENT PROTOCOL

An innovative mastered protocol

Our engineers have concentrated their expertise and know-how of the Eddy current method with the RS Profiler technique developed in our laboratory.

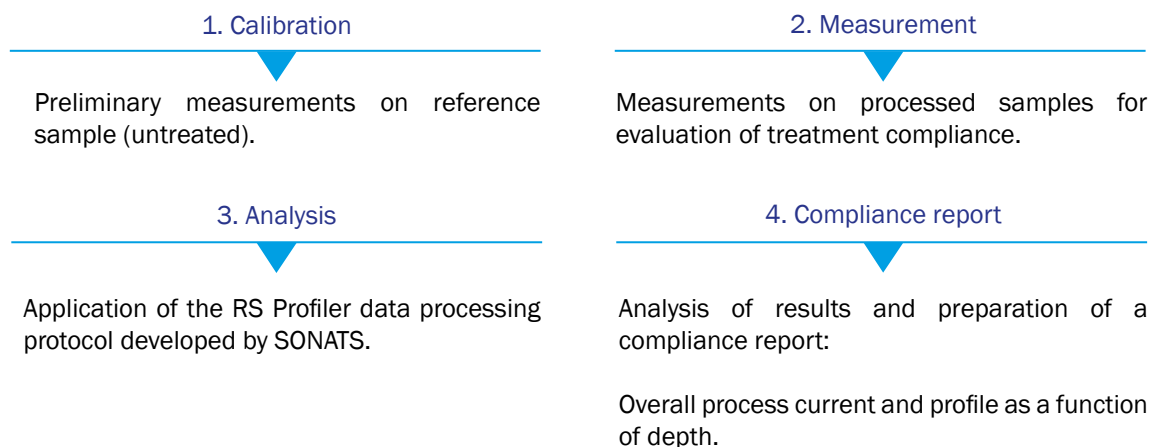
This innovative technique is based on:

- High productivity industrial control equipment,
- Data processing to deliver clear and simplified measurement results.



RS Profiler non-destructive measurement using eddy currents

Chronology of the protocol



IMPLEMENTATION PROCESS

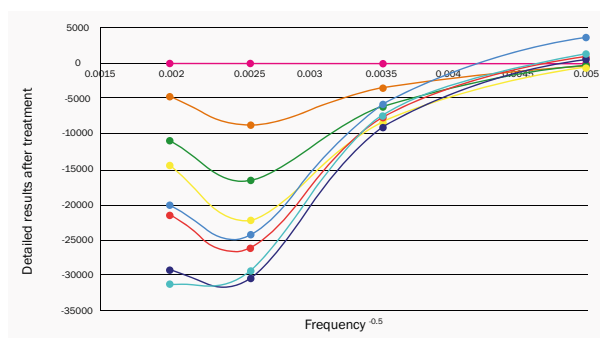
Examples of typical non-destructive measurements of residual stresses using Eddy currents:

- **Technical feasibility study** and correlations with other residual stress measurement techniques to optimise the manufacturing process
- **Industrial feasibility study** on some dozens of parts of various batches to study the sensitivity of the control to different material batches and / or variations of sample geometries (on and off site)
- **Rapid qualitative control of production lines**

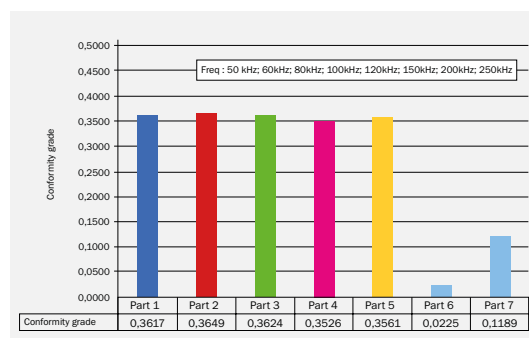
Application examples

- Control of mechanical compression treatment (shot peening, roller burnishing etc.)
- Stress relief control
- Heterogeneity of materials (new perspective)

Examples of results



Evaluation of treatment current



Production conformity control

WHO ARE WE?

The SONATS laboratory guides and assists you in the characterisation of residual stresses and materials, from the definition of your challenges to the completion of studies.

We put our experience and databases to work for you to interpret the results. This step is essential and ensures full use of the results obtained.

Our team is specialised in metallurgy, materials and mechanics. We can provide you with the means to engage in an effective approach to quality and improvement of your products and processes.

Quality - Price - Deadlines

- ASTM E837 standard
- ISO 9001 and EN 9100 qualifications
- Engineers and PhDs in Materials Science and Physical Measurements
- Our laboratory is audited and qualified by major key accounts of civil and military aerospace
- It is an active member of the French Constraints Analysis Group (GFAC)
- Verification of devices before each series of measurements
- Device monitoring (control card)
- Control of prices, short times



Other methods of measuring residual stresses at SONATS

- Non-destructive X-ray diffraction on the surface and in depth
- Contour method
- Incremental hole method
- Access to large instruments: Synchrotron X-ray diffraction and neutron scattering

SONATS ACTIVITIES

Established in 1991, SONATS is an innovative industrial company specialised in mechanical surface treatments, the main process being shot peening ultrasonically activated (STRESSONIC® Technology).

SONATS offers a complete range of products and services for understanding and improving the fatigue resistance of your metal assemblies and parts:

- Shot peening machines
- Straightening / forming equipment
- Welding hammering equipment (HFMI- High Frequency Impact Treatment)
- Subcontracting of shot peening (in our workshops or on customer sites)
- Measurements and characterisation of residual stresses
- Distribution of peening and conventional sanding tools

