Applications

- Layer thickness measurements of finishes or of ceramic coatings, layer adhesion
- Detection of micro-defects in film compounds
- Hidden defects in compound materials
- Detection of surface defects in forged parts as an alternative to magnetic particle inspection
- Inspection of moving long products made from steel
- Recognition of unwished exogenous phases in casted steel
- Crack detection in ceramics
- Material identification and oppression of emissivity influences by spectral resolution

Are you familiar with our industrial-grade accredited inspection services?

- Accredited laboratory in line with DIN EN ISO / IEC 17025, to qualify and validate new non-destructive testing (NDT) processes for industrial applications
- Accelerated time-to-market and opportunity for qualified, norm-compliant deployment in industrial applications as well as for new in-house developments or custom adaptation of innovative NDT technologies, even in fields where norms have not been established
- Certification of the corresponding quality management system in accordance with DIN EN ISO 9001

Contact

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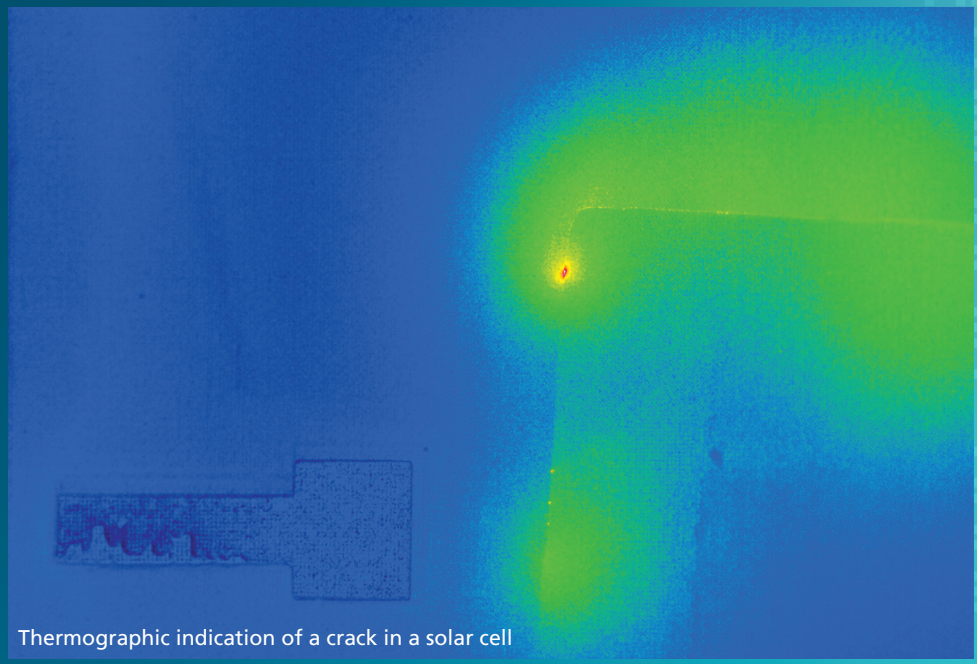
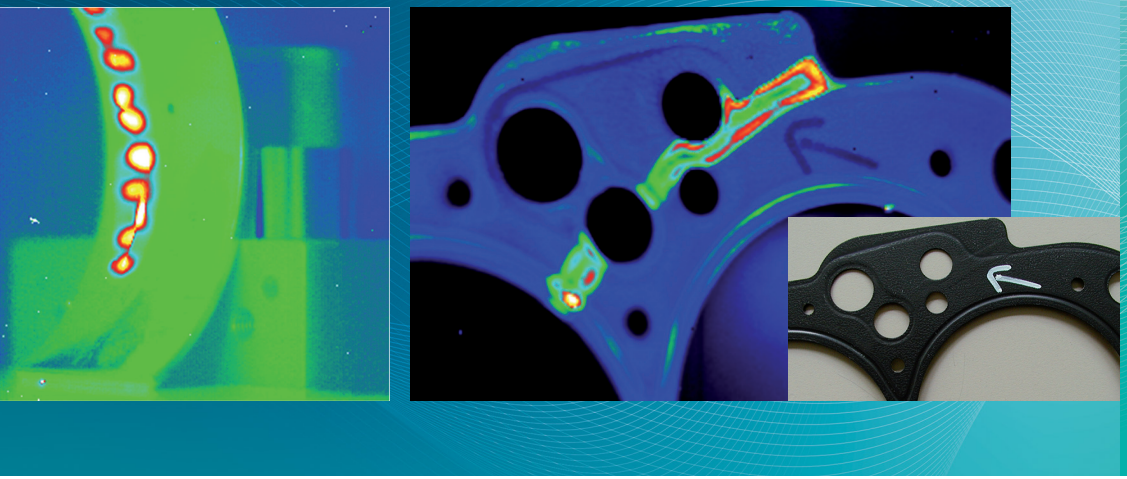
Fraunhofer IZFP

Sensor and Data Systems for Safety, Sustainability and Efficiency



Thermographic indication of a crack in a solar cell

Noncontact imaging inspection using thermal techniques



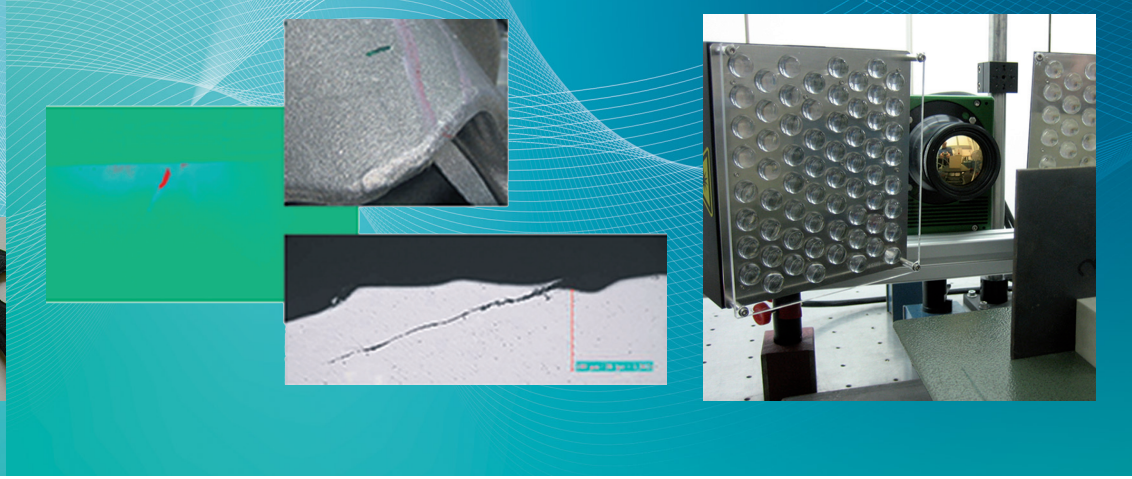
Left: Delaminations under nickel coating on steel; right: Varying layer thicknesses of a lacquered automotive component

Noncontact imaging inspection using thermal techniques

Modern high-performance materials such as light metals or fiber-reinforced plastics require reliable quality assurance. The recurring inspection of safety-relevant systems and components is also crucial. Thus, the need for nondestructive inspection techniques enabling the fast and reliable inline characterization of these materials (100 percent testing) is steadily rising. At the same time, these techniques are to be mobile and flexible enough for periodic in situ inspection. To meet these requirements, inspection techniques that enable fast, automated inspection even of components with complex shapes are particularly in demand.

In recent years, active thermal testing techniques have been pushed to maturity for industrial-grade inspection systems in series production. While providing high inspection speed, they can be used for virtually any components, even those with complex geometries, and in many cases also for the noncontact characterization of materials and coatings.

At Fraunhofer IZFP different variants of thermal inspection techniques have been developed, which use both, different physical effects for energy input (heating) and different evaluation methods. Common to all is the heating of the inspection object. The temperature distribution at the surface is examined using time-resolved images generated by an infrared camera (active dynamic thermography). The required information is provided by the reflexion or transmission of the resulting transient heat flows. The heating can be carried out



Left: Crack display of a forged part using inductively excited thermography and optical photo of the sample, metallography (200 µm crack depth)

pulse-like (pulsed thermography) or periodically (lock-In thermography). Available variants include:

- Light excitation by light flash, halogen lamps, LED arrays, infrared radiators, diode lasers
- Ultrasonic excitation
- Inductive excitation in case of electrically conductive materials
- Exitation by microwaves
- Excitation by hot or cold air

Evaluation techniques such as pulse phase thermography or lock-In analysis are able to assess the image sequences and to oppress perturbations. They provide statements on defect depths and allow for the quantitative imaging of layer thickness distribution at the component as well as for the automated defect detection and data compression techniques as prerequisites for the inspection of mass parts at inspection clock rates of only a few seconds. Reconstruction technology to determine the defect shape on basis of thermographic data is available.

Fraunhofer IZFP has portable and stationary infrared cameras at its disposal in near-wave, medium-wave and long-wave infrared as well as dual-band with temperature resolutions of down to 15 mK and frame rates up to 20 kHz (partial image). Lenses ranging from macro to wide-angle as well as telephoto lenses for large inspection distances are available. Software specifically designed for dynamic thermography is steadily enhanced. Feasibility studies can be carried out and prototypes can be tested in a full-size application facility.

Benefits

- Fast planar inspection with optional fully automated defect detection
- Contact-free
- Curved object surfaces
- For all material groups
- Highly automatable
- No need for test media and chemicals