



## TRACKING DOWN TINY CRACKS IN RAILROAD WHEELS – ACTIVE THERMOGRAPHY BY INDUCTIVE EXCITATION

By the way, you already know 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 complete 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



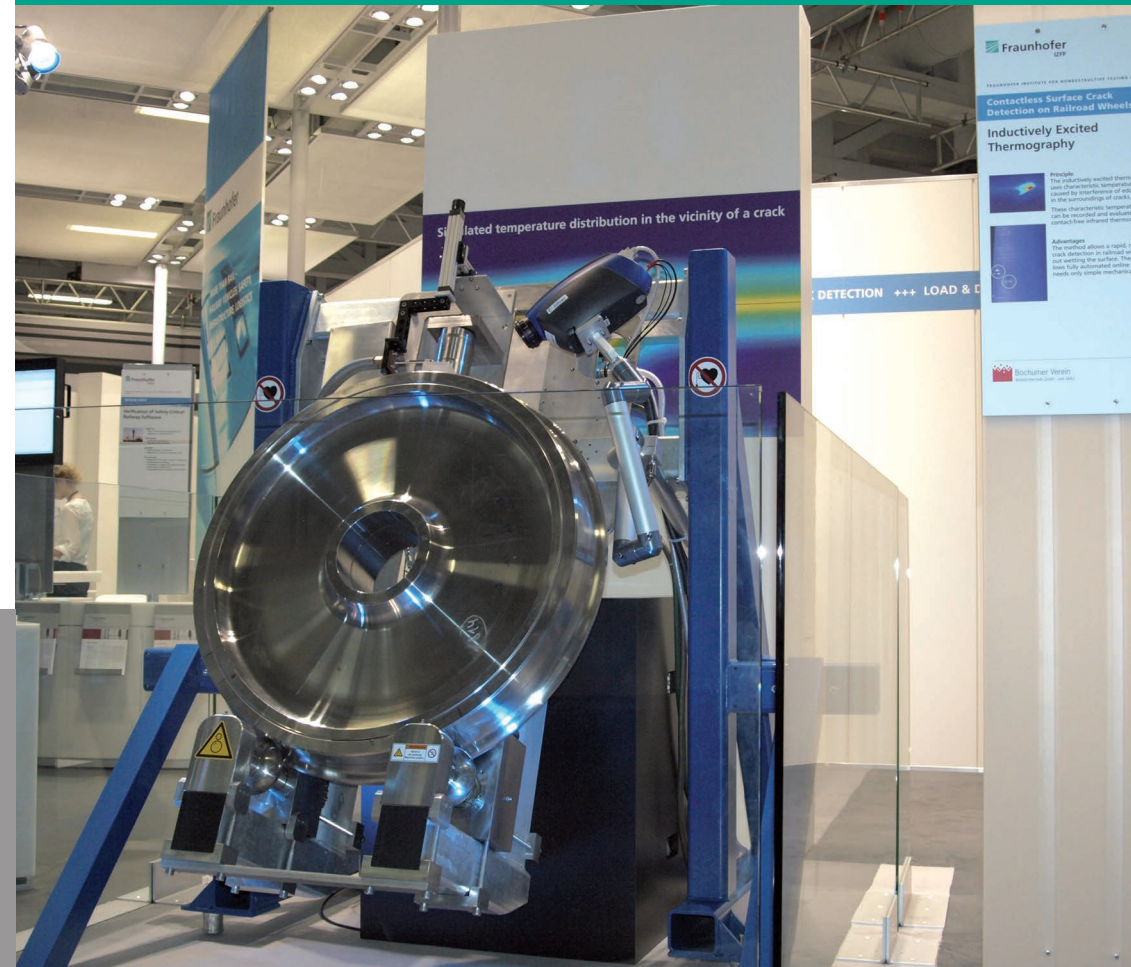
Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren IZFP

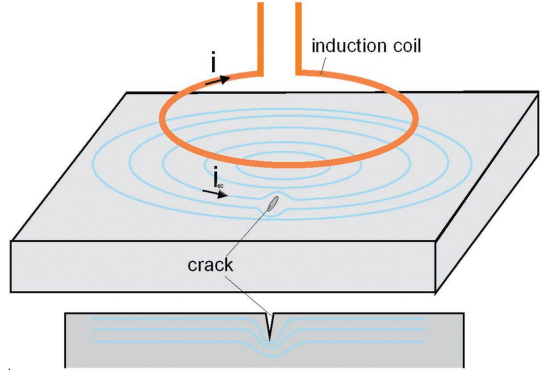
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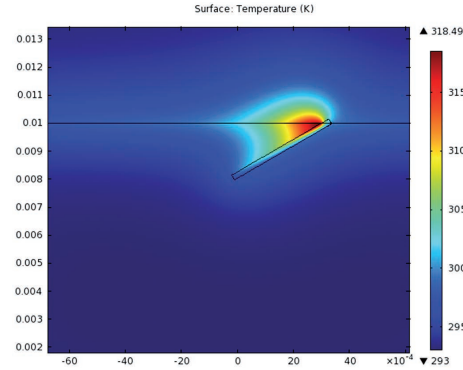
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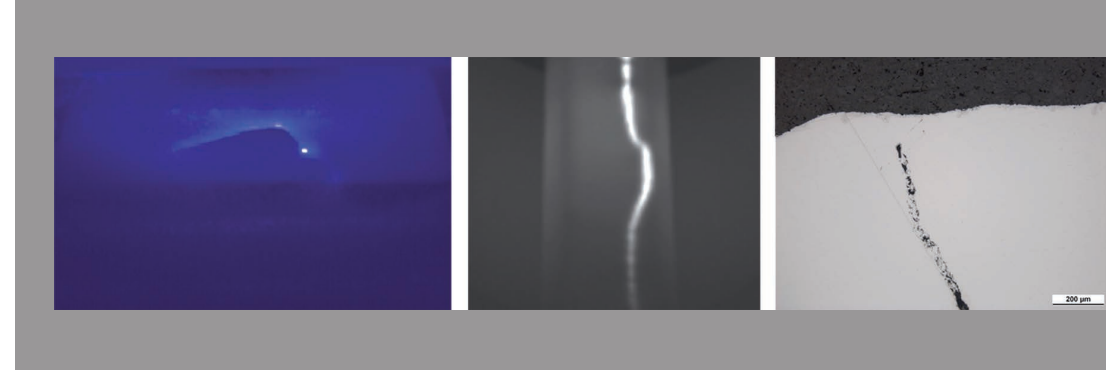




Induction thermography – principle



Temperature distribution near a crack



Railway with squat (inclined crack)

Covered crack in a steel profile

Covered crack in the micro-section

In the railroad industry and many other industrial sectors, nondestructive 100 percent in-process examination of safety relevant components like railroad wheels for surface-breaking cracks is mandatory. In future, nondestructive testing techniques are preferred for this purpose that don't need any previous surface preparation. Additional requirements are high sensitivity, reliability and objectivity plus eligibility for full automation.

Induction thermography works fast and allows the detection of surface cracks in steel components without the need for prior surface preparation. The method can easily be automated without large efforts regarding the mechanics. It is sensitive, reliable and objective and provides the ability to determine the defect depth. Therefore, it is very well suited for fully automated test systems integrated in the production line for 100 percent testing.

Fraunhofer IZFP has the technical equipment for different excitation variants of active thermography:

- Optical pulse and "lock-in" excitation (periodic excitation)
- Ultrasonic excitation and inductive excitation by electromagnetic alternating fields
- Different infrared camera systems for the near, medium and long-wave infrared radiation range providing a non-contact infrared technology
  - Temperature resolution up to 15 mK
  - Time resolution up to 50 microseconds
  - Frame rates up to 20 kHz and resolutions up to 1024 × 768 pixels
- Robots and linear mechanical devices for fast, automated testing
- Specialized software to perform
  - control of inspection systems
  - data processing and analysis of measured data
  - automated defect detection and defect reconstruction

## Our Services

- Fundamental theoretical and experimental investigations (physical basics and possible applications for different active thermographic test methods)
- Test measurements and feasibility studies for industrial applications
- Accreditation-compliant inspection services in the accredited laboratory

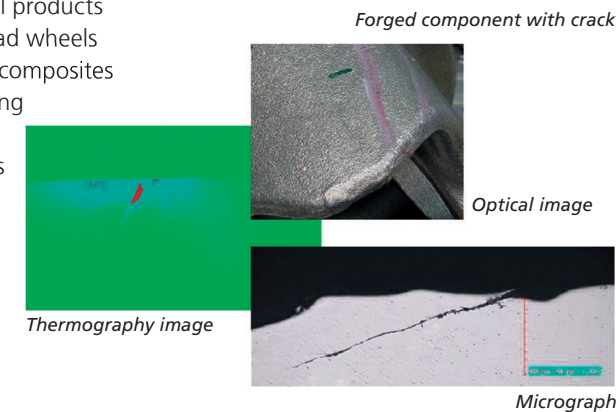
- Design, planning and construction of mobile test systems
- Design, planning and construction of fully automatic systems for online testing of components in the production line, including robot-based inspection systems

## Advantages

- Nondestructive, contact-free and fast inspection method for detection of surface-breaking cracks
- Inspection of components with complex geometry
- Crack depth estimation
- Detection of subsurface (covered) imperfections
- Objective and reliable inspection of components in industrial production
- Easy automation without large efforts regarding the mechanics
- Suitable for fully automated systems with 100 percent inspection of components in the industrial production line
- Eco-friendly since no fluorescent particles liquid is needed

## Applications

- Crack detection in forged components
- In-process crack detection of long steel products
- Surface crack testing of rails and railroad wheels
- Detection of delaminations in metallic composites
- Replacement of magnetic particle testing
- Crack detection in solar cells
- Crack detection in turbine components
- Detection of broken fibers in CFRP



Forged component with crack

Optical image

Thermography image

Micrograph