

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 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

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Sensor and Data Systems for Safety,
Sustainability and Efficiency



Automated wheel tread inspection system

AUROPA



Left: Modern implementation design of an AUROPA inspection railtrack; right: Rail wheel and EMAT probe in roll-over operation

AUROPA – Automated wheel tread inspection system

AUROPA – Automated Ultrasonic Wheel Tread Inspection System – is an inspection system for automated detection of crack-like defects in the tread of rail wheels. Additionally, the system provides information on the wear condition of the tread area. Continuous development has evolved this inspection system into a reliable tool for safe rail-bound speed traffic. The defect detection is carried out by means of an ultrasound inspection applying surface waves which propagate along the tread in the circumferential direction.

In order to enable the inspection of complete trains in roll-over mode, couplant-free working electromagnetic acoustic transducers (EMAT) have been integrated into a special inspection track.

The tread inspection is carried out in pulse/echo and pulse/transmission technology with ultrasonic surface waves propagating bidirectionally, clockwise and counter-clockwise. Excitation and pick up of the ultrasound signals are performed by EMAT probes integrated into the track.

As a major benefit of this technique, Rayleigh waves – a kind of surface waves – can be excited and received directly in the sample. Moreover, this inspection technique has no need for a couplant, so that reliable inspections are possible even at low ambient temperatures. The surface wave can spread around the wheel over several turns without relevant interruptions, which is crucial for the application of the measuring principle. Only by this, reliable measurements on the tread condition are enabled in run-over operation.

AUROPA: Development and inspection setup at Fraunhofer IZFP

The exact triggering time is determined by light barriers at the rails. Thus, the Rayleigh wave is triggered exactly in the moment when a wheel is at right angle over the respective probe: On each side of a rail two probes are mounted which are triggered one by one, with a short delay. This technique enables complete covering of dead zone areas and increases redundancy and, thereby, the measuring reliability. As long as a wheel is free of defects, the ultrasonic signals propagate multiple times clock- and counter-clockwise around the wheel tread during the contact time between the probe and the tread. In the case of an ultrasonic pulse striking a crack, a fraction of its sound energy is reflected as echo. These echo signals can be picked up and are visualized in form of additional peaks between the signals from common surroundings.

By continuous developments, especially in the last years, Fraunhofer IZFP evolved the AUROPA system into a reliable measurement equipment for the tread inspection: In order to record the development status

of all developments, AUROPA has successfully undergone a comprehensive validation process.

Benefits

- Inspection of the tread condition of an entire train in roll-over operation
- Application of EMAT probes immediately in the track
- Couplant-free ultrasound inspection enabling measurements even at low ambient temperatures
- Increased measurement reliability by redundant probes
- Cost-effective realization of the inspections including automated recording of the inspection results in a database

Application

- Wayside Monitoring
- Predictive Maintenance