- Measuring accuracy and speed, robustness of the approach and surface coverage are higher than those of existing systems – at affordable costs
- Strong efforts towards standardization of the method will be started and strategically pursued for the benefit of the full value chain of the steel production
- Well-documented in its characteristics and suited for all kinds of strip steel including AHSS
- Guidelines will be created and a transnational workgroup will be initated to take care of applications and further developments for the synergy of EMAT and micromagnetics in other fields of application

Are you already familiar with our industry-standard services?

- Accredited testing laboratory in accordance with DIN EN ISO/IEC 17025 for various NDT methods
- Certificate of competence of the accredited laboratory to qualify and validate (new) nondestructive testing methods for industrial testing practice in the field of ultrasonic testing
- Rapid transfer to market readiness for qualified, standard-compliant use in industrial applications, both for new developments (in-house developments) or for adaptations
- Our associated quality management system is certified in accordance with DIN EN ISO 9001

Contact

Fraunhofer Institute for Nondestructive Testing IZFP

Campus E3 1
66123 Saarbrücken

+49 681 9302 0

info@izfp.fraunhofer.de
www.izfp.fraunhofer.de

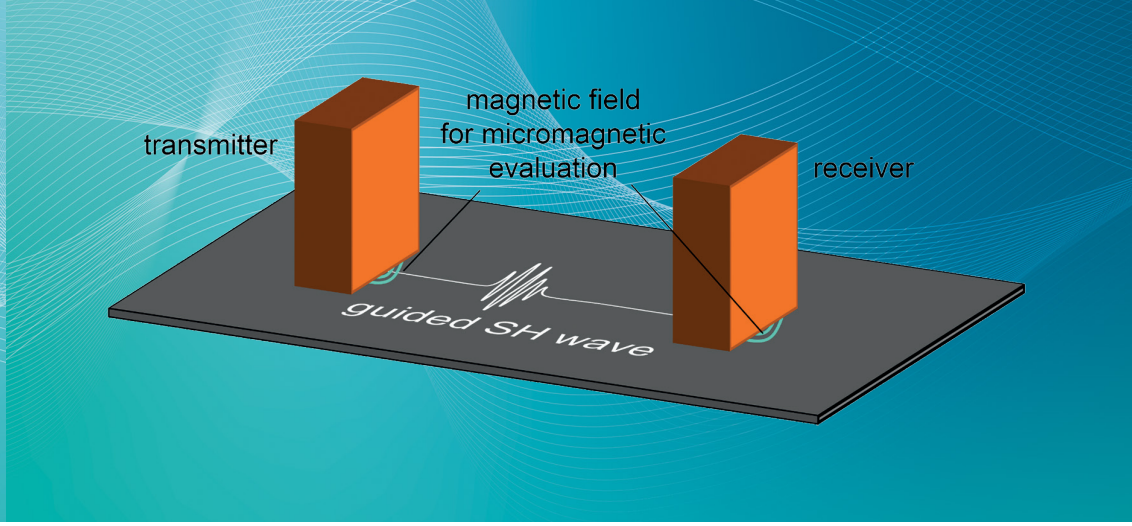
Fraunhofer IZFP

Sensor and Data Systems for Safety, Sustainability and Efficiency

Hybrid micromagnetic ultrasonic testing system for in-line inspection of advanced high-strength steel

MAGNUS

MAGNUS with holder



Principle of micromagnetics / ultrasonics combination

MAGNUS

Advanced high strength steels (AHSS) are used in the automotive industry for car body constructions in order to reduce vehicle weight (and therefore the CO2 equivalents) while maintaining or even improving safety and reliability of the construction. However, the beneficial properties of AHSS are much more sensitive to process variations than those of regular steel, raising the need for improved process monitoring and quality control. The same applies to other advanced steel qualities. So far, there is no comprehensive inline testing solution accounting for all parameters of interest. For example, texture and grain size are still measured in the laboratory at randomly taken samples.

In MAGNUS, the consortium of Fraunhofer IZFP and CETIM aims at the development, evaluation and standardization of a robust high-speed hybrid multi-probe testing system based on a smart sensor principle. It combines micromagnetic and ultrasonic methods, joining their complementary information for an optimal in-line steel strip materials characterization in a real-life harsh environment.

Our innovation: Combination of micromagnetic and ultrasonic methods

In the framework of MAGNUS, equipment will be developed which makes the combined methods available to a wide field of customers. The main application will be in strip steel industries, but the affordable multiple-probe support and high speed of the system to be developed will also serve other industrial branches such as heavy plate production and producers of components with recurring geometric features (camshafts, crankshafts, gears, etc.). MAGNUS zeroes in on:

- Contactless, process-integrated, and fast (real-time) determination of the most essential quality parameters of regular steel and AHSS: yield strength, tensile strength, texture, grain size and secondary phase content in addition to flaw detection
- Smart, rugged "hybrid probe", which uses synergies between its internal components in order to operate as both electromagnetic acoustic transducer (EMAT) and micromagnetic sensor
- Cost-efficient solution for connecting and synchronizing multiple "hybrid probes" to the measuring system in order to measure the distribution of the properties across the width of the strip
- Method of maintaining an air gap and a procedure / an algorithm of lift-off in fluence compensation in order not to touch the strip and still obtain reliable results
- Increased Measuring speed by approx. one order of magnitude as compared to the state of the art, allowing for sufficient surface coverage at high strip speeds and with multiple probes
- Combination of technical improvements and software tools which ensure the fast return to normal operation in case of a probe or device replacement which currently required a time-consuming recalibration.

Benefits

- Destructive tests on random samples can be replaced by nondestructive in-line testing with high surface coverage of yield and tensile strength, texture, grain size and secondary phase content, making process and products safer, greener, and less expensive.

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