LabIR SpotWELD – non-contact non-destructive inspection of spot welds

Development status

Phase 4

The transition from the prototype to the final and fully functional form. At this stage, the prototype is already fully tested, or the technology is certified and ready for mass deployment.

IP protection status

already granted patents and utility models: - Method of inspecting welds, especially spot welds, patent CZ 309 174, application number PV 2020-582 - Method of measuring the area distribution of emissivity of material surface, patent CZ 309 252, application number PV 2020-629 - Cover of the workspace of the laser thermography system, utility model 35950, application number PUV 2021-39328

Partnering strategy

Co-development, Collaboration, licensing

Institution

Challenge

We respond to the requirements of manufacturers and users of industrial lines where welding of automotive components takes place. What is required is a technical method for inspecting spot welds that will perform inspection in an automated (machine vision form), non-contact, non-destructive, consumable-free manner, and will be fast enough to ideally allow inspection of every weld on every welded component at the pace of the production line.

Description

General principle - robotic active thermography (IRNDT) with laser excitation and thermocamera diagnostics. Advantages: for 3D geometry of welded parts, non-contact, non-destructive, characterization of the weld according to heat transfer, fundamental difference from competing NDT methods (ultrasound, X-ray), assembly from verified components intended for 24/7 industrial use, The principle of LabIR Spot WELD (solves the usual problems of IRNDT methods): The heating acts around the weld in the area of the surface of the material, which is not affected by the previous welding process. The thermal process includes a heating phase, thanks to which it is possible to evaluate the quality of the weld, and a cooling phase, thanks to which it is possible to evaluate the spatial distribution of the emissivity of the material surface (a necessary prerequisite for an accurate quantitative evaluation of the temperatures in the heating phase). Fundamental difference from competing IRNDT methods (flash-pulse). Characteristics of the weld according to the amount of removed heat, the size of the optical-thermal trace on the surface, the area of heat conduction and the emissivity value of the material surface. Advantages: automated measurement and evaluation without the operator's participation, variability of parameter settings for different types of welds, repeatability, minimization of false positive and negative results in the identification of ok/nok welds, inspection speed comparable to competitive methods, quantitative evaluation in relation to the reference ok weld, world uniqueness confirmed by the granting

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of patents, functionality verified by a comparative study of steel sheet welds with the results of other destructive and non-destructive methods.

Commercial opportunity

In cooperation with a Czech manufacturer and a major European supplier of welding lines (Chropyňská strojírna), a demonstration robotic workplace was created. It is currently undergoing verification tests of customer samples and welded components. So far, negotiations have taken place with the following companies: Suzuki, Honda, Renault, Magna. ZČU-NTC participates in presenting the technology to potential customers and evaluates the inspection results (alternative evaluation algorithms are being developed). Customer projects are in various stages of resolution. Contracts (including license agreement) for pilot orders are being prepared.