Recent Developments in Non-Destructive Testing of CFRP Components Using Active Thermography

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Abstract. *Non-destructive testing of CFRP components during manufacturing and maintenance is mandatory to assure sufficient quality standards. Therefore, many different testing approaches have been developed: ultrasound, x-ray, tap test, and active thermography. The advantage of thermography is its high testing speed. Large areas can be measured rapidly with excellent accuracy and reproducibility. This will be especially important for production quality control of medium and high volume quantities of CFRP parts expected for automotive applications in the future.*

During an active thermography measurement, heat is applied to the tested component by halogen or flash lamps. In intact structures, the generated heat flow propagates into the material without any obstruction. In defect areas, however, the heat flow is disturbed by flaws like delaminations or porosity. This leads to slightly higher surface temperatures in these areas indicating the presence of the defect. The temperature pattern is recorded by an infrared camera and evaluated by adapted algorithms (e.g. Fourier transformation). The generated results are insusceptible to disturbances like vibrations, poor positioning accuracy, or varying surface properties. The spectrum of detectable defects ranges from porosities, delaminations, inclusions, excess of resin, ondulations, thickness variations, defects in adhesive joints, poor bonding of inserts, impact damage, to characterization of repairs.

This contribution gives an overview on recent developments in non-destructive evaluation of CFRP components using active thermography methods. It thereby focusses on industrial applications, mainly in the automotive and aerospace industry. It also includes new measurement approaches like fiber-orientation measurements using inductive excitation and the possibility of using inexpensive uncooled infrared cameras.

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