Testing of Carbon Fiber Materials (CFRP) using High-Frequency Eddy Current (HF EC) Techniques

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Abstract:
Carbon fiber materials become more and more important for many applications. Unlike metal the technological parameters and certified quality control mechanisms for Raw Carbon Fiber Materials (RCF) have not yet been developed. There is no efficient and reliable testing system for in-line inspections and consecutive manual inspections of RCF and post laminated Carbon Fiber Reinforced Plastics (CFRP). Based upon the multi-frequency Eddy Current system developed at Fraunhofer IZFP, structural and hidden defects such as missing carbon fiber bundles, lanes, suspensions, fringes, missing sewing threads and angle errors can be detected. Using an optimized sensor array and intelligent image pre-processing algorithms, the complex impedance signal can be allocated to different carbon fiber layers. This technique enables the detection of defects in depths of up to 5 layers, including the option of free scale measuring resolution and testing frequency. Appropriate parameter lists for optimal error classifications are available. The dimensions of the smallest detectable flaws are in the range of a few millimeters. Algorithms and basic Eddy Current C-Scan processing techniques for carbon fiber material testing are described in this paper.

Keywords: Eddy Current, Raw Carbon Fiber (RCF), Carbon Fiber Reinforced Plastics (CFRP), Analysis Techniques, Image Calculation