



Quality Control Methodologies for Surface Preparation Processes for Composite Bonding

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ABSTRACT

The objective of this research is to assess quality control (QC) methodologies and their ability to identify less-than-desirable surface preparation for adhesive bonding of composites. QC methodologies are needed because conventional nondestructive inspection (NDI) methods are not suited to measure adhesive strength. Substantial progress has been made in applying and interpreting various laboratory surface characterization techniques to composite surfaces prepared for adhesive bonding. This research evaluates portable QC instruments with respect to laboratory techniques. Samples with cure cycle process deviations and controlled surface contamination were included to determine the effectiveness of the QC methods in detecting features that affect bond quality. Specifically, contact angles, surface energies and surface chemistry of several peel ply prepared aerospace composite systems are measured using goniometry, a Brighton Surface Analyst and Fourier Transform Infrared Spectroscopy (FTIR). Surfaces are also examined by SEM and bond quality measured by Mode I fracture tests to correlate changes in process parameters and bondability. Results from this research will help to increase safety and reliability of adhesively bonded structures and further the fundamental understanding of adhesion.