Investigations of strength and quality of clinched joints using digital image correlation

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Abstract

This study examines the impact of processing conditions on joint strength and the effectiveness of digital image correlation (DIC) in detecting failure points in clinched joints. Mechanical tests, including single-lap shear and pull-out tests, were conducted using DIC to evaluate joint quality in various clinched configurations. The results showed frequent failures at the neck rejoin in clinched joints between mild steel and aluminum sheets, particularly when thinner sheets were positioned on the punch side and softer materials on the die side. DIC effectively identified defects and failure locations, offering insights into material combinations, sheet positioning, and failure modes. Although DIC was

useful in detecting defects in both elastic and destructive regions, its ability to distinguish specific defect types from strain contour maps was limited. The study highlights the need for further research to extend DIC's application to other mechanical joining systems and advocates for its proactive use in refining designs and manufacturing processes. © 2024 Informa UK Limited, trading as Taylor & Francis Group.

Author keywords

Aluminium; clinching; digital image correlation; joint failure; joint quality; steel

Indexed keywords

Engineering controlled terms

Aluminum coated steel; Failure modes; Fracture mechanics; Image correlation

Engineering uncontrolled terms

Clinching; Digital image correlations; Failure points; Joint failure; Joint quality; Joint strength; Mechanical; Processing condition; Pull-out test; Single lap shears

Engineering main heading

Aluminum sheet

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