Laser-Shearografie (NDT) Inspektion von Luft- und Raumfahrtkomponenten

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Kurzfassung

Die Fähigkeit, Defekte in Luft- und Raumfahrtstrukturen mithilfe der Laser-Shearographie effektiv und effizient zu erkennen, ist allgemein bekannt. Die Technologie kann zur Erkennung einer Reihe von Fehlern eingesetzt werden - einschließlich; Delaminierungen, Kissing Bonds, gerissene Kerne, Eindringen und Fremdkörperschäden (FOD) in Laminaten, Waben, Schaumkernen und gebundenen Bauteilen. Shearografie-Systeme wurden seit zwanzig Jahren für eine Reihe von Luft- und Raumfahrtanwendungen, darunter: Radomen, Hubschrauberblätter, Druckbehälter, Tanks und Steuerflächen.

Der Vorteil der Durchführung wiederholbarer NDT-Inspektionen mit Laser-Shearographie mit hohen Inspektionsraten, die nachvollziehbare und reproduzierbare Messergebnisse liefern, ist eine wirklich zeiteffiziente und damit kostengünstige Lösung. Flexible Lösungen für eine wachsende Anzahl von Testanwendungen erfordern die Bereitstellung einer agilen Roboterintegration.

Die Validierung der Testergebnisse muss anhand von benutzerdefinierten Toleranzen festgelegt werden. Zuverlässige Messungen sind ein absolutes Vorrecht für jede ZfP-Technologie. Dies ist an sich schon eine Herausforderung, für die Dantec Dynamics die Lösung für Ihre Testanwendung hat.

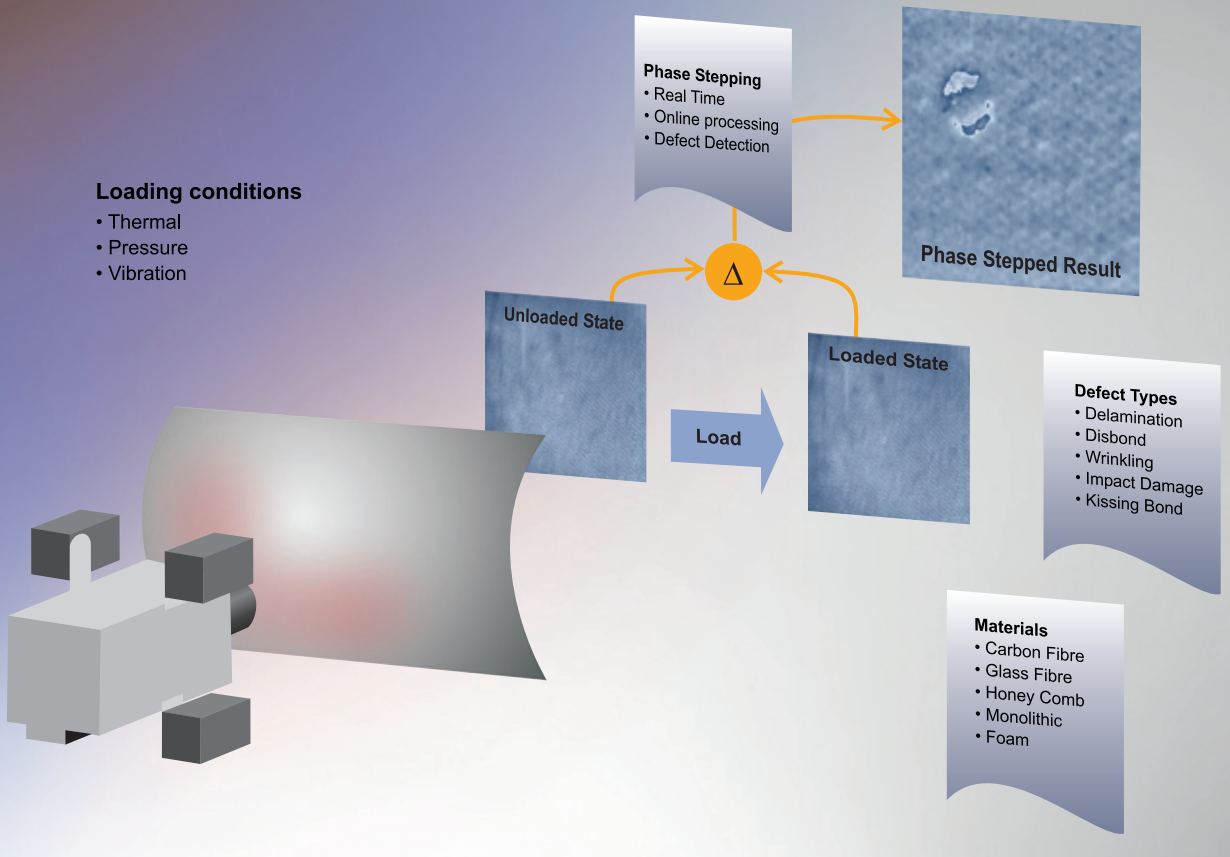
Shearography NDT

Introduction

Shearography is an optical Non Destructive Testing method that provides fast and accurate information about internal anomalies in different materials. Shearography is being extensively used in production, research and development and in-field within the aerospace, automotive, marine and wind industry.

Features

- Non-contact NDT technique that provides a measurement area up to 1 square meter
- Shearography has been incorporated into the ASNT standards since 2006
- ASTM inspection standards for shearography released in 2007



Principles

When a surface is illuminated with a coherent laser light source a stochastic interference pattern is created. This 'speckle' pattern is projected on a camera's CCD chip. In contrast to ESPI (Electronic Speckle Pattern Interferometry) where the speckle is compared with a reference light path, Shearography uses a reference created by shearing the image of the test object to create a double image. This makes the method much less sensitive to external vibrations and noise. The superposition of the double image, a shearogram, represents the surface of the test object in an unloaded state. By inducing a small strain in the material using thermal, pressure or mechanical loading, the material deforms. If the material has non-homogeneous properties, the deformation of the surface will not be uniform. A new shearogram is recorded in this loaded state and is compared with the unloaded image. If a flaw is present it will be seen in this result as a small deformation.

Phase Shift Technology

To increase the sensitivity of the technique, a real-time phase shift process is used in the sensor. It uses a stepping mirror that shifts the reference image and enhances the results with directional information included with the deformation.

Applications

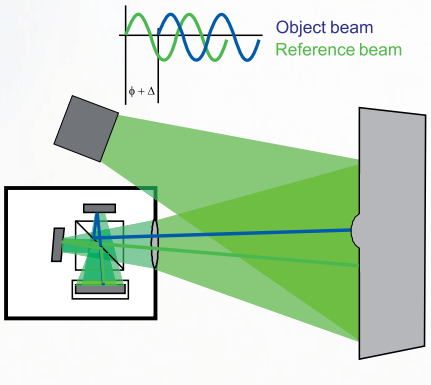
The main applications for shearography are for Quality Assurance of composite and other materials. Defects including disbonds, delaminations, wrinkles, porosity, foreign objects, impact damage and many more can be detected. These can be detected in the production process or during in-field inspections.

Inspection Standards

The Non-destructive Testing industry is controlled by Inspection Standard Documents. Shearography is incorporated in following standard documents:

ASNT SNT-TC-1A, 2006 edition
ASNT CP-105, 2006 edition

ASTM E2581 -07, Standard Practice for Shearography on Polymer Matrix Composites, Sandwich Core Materials and Filament Wound Pressure Vessel's in Aerospace Applications



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