Laser shearography inspection

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Outline

- Dantec Dynamics
- Laser Shearography
- Standardization actions
Dantec Dynamics
Who are we? What are we doing?
Dantec Group Overview

- Dantec is the world’s leading supplier of optical measurement solutions for research and diagnostics into flows, micro fluidics, particle sizing, combustion and materials/components.
- Main office in Copenhagen, Denmark.

Additional facts:
- A NOVA Instruments Company
- 5 subsidiary companies in 5 countries and representatives worldwide
- 120 employees worldwide, many with MScs, PhDs or other post graduate degrees

Map showing locations:
- Dantec Dynamics main office
- Dantec Dynamics company
- Dantec Dynamics representative
Main Business Areas of the Dantec Group

- **Fluid Dynamics**
  - Air and gas flow measurements
  - Comfort measurement
  - Liquid flow measurements
  - Particle size measurements

- **Strain/Stress/Vibration**
  - Strain & Stress measurements
  - Vibration analysis
  - Non-destructive testing

Optimisation of product design and combustion

Aerodynamics and hydrodynamics

Optimisation of materials and components
Dantec Dynamics GmbH

Dantec Dynamics GmbH (Ulm, Germany) represents the group´s competences into elasto mechanics of materials and components and surface metrology

We deliver innovative solutions for

- Strain- / Stress Analysis
- Vibration Metrology
- Nondestructive Testing
  NDT/NDI

- **Non contact**
- **Full field**
- **Threedimensional**
Laser Shearography
NDT inspection using Shearography
Non-Destructive Inspection With Shearography

- Technique to identify defects in almost any material
- Slightest surface excitation leads to surface deformations from the internal flaws
- The shearography system can detect these very small deformations
- Full-field, non-contact technique
Principle of Shearographic Measurement

Differential displacement (between sheared points)
Typical Result

- core
- skin
- defect
- loading

Deformation of surface

Gradient of deformation
Loading

- Vacuum Loading
- Heat Loading
- Mechanical Loading
- Vibration Loading
Detectable Defects with Shearography

- Delamination
- Debonding
- Separation of structural components
- Undulation/waving/wrinkling
- Kissing bonding
- Impact Damage (BVID)

- Structural anomaly
- Inter-laminar separations
- Crushed Core, differentiates between disbonds
- Internal corrosion
- Changes in section and core splices / bulkheads
Standard Q-800 System

Q-800 Shearography Sensor for various applications in production or in-field

- Variable field-of-view
- Lightweight
- Compact design
- Any excitation method
Examples of Defects

- Disbonds
- Porosity
- Delaminations
- Hole
- Inner structure

A Nova Instruments company
Q-810 Vacuum Hood System

Q-810 portable Shearography System for applications in production or in-Field Service

- Large area coverage (15sqm/hr)
- Hood mounted touch-screen monitor
- Thermal and vacuum loading
- Lightweight
- Long cable connection >20m
Shearography on Rotorblades

• High Speed inspection for large areas

• In Field Inspection Systems

• Wrinkling Detection
Customized Systems

Q-8xx customized Shearography System for applications in production or in-Field Service

• Combination with robot
• Large objects with complex shape
• Combination with crawler for inspection inside
• Fully automated
Results

Part with defects

Part without defects
Standardization
Standardization actions
Standardization

EU founded projects
• Series of projects (SPOTS, ADVISE, VANESSA) on standardization of
  - optical techniques for full field strain measurement
  - validation of numerical simulations

Digital Image Correlation (DIC)
• Member of VDI committee for creating a DIC directive (Germany)
• DIC Challenge (world wide)

Shearography
• Member of DIN committee (DIN 54180-1, Germany)
• Member of ASNT committee (ASTM E2581-07, USA)
• Part of the industrial advisor board of VITCEA project (EU)