High Speed Inspection of Composite Profiles

Vincent BISSAUGE, NDT Senior Engineer at TESTIA France
& Guillaume ITHURRALDE, C.T.O. of TESTIA France

Czech Society for NDT and European Federation for NDT in collaboration with GUARANT International will organize

11th European Conference on Non-Destructive Testing
October 6–10, 2014, Prague, Czech Republic
Company Profile

- **Core business**: worldwide NDT (Non-Destructive Testing) services & solutions, mostly for the Aerospace market
- **Shareholder**: AIRBUS GROUP company
- **Locations**: France, Germany, Mexico, Russia, Singapore, South Africa, Spain, UK
- **More than 20 years** of experience
- **Activities**: training, inspections (in service & manufacturing), consultancy, engineering & products
- **Approvals**: COSAC, EN4179, NAS 410, EN 9100 – ISO 9001-2000, EASA, FAA PART 145, CESSNA
Contents

1. Introduction
2. ‘Design to Control’ Approach
3. Modular Architecture
4. Industrial Applications
5. Conclusions
Context

Increasing number & diversity of CFRP profiles manufactured for the aerospace industry

Ratio of inspected components $\approx 100$

$\Rightarrow$ Need for NDT machines dedicated to profiles
Our Experience
Strong knowledge & know-how in the NDT of CFRP components especially with ultrasound (UT) & infrared thermography (IRT)

Our ‘Design to Control’ Approach
Propose competitive solutions optimized according customers’ requirements & environment constraints
Introduction (3/3)

**Standard key modules** for acquisition & analysis

**Smart NDT tools**

Common differencing characteristic: **computer-aided diagnosis**
Contents

1. Introduction
2. ‘Design to Control’ Approach
3. Modular Architecture
4. Industrial Applications
5. Conclusions
‘Zooming-out’ methodology

- Flaws
- Component
- NDT system
- Process
- Industrial environment
Design to Control (2/2)

‘Screening’ methodology

COMPONENT

Part Drawing

Quality

Method

Probes

Analysis

Technique

Number of probes & definition

Scanning Trajectory

Robustness

Parallelism

Automation

Other processes

UT, IRT

Pitch, step, foc.

Software

TT, DT, Pulse-echo

Flat, curved

Moving component or probe

Method, probe, mechanics

Number of probes vs number of paths

Handling, settings, analysis, ...

VT, dimensional checks, machining...

Manuf. Rate

11th ECNDT - October 2014 - Prague, Czech Republic
Our solutions: combinations of **scalable standard modules**

- UT Phased Arrays
- Infrared camera
- Heating sources
  ...

- Sensors
- Data Acquisition System
- Data Analysis System
- Mechanical System

- Acquisition electronic boards & software
- Analysis software

- Conveyor
- Robot
- Linear tracks
- Turntable…
Parallelism of scalable standard modules for Profiles
Parallelism of scalable standard modules for **Plates**

- Visual testing
- Thickness gauge
- Utrasound testing
- Automatic analysis, sorting & reporting
Main benefits

- Optimization

- Progressive Automation

- Simplified Maintenance (incl. periodical verifications)

- Combination with other processes
Contents

1. Introduction
2. ‘Design to Control’ Approach
3. Modular Architecture
4. Industrial Applications
5. Conclusions
Industrial Applications (1/4)

Semi-automatic Ultrasound Testing of Clips, L-stringers, …

Sensors:
- 2 UTPA transducers
- Static positions

Scanning system:
- Static encoding wheels
  + Operator handling
- Guiding corners

Acquisition system:
2 Smart U32 + PC
- Automatic settings
- Concatenation
- Parallelism
- User-friendly interfaces

Analysis software:
‘ULTIS’ (invisible task)
=> Automatic
- Setting
- Processing
- Sorting
- Reporting
Automatic Infrared Thermography Testing of Hat Stringers

Sensors:
- 1 heating source / 1 position
- 1 camera / 2 angular positions

Scanning system:
- Clamping
- Moving component (1 vertical linear scan)
- Automated cycles chaining

Acquisition system: 1 PC
- Manual settings
- Triggering of excitation & reception

Analysis:
- software conversion of dynamic acquisition (movie) into 1 single thermogram
- processing
Industrial Applications (3/4)

Automatic Ultrasound Testing of Fuselage Z-Frames

Sensors:
8 static UTPA transducers
(total: 256 elements)
- small pitch (0.6mm)
- 1 single line-scan

Acquisition system:
8 Smart U32 + 8 PC
- automatic settings
- automatic merging
- parallelism

Scanning system:
- conveyor
- positioning & clamping system
- wheel drives
- automatic cycles chaining

Analysis software:
‘ULTIS’ (invisible task)
=> Automatic
- processing
- sorting
- reporting
Multi-purpose Automatic Ultrasound Testing Machine

Sensors:
- 1 set of UTPA for profiles in a specific probe holder
- 1 UTPA + 1 bulbblcer for flat or curved planels

Mechanical system:
- clamping
- scanning
- changing tools
- automatic cycles chaining

Acquisition system:
9 Smart U32 + 9 PC
- automatic settings
- automatic merging
- parallelism

Analysis software:
‘ULTIS’ (invisible task)
=> Automatic
- processing
- sorting
- reporting
Contents

1. Introduction
2. ‘Design to Control’ Approach
3. Modular Architecture
4. Industrial Applications
5. Conclusions
Context => **Need for NDT machines** dedicated to **profiles made of CFRP** to face the increasing number & diversity of components manufactured for the aerospace industry

Our ‘**Design to Control’ approach** => Supply competitive solutions optimized according customers’ requirements & environment constraints

Our **scalable architecture & standard key modules** => Speed-up the acquisition and analysis processes & facilitate inspector’s tasks thanks to **computer-aided diagnosis** + **automatic reporting & sorting**

Our **references** => Method: UT, UTPA, IRT, ET / Automation: semi or full / Multi-purpose or optimized for one type of product / Our difference: supply with all associated services (training, qualification, etc.)
• Many **thanks** to our:
  - Customers DUQUEINE & AEROFONCTIONS for their kind agreement to use the pictures of their facilities
  - Partner ACTEMIUM for the supply of CAD views of the machines

• Any **question**?

• **Invitation**: come & visit us to the Booth B7 (Floor 3)

• **Contact**: contact@testia.com
Thank you for your attention

www.testia.com