OEM worldwide patented PA UT for Automated UT Industrial applications

FAAST-PA delivers high speed inspection for Tubes, Plates, Bars/Billets, Rail, Turbine discs and more...

More info about this article: http://www.ndt.net/?id=25294
SUMMARY

I
SOCOMATE INTERNATIONAL OVERVIEW

THE PHASED ARRAY FAAST-PA TECHNOLOGY

II
INSPECTION OF BARS & BILLET

INSPECTION OF TITANIUM & ALUMINIUM PLATES

III
INDUSTRIAL REFERENCES USING FAAST-PA
Socomate International overview

- Created in 1977, based in France
- 40 years experience in NDT environment for UT inspection
- Core Business: development of high-end UT Electronics
- Worldwide Sales: over 40 countries
- Design, manufacture and provide OEM UT Electronics
- Conventional UT and PA UT Instruments for custom systems manufacturers
Socomate International product range

**SOCO-I-UT**

**SOCO-8S-UT**

**SOCO-8P-UT**

**Socoscan-PA**

**FAAST-PA**

- Common DLL for Conventional and PA UT working with any languages on windows 7 and 10
- OEM stand alone products, working with Ethernet connection
- Worldwide patent on FAAST-PA
What are the differences between Conventional PA and FAAST-PA?
What are the differences between Conventional PA and FAAST-PA?
Bars and Billets Inspection using FAAST-PA
Bars/Billets Inspection - Context

INTERNAL FLAWS

SURFACE FLAWS (LONGITUDINAL CRACKS)
Bars/Billets Inspection – Inspection’s Principles

- **0° SHOT**
  - **INTERNAL FLAWS**

- **OBLIQUE SHOTS (CW+CCW)**
  - **SURFACE FLAWS (LONGITUDINAL CRACKS)**

> **A CONVENTIONAL PHASED ARRAY INSTRUMENT WILL REQUIRE 3 SEQUENTIAL SHOTS TO COVER THE FULL INSPECTION**
Bars/Billets Inspection – FAAST-PA Solution

- **FAAST-PA Inspection**: Only one shot is required for multiple angles.

- In this configuration, FAAST acquisition is 3 times faster than conventional PA.
Bars/Billets Inspection – Comparison between solutions

Use of a 1D Linear Probe R60
Bars/Billets Inspection – Comparison between solutions

FBH detection

**CONVENTIONAL PA**

- SNR=24dB
- FBH
- No Defect

**FAAST MULTI-ANGLE SHOT**

- SNR=22dB
- FBH
- No Defect
Bars/Billets Inspection – Comparison between solutions

Notch detection

CONVENTIONAL PA

SNR>28dB

Notch

No defect

FAAST MULTI-ANGLE SHOT

SNR=24dB

Notch

No defect
Titanium Plate Inspection using FAAST-PA
Titanium Plate - Context

- Detection of flaws at different depths
- Looking for 0.8mm FBH
- From 15mm to 185mm with defects at: 15, 25, 40, 80, 135, 185

- Material: Titanium TA6V
- Probe: 1D linear PA, 10MHz
Titanium Plate – Inspection using conventional PA

- The principle of conventional PA is the use of different US focused beam for each zone.
- This require several sequential shots which lead to time consuming.
Titanium Plate - Inspection using conventional PA

**Sequential Unifocal Shots**

<table>
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<tr>
<th>Shot 1</th>
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<th>Shot 3</th>
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<th>Shot 5</th>
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\( F_i = \text{Optimal Focale for FBH n° } i \)
Titanium Plate– Inspection using FAAST-PA

➢ Based on FAAST-PA, one shot is required for multiple depth focusing

Probe

Shot 1

Probe

Shot 2

Probe

Shot 3

...
Titanium Plate—Inspection using FAAST-PA

- Example of FAAST-PA using Multiple focal within 1 US Shot

- Multi-focus Transmission + DDF Reception ➤ Advanced DDF

Multi-focus Shot

DDF Receptions
Titanium Plate - Results Comparison

**CONVENTIONAL PA**

- FBH 15 mm
  - SNR = 38 dB
  - Noise

**FAAST ADVANCED DDF**

- FBH 15 mm
  - SNR = 38 dB
  - Noise
Titanium Plate - Results Comparison

**CONVENTIONAL PA**

FBH 185 mm

SNR=20dB

Noise

**FAAST ADVANCED DDF**

FBH 185 mm

SNR=19dB

Noise
Aluminium Plate Inspection using FAAST-PA
Aluminium Plate – Context

**Mechanical scanning speed:** 700mm/s

**Maximum PRF 800Hz (limited by ghost echoes)**

**Pitch:** 1mm with 3 dB repeatability

**Specification:**

1,2mm FBH

**From 1,5mm to 190mm**
Aluminium Plate - Laboratory results

- Aluminium block test with FBH Ø1.2mm

Near zone detection

SNR = 18 dB
Aluminium Plate – Laboratory results

- Aluminium bloc test with FBH Ø1.2mm

Deep zone detection

SNR=17dB

FBH 163mm

FBH 163.5mm
Aluminium Plate – On-site results

- **ALUMINIUM PLATE WITH FBH Ø1.2MM**

  - FBH 22 mm
  - SNR = 26 dB

  - Virtual Probes

  - C-SCAN

  - FBH 22 mm

  - Noise

  - MECHANICAL SCAN
Aluminium Plate – On-site results

C-SCAN
Virtual Probes
FBH 190mm
Noise

FBH 190mm
SNR=26dB
Aircraft turbine discs using Multi-zone process

- Use of multi-focus and multi frequency with only one 128 elements 2D matrix PA probe 10MHz
- High speed rotating inspection
- **Specification:**
  - Titanium
  - 0.4mm FBH
  - From 2.5mm to 140mm
  - Inspection of 7 zones in 2 shots
OCTG seamless tubes overview

- Use of Multi-angle, Multi-frequency and Multi-beam acquisition mode using 1D & 2D Matrix PA probe
- 1D: Lamination and Wall thickness
- 2D: Flaw detection

**Specification:**
- Transverse, Longitudinal, all oblique flaws inner and outer
- Real time to inspect 100%
- 1,5m/s rotating tube
- 58mm pitch
Rail inspection at high speed

- Use of Multi-angle acquisition mode using 1D Linear probe and conventional
- 1 probe, up to 16 directions in one single shot and processing signals in real time

**Specification:**

- 72 km/h
- Inspection pitch: 4mm
- 1 Linear probe for 8 directions,
- 1 conventional for 0°, 55° and 70° offset
High precision tube

- Use of Multi-angle acquisition mode using Bi-linear Phased Array ring probe
- 1 probe for Transverse, Longitudinal, inner and outer flaw detection

**Specification:**
- Minimum flaw depth of 5% of Wall thickness
- Range from 15 to 50mm
- Thickness range from 1 to 4mm
- Linear speed of 15m/min
- 4 ring probes to fully inspect the tube
Thank you for your attention & participation

Any Questions?