Digital Radiography in Aerospace

Underlying principles and migration from film technology
About VisiConsult

• Founded in 1996
• Over 80 employees worldwide
• Located in Northern Germany
• US subsidiary based in Atlanta, GA
• Germany's 4th fastest growing company (in EU 600)
What we will do today
# Product overview

<table>
<thead>
<tr>
<th>Digital Radiography</th>
<th>Security</th>
<th>Electronics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard systems</td>
<td>Custom</td>
<td>Software</td>
</tr>
<tr>
<td></td>
<td>Mobile</td>
<td>Mobile</td>
</tr>
</tbody>
</table>

- **Digital Radiography**
  - Cabinets
  - CT
  - Gantry
  - Pipe

- **Security**
  - XRH Mobile
  - Xplus Security

- **Electronics**
  - XRH Count
Standard cabinets
Computed Tomography
Cabinet overview
Portable DR solutions
X-ray sources
Detector covers
Xplus Mobile Software

- Running on tablet or laptop
- WiFi connectivity
- Easy touch operation
- Fast setup
- Mission database
Other possible applications:

Single wall weld inspection inspection of small tubes
Cloud inspection
XRHGantry system
XRHGantry system

XRH Gantry

ACCESSIBLE ROOF
REDUCED SPACE REQUIREMENTS THROUGH USAGE OF THE ROOF FOR ELECTRICAL AND GENERATOR
The big challenge?
Application centered

- Disbonds
- Cracks
- Delaminations

- Cracks
- Pores
- Inclusions

- Porosities
- Inclusions
- Geometry

- Delaminations
- Pores
- Inclusions
Basics of X-ray inspection

Photodiodes
(flatpanel pixel)

scintillator

signal
DR Phantom
Contrast Sensitivity (CS)
Contrast Sensitivity (CS)
Spatial Resolution (SRb)
Spatial Resolution (SRb)
FIGURE 25.8
Minimum detectable SNR. An object is visible in an image only if its contrast is large enough to overcome the random image noise. In this example, the three squares have SNRs of 2.0, 1.0 and 0.3 (where the SNR is defined as the contrast of the object divided by the standard deviation of the noise).
# Report generation

<table>
<thead>
<tr>
<th>CDA System</th>
<th>voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Year</td>
<td>tube current (mA)</td>
</tr>
<tr>
<td>Last Service</td>
<td>pre-filter (material and thickness)</td>
</tr>
<tr>
<td>Detector Settings</td>
<td>focus-detector distance (mm)</td>
</tr>
<tr>
<td>Software</td>
<td>object-detector distance (mm)</td>
</tr>
<tr>
<td>Software Version</td>
<td>total exposure time per image (s)</td>
</tr>
</tbody>
</table>

## Test
- ☐ Acceptance Test
- ☐ Test after Repair or new Software
- ☐ Long-term Stability (short version)
- ☐ Long-term Stability (long version)
- ☐ 5-Groove-Wedge
- ☐ Duplex Plane Phantom
- ☐ Duplex Wire IGI (EN 462-6)
- ☐ Focal Plane
- ☐ Wire IGI (EN 462-1)
- ☐ no IGI required

## Material of the used IGI
- ☐ Aluminium
- ☐ Titanium
- ☐ CRES

## Tests
<table>
<thead>
<tr>
<th>Tests</th>
<th>Unit</th>
<th>Result (new) thin</th>
<th>Limit</th>
<th>Result (new) thick</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial Resolution</td>
<td>SR (μm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Contrast Sensitivity</td>
<td>CS (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material Thickness Range</td>
<td>MTR (mm)</td>
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<tr>
<td>Signal-to-Noise Ratio</td>
<td>SNR</td>
<td></td>
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<tr>
<td>Signal Level</td>
<td>SL</td>
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<td></td>
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<td></td>
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<tr>
<td>Image Leg</td>
<td>Leg (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Burn-in</td>
<td>BI (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Offset Level</td>
<td>OL</td>
<td></td>
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<td></td>
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<tr>
<td>Dead Pixel Distribution</td>
<td></td>
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</tbody>
</table>

## Date of Tests

## Conclusion

## Operator
Overlays

21 10 2016 - 11:30 Sample Application Part
Scrap 100,0 kV
3,00 mA
Digital Filters

Conventional Image  LIVEFilters
Computed Tomography (CT)

ANALYSES: Actual-nominal comparison
Compued Tomography (CT)

ANALYSES: clipping boxes to have a look on inner walls
Computed Tomography (CT)

**ANALYSES:** dimensional measuring

- traditional with CMM (coordinate measuring machine)
- dimensional measurements in CT: distances, angles, min/max distance...

Automation example
Automation example
Automation example
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