

Cutting Edge 3D Radiography for Component Inspection

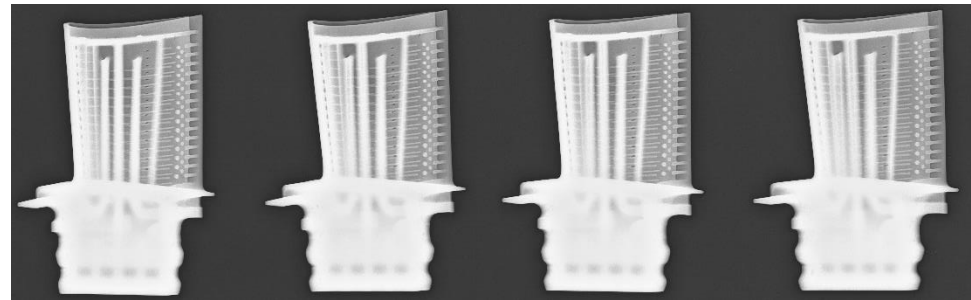


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09 28 2020

The Reality

- Parts Inspection is very **Costly** and **Labor Intensive**
 - Parts are becoming more complex
 - Specialized workforces are needed
 - Increasing client expectations for High Quality Standards
 - Current solutions not suitable for mass production
 - **100% Inspection** not technically or economically viable
 - Need for **Industry 4.0** connectivity

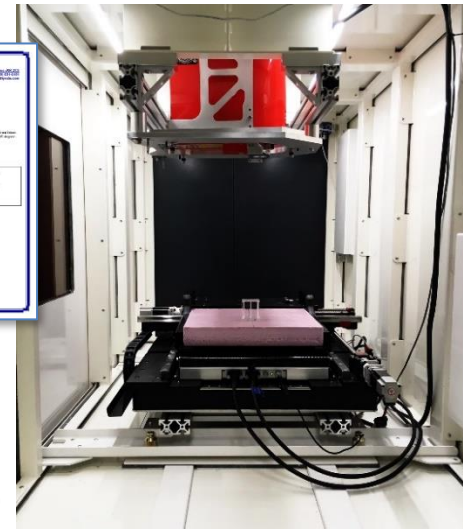


100% Inspection is Possible!

- ✓ 100% Inspection
- ✓ Low Cost
- ✓ Fast
- ✓ Easy to Use



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3D Radiography

A unique approach to
X-ray Inspection

eXamine solo

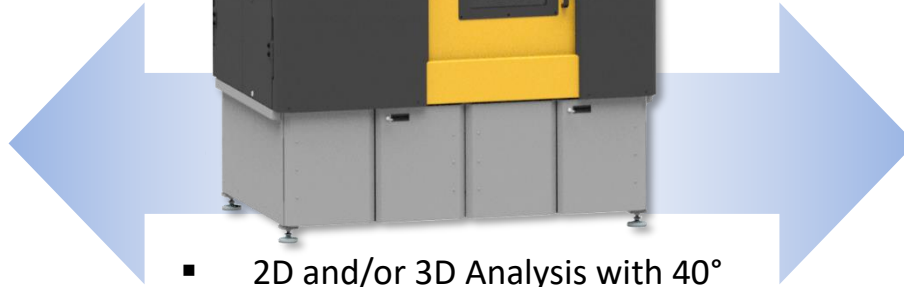
Market Fit



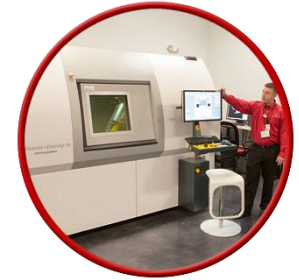
Traditional 2D



- Manual Image Capture
- 1 Image at the time
- 100% Visual Inspection
- Distorted Images
- Imprecise Measurements
- Limited Resolution
- Results highly dependent on technician experience



3D Tomography (CT)

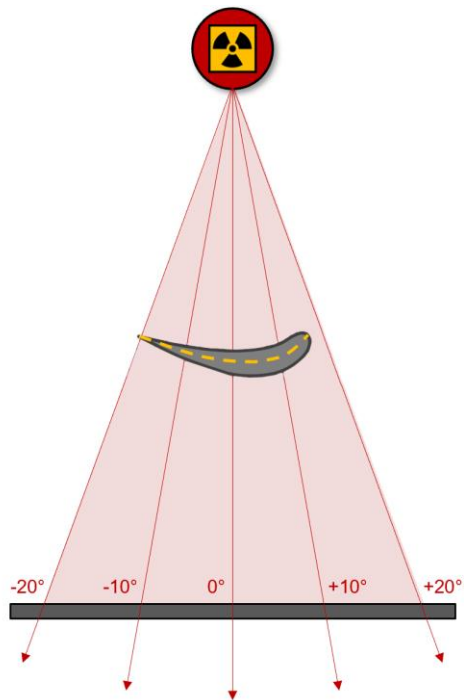


- 2D and/or 3D Analysis with 40° Coverage
- Very Fast Data Acquisition (<5 min)
- Ease of Use
- Visual Inspection and/or **Automated Defect Recognition**
- High Resolution Geometrically Corrected Multi-Angle Image Stitching
- 100% Inspection is Possible!
- 3D Analysis with 360° Coverage
- Time Consuming Data Acquisition (>1 hr) and volume reconstruction (>1 hr)
- Very costly
- Not suitable for high volume production
- Size Limitations due to object rotation

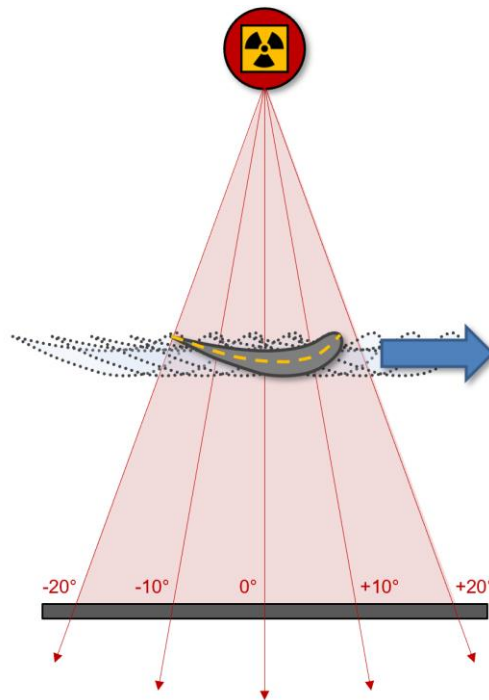
Data Acquisition Comparison



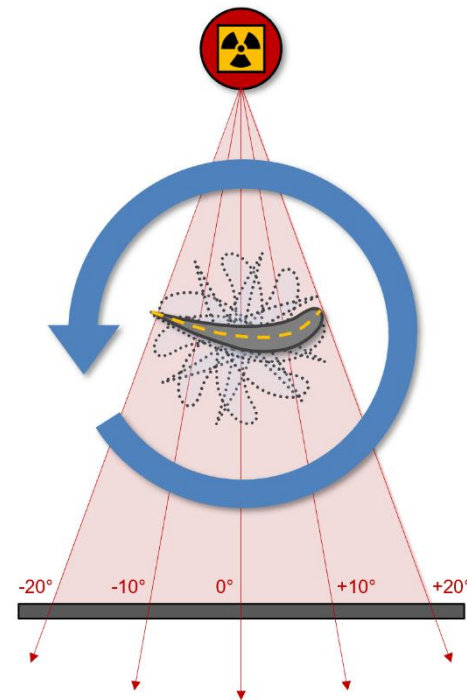
Traditional 2D



3D Radiography (Based on Parallax)



3D Tomography (CT)



Multiple Viewing Angles *from 1 scan sequence*



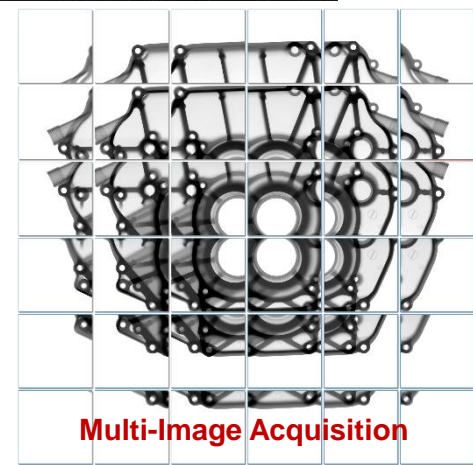
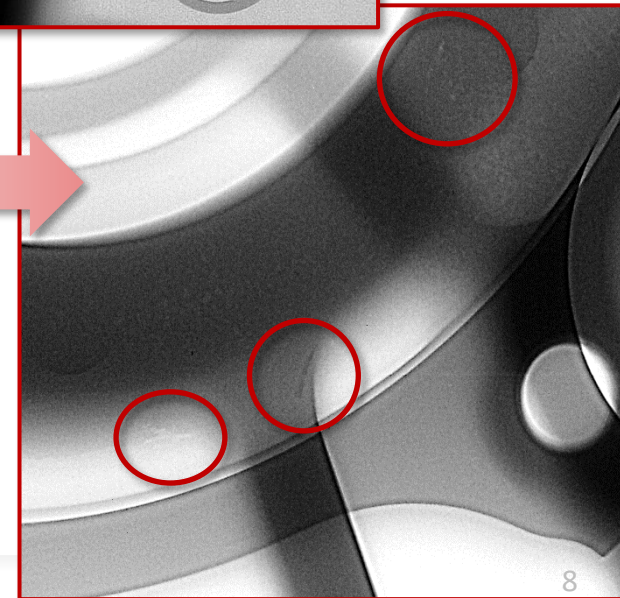
- Exploits **Geometry** and **Parallax** information
 - Multiple viewing angles increases probability of detection
 - Automatic 3D positioning of defects



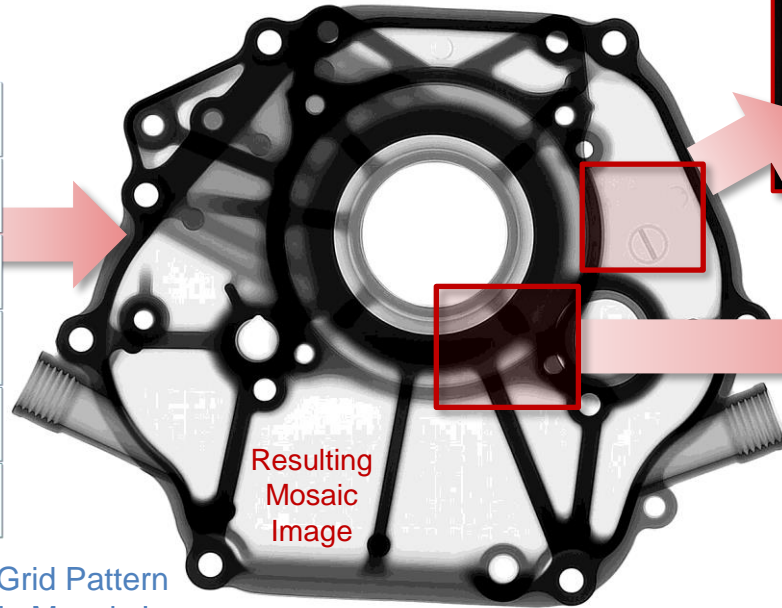
Unique Feature: Automatic Image Stitching



Distortion-Free & Seamless
High-Resolution Mosaic Image



Multi-Image Acquisition



Resulting
Mosaic
Image

Scanning Object along precise Grid Pattern
Automatically generating a single Mosaic Image
Resulting into a 9000 x 9000 pixels image

Unique Feature: Real-Time Simulation



Traditional X-ray Image

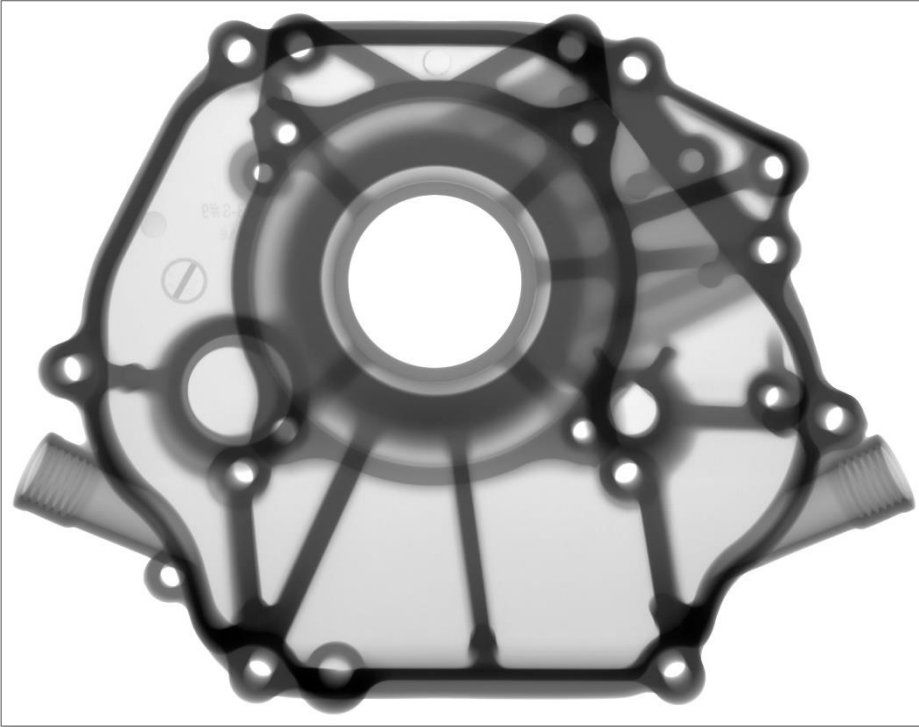
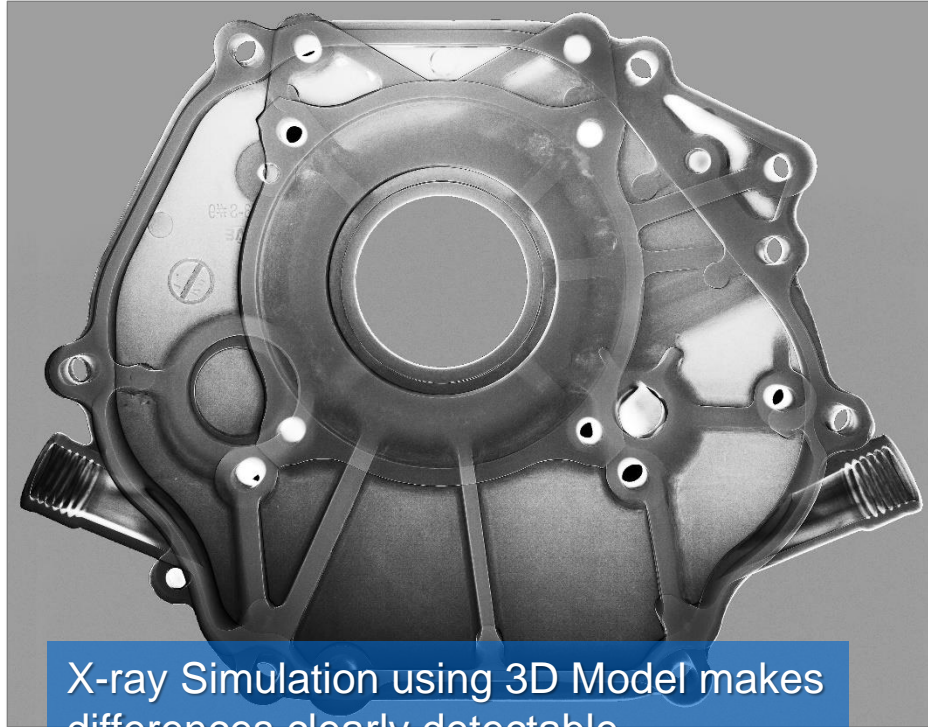
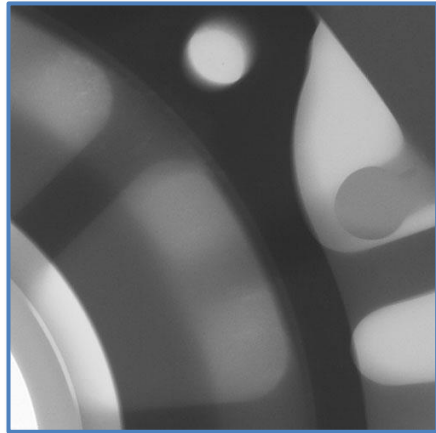


Image Difference = Real Image – Simulated Image



X-ray Simulation using 3D Model makes differences clearly detectable (geometric or defects)

Unique Feature: Real-Time Simulation



Traditional X-ray Image

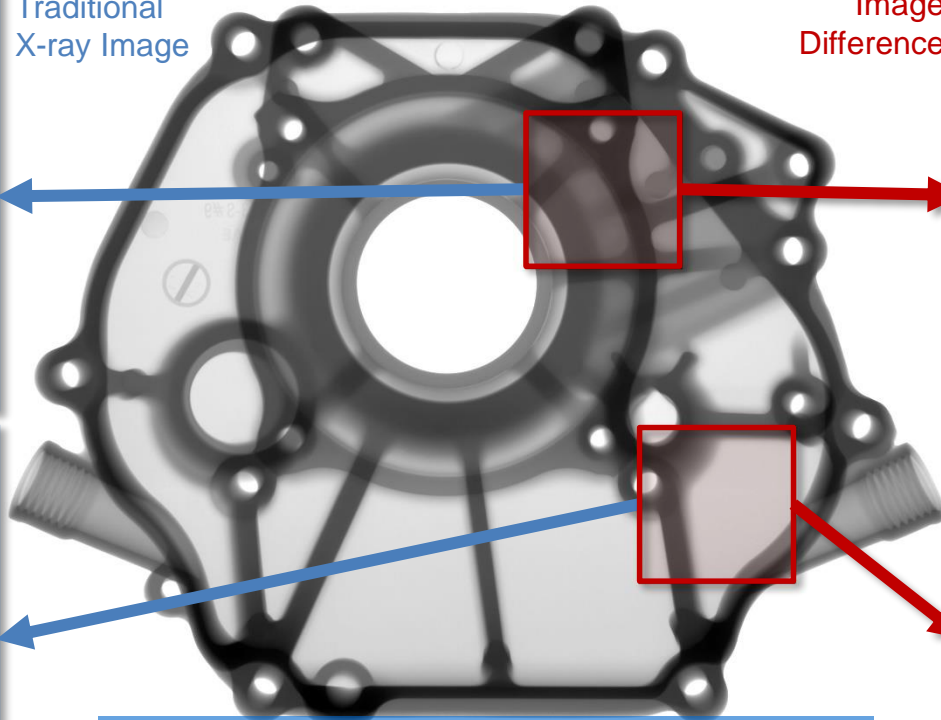
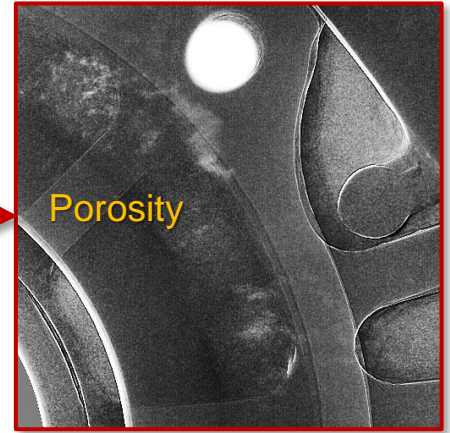
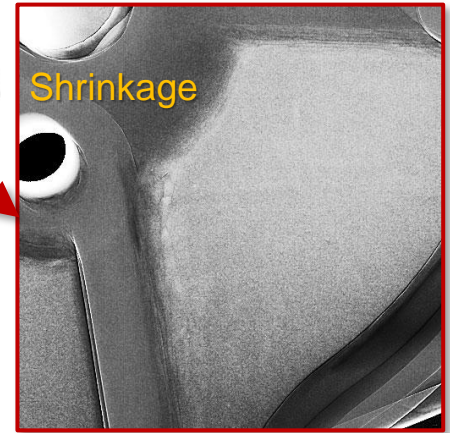
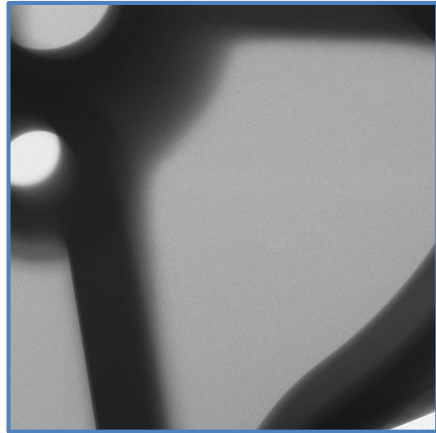


Image Difference



Porosity



Shrinkage

Defects are much easier to detect

Unique: 3D Positioning



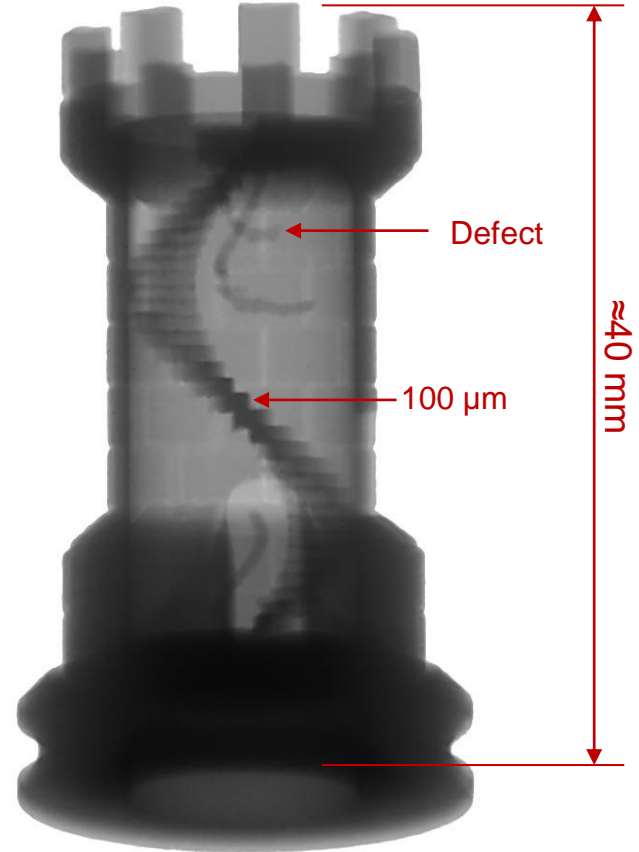
- Defect detection assisted by Artificial Intelligence (AI)
«Deep Learning»
- 3D Positioning

Finding defects is important, but positioning them in 3D space before machining or other treatment minimizes production cost



Augmented Reality Viewing Demo

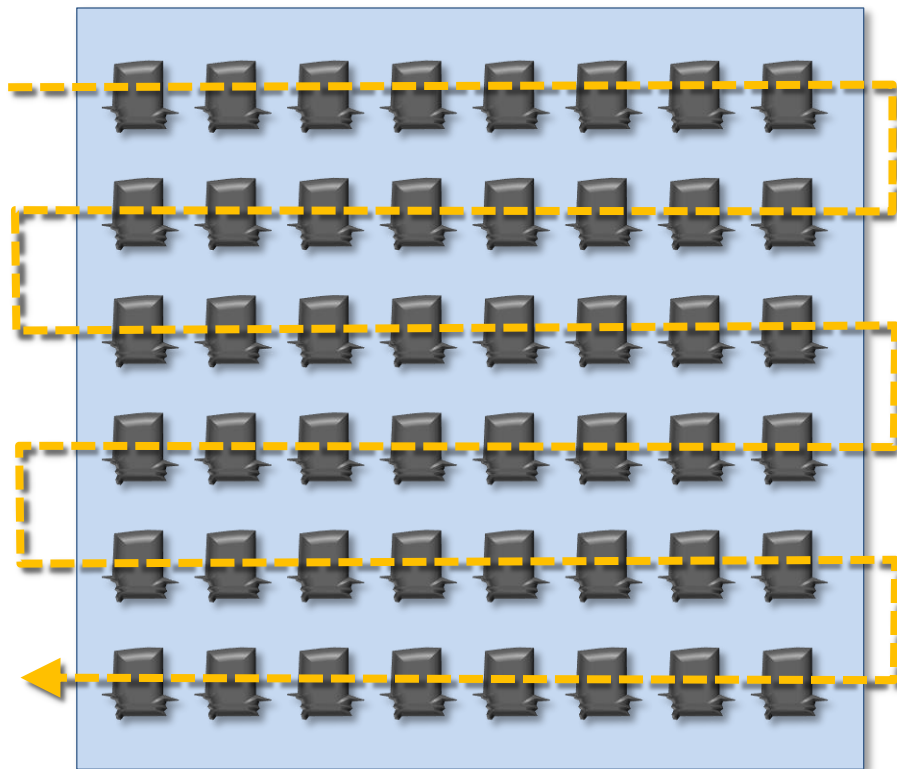
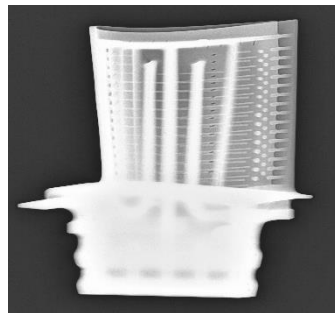
High Resolution Capability





■ Batch Processing Capability for Small Items

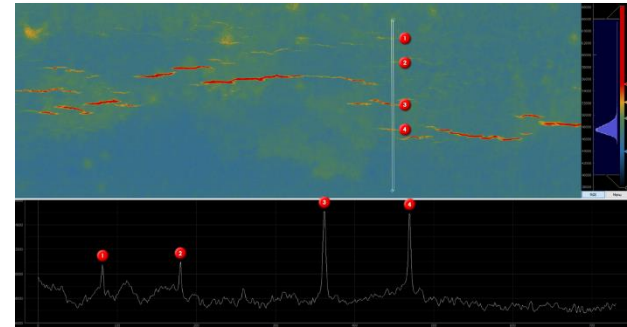
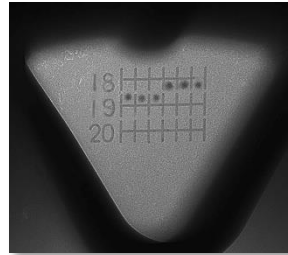
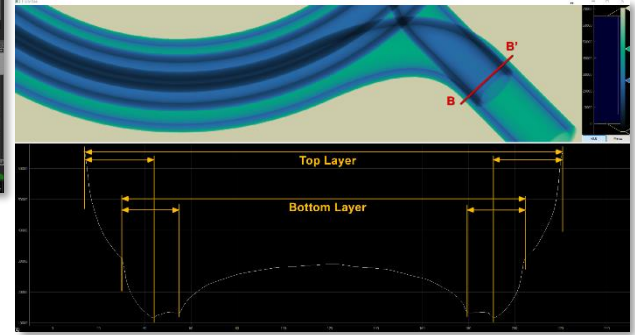
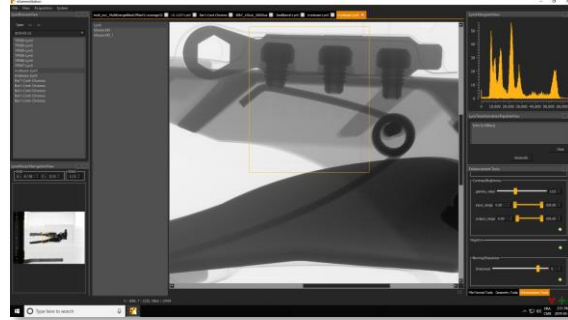
- Automated Segmentation
- Item per Item defect detection and metrology
- Full Traceability



Other Capabilities



- Remote Analysis & Monitoring
- Wall Thickness Measurement
- SCC Depth Measurement
- Traceability (*OCR/QR Code*)
- Inline Inspection
- Pass/Fail Inspection
- Metrology
- Archiving



Industry 4.0 Context

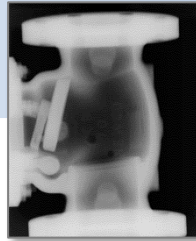


Industry
1.0



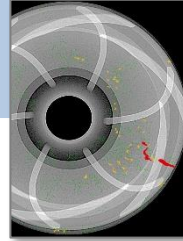
X-ray
Discovered

Industry
2.0



First use of
X-ray in NDT
(Film)

Industry
3.0



Moving to
Digital X-ray

Industry
4.0



**Next step for
use of X-ray
in NDT**

Assisted Defect Recognition
Process Automation
100% Inspection

Robotics provide the muscle
Cameras provide the senses
Connectivity is the nervous system
Artificial Intelligence is the brain!

Contacts:

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www.weaverndt.com/3d-xray

