NTS SERVICE SPOTLIGHT

NDT ARMOR-BALLISTICS TESTING

A POWERFUL TOOL IN THE FIELD OF INDUSTRIAL IMAGING

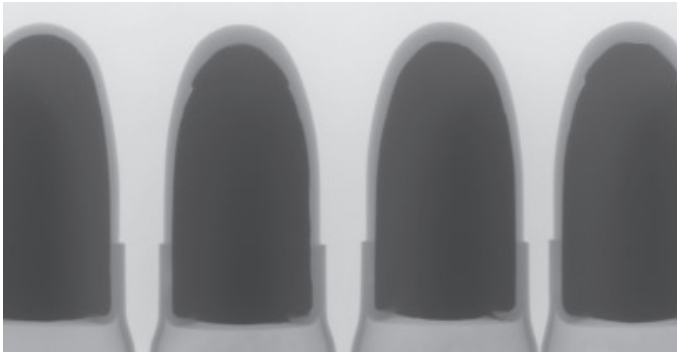
X-ray computed tomography scanning, or CT scanning, has proven to be a very powerful tool in the field of non-destructive testing and industrial imaging. This advanced technology provides NTS with the capability to obtain highly-detailed 3D images of the internal structures and components of various materials and products, thus eliminating the need for costly and time-consuming destructive inspection.

WHAT IS INDUSTRIAL CT SCANNING?

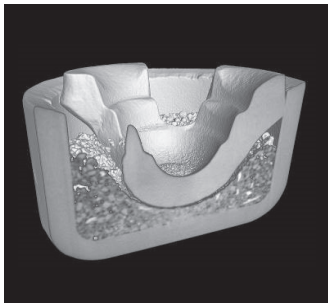
Industrial CT scanning, much like medical CAT scanning, begins with acquiring multiple x-ray projection images a full, or partial, 360 degrees around an object. These projection images are then reconstructed into a three-dimensional data set.

Unlike medical CAT scanning, however, there is no human patient being exposed in the industrial X-ray CT scanner. Therefore higher levels of radiation can be used, that allow for increased penetration though dense materials to obtain high resolution image data.

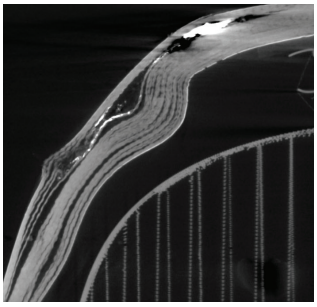
NTS maintains one of the most powerful, high-resolution industrial x-ray CT systems commercially available. A large walk-in 450kV micro-focus system enables large objects (up to 37 inches in diameter) to be imaged with extreme high resolution. This system, combined with other NTS capabilities and state-of-the-art processing and visualization tools, allows this technology to solve numerous problems spanning many different industries.



X-ray inspection of ammunition can help determine inconstancies in core shape and jacket thickness



Virtual cross section shows internal structure and fill of a loaded small caliber primer assembly



CT Scan of ballistic helmet shows separation of layers induced by projectile penetration

HOW CAN X-RAY IMAGING AND CT SCANNING BENEFIT MY PROJECT?

CT scanning is a unique technology with multiple applications in every part of the design and manufacturing process, from research and development through quality assurance and failure analysis.

The imaging results are not limited to just qualitative image data, advanced processing techniques and algorithms are available to NTS analysts to produce many different types of quantitative data.

Some examples include:

- Material Properties
  - » Porosity/Inclusion Analysis
  - » Fiber Composite Material Analysis (Fiber Orientation)
  - » Foam Structure Analysis
  - » Density Mapping (Polymers/Ceramics)
- Geometric/Surface Data
  - » Part-to-part/Part-to-CAD Comparisons
  - » Export Polygon Mesh/CAD Surfaces
  - » Wall Thickness Measurements
  - » Advanced Coordinate Measurement (GD&T)

ARMOR MATERIALS DESIGN AND TESTING PROCESS

CT scanning has become an important part of the armor design and testing process. The ability to capture data non-destructively makes this technology invaluable when assessing materials for quality control and failure analysis.

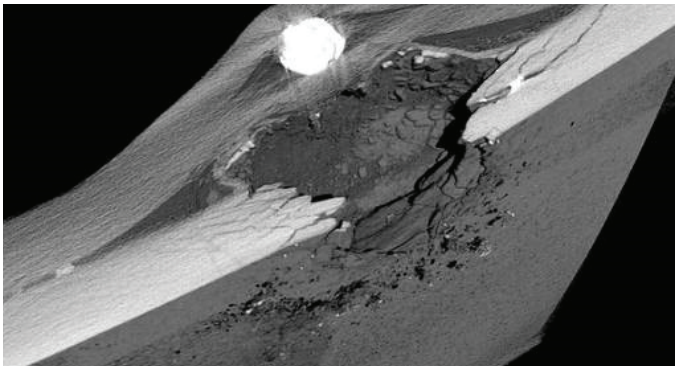
This is especially true when working with brittle materials such as ceramic, where physical cross-sectioning can become impossible without comprising the test article.

Some examples include:

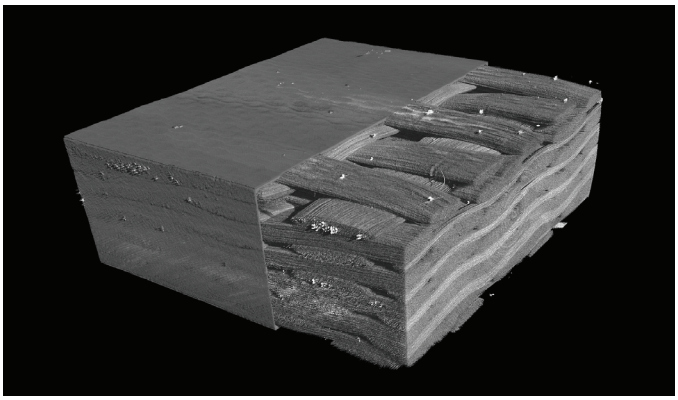
- Digital x-ray inspection that offers customers a quick, affordable option to have their materials inspected prior to testing in order to screen for flaws or damage from the shipping process
- X-ray and CT scanning of armor materials after an during testing (in between shots), and after, in order to assess the overall integrity and condition of the system
- 3D measurements of:
  - » Depth of penetration (DoP)
  - » Deformation
  - » Penetrated layer count
  - » Captured spall measurements

FIREARMS AND AMMUNITION INSPECTION

Inspection of firearms and ammunition using CT scanning and prove beneficial, as internal data can be captured and analyzed non-destructively. This enables CT scanning to be used in a wide variety of applications from development and testing to failure analysis and forensics.



3D cross section of ceramic body plate allows of more in-depth analysis of cracking patterns and delamination



High resolution scanning, with micron-resolution can help assess composite material structure

FIREARMS AND AMMUNITION INSPECTION CONTINUED

Some examples include:

- Inspection and reverse engineering of weapon systems and ammunition from captured 3D surface data
- Inspection of ammunition to assess:
  - » Core size
  - » Shape
  - » Position
  - » Material properties
  - » Ecapsulated incendiary material location & quantity
- Forensic inspection of projectiles and cartridges to obtain surface information

ABOUT NTS

Every hour of every day, NTS is fully invested in helping you build better, stronger, safer, more reliable products, and bring those products to market quickly and efficiently. Since conducting our first rounds of tests in 1961, NTS has become one of the largest commercial test laboratory networks in North America. Our test, inspection and certification services cover environmental, dynamics, EMC, wireless, product safety, materials, ballistics and much more. NTS engineers and technicians have exceptional knowledge of all test and conformity requirements in both domestic and international arenas. Our client partners in Aerospace, Defense, Telecom and Energy rely on NTS to make sure they're putting their best products forward, and so can you.

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