element
U.S. Space & Defense

SERVICE SPOTLIGHT

CT SCANNING

NON-DESTRUCTIVE IMAGING: ARMOR & BALLISTICS

X-ray Computed Tomography Scanning & Digital Radiography

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 Element U.S. Space & Defense 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 to the industrial X-ray CT scanner. Therefore, higher levels of radiation can be used (still benign to most test objects), that allow for increased penetration though dense materials to obtain high resolution image data.

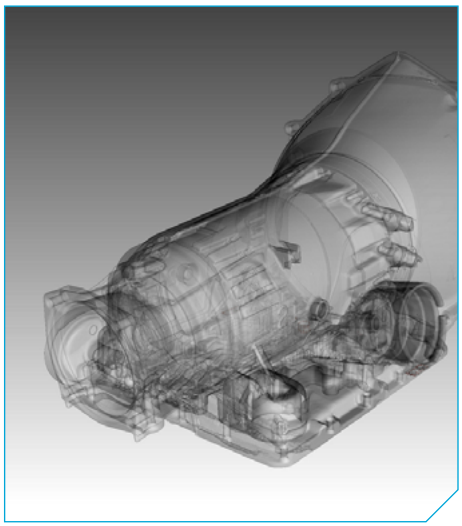
Element U.S. Space & Defense maintains one of the most powerful, high-resolution industrial x-ray CT systems commercially available. A 225kV micro-focus system enables objects (up to 37 inches in diameter) to be imaged with extreme high resolution. This system, combined with other capabilities and state-of-the-art processing and visualization tools, allows this technology to solve numerous problems spanning many different industries.

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 Element U.S. Space & Defense's experts 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)



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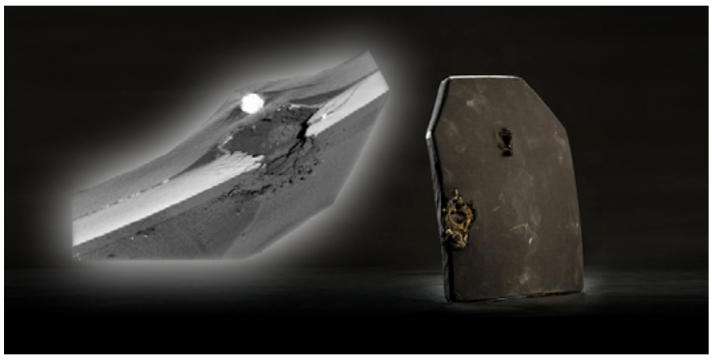

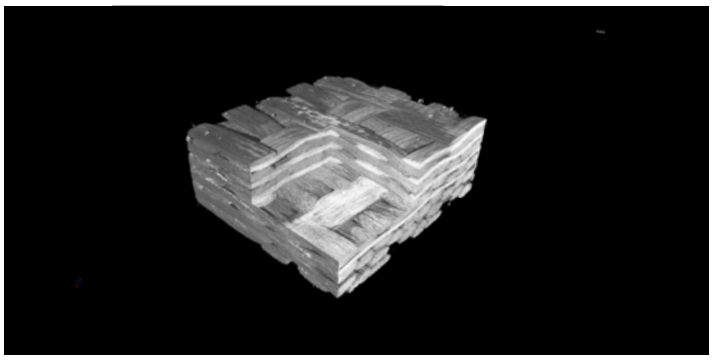

Armor Materials Design and Testing Process

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 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, to assess the overall integrity and condition of the system
- 3D depth of penetration (DoP), deformation, penetrated layer count, and captured spall measurements

Firearms and Ammunition Inspection

Inspection of rearms 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.

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, and material properties, as well as encapsulated incendiary material location and quantity
- Forensic inspection of projectiles and cartridges to obtain surface information

About Element U.S. Space & Defense

From centrifuge testing for the latest Mars rover, vibration testing for the Space Launch System (SLS), or environmental simulations for next-generation missiles, Element U.S. Space & Defense is the pioneering partner for highly custom, end-to-end, testing design and implementation.

By advancing its state-of-the-art testing technologies, subject matter expertise, and service to critical missions, Element U.S. Space & Defense has become the go-to partner for ground-breaking industries.

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