

# Safely Testing Components with an Enclosed High-Energy X-ray CT System

**Building a customized walk-in radiation enclosure in tight quarters and installing an advanced, high-energy computed tomography imaging system to improve inspection of ballistics samples, batteries and other Department of Defense hardware**

## The Challenge

The Customer provides experimentation and non-destructive testing services in support of munitions and protection systems research, certification, and compliance testing to customers including the U.S. Department of Defense. For example, the Customer tests ballistics samples and inspects military helmets and body armor. They also provide testing services for the aerospace, automotive and other industries.

New advances in X-ray computed tomography (CT) technology—which provides digitized three-dimensional X-ray images of a test sample—were driving increased demand for CT scanning services. The Customer saw an opportunity to become a leader in advanced CT scanning services in North America, while also enhancing the effectiveness of testing on various military components to better meet test contract requirements and help protect U.S. troops in the field.

Because of the high levels of radiation involved in this type of imaging, a protective barrier needs to be placed between the scanner unit and any test personnel. Essentially, the entire system must be encased on the top and sides to prevent dangerous radiation exposure in the surrounding area. The Customer turned to Adaptive Energy to design and build an integrated testing

system radiation enclosure. Beyond the challenge of providing an advanced CT installation to meet the company's testing needs, Adaptive Energy faced an additional challenge: how



Walk-in custom radiation enclosure for conducting high-energy CT scanning

**Industry:** Military / Government / Aerospace

**Technology:** Computed Tomography

**Products & Services:** Custom radiation enclosure / X-ray computed tomography imaging system

**Customer Profile:** A U.S. technology component supplier to military and aerospace firms

**Business Challenge:** The customer needed a large, radiation-proof enclosure for testing ballistics samples, batteries and hardware items to meet quality requirements for the U.S. Department of Defense, researchers, and other customers, but had only limited space and access within its existing facility

**Solution:** A custom-built radiation enclosure and a state-of-the-art X-ray computed tomography system, built on site in carefully orchestrated stages

### Benefits:

- Allows the customer to conduct high-energy X-ray testing as required for component quality assurance conveniently within their current facility
- Enables accurate three-dimensional inspection of critical military and industrial components to ensure they will function properly
- Protects the safety of test engineers, who are shielded from exposure to dangerous levels of X-ray radiation

to install a room-sized, radiation-proof enclosure to surround the CT system inside of an existing production facility that had limited access.

## The Adaptive Energy Solution

To deliver the solution, Adaptive Energy integrated state-of-the-art computed tomography technology with a custom designed and built walk-in testing enclosure made from lead panels encased in steel. The CT system is a unique 225-450kV micro-focus vault-based X-ray and CT scanner that can scan large objects up to 37 inches wide.

The scanner captures a series of thousands of two-dimensional radiographic (X-ray) images 360 degrees around any object and then assembles them all into a detailed three-dimensional model of the internal and external structure of the sample. This model can be virtually sliced in any direction for fast, non-destructive analysis of both the internal and external features. The system includes a linear detector for high-quality, scatter-free scans, and state-of-the-art analysis systems and software that enable advanced, microscopic fault detection, wall-thickness assessment and CAD model comparisons in a range of materials including metals, ceramics and composites. The scanner is powerful enough to discern individual fibers in composite materials, down to the level of a few microns.

To install the massive CT scanner system inside the Customer's facility, Adaptive Energy devised a staged construction process to accommodate the size of the components. First they built and then installed on site the skeleton of the enclosure unit. Next the CT system infrastructure was installed, the remainder of the enclosure structure was built around it in place, and then the final controller and system technology were moved in and installed.

## Results

The Customer is able to conduct complex CT inspection scanning with an unprecedented degree of accuracy and detail in 360 degrees. At the same time, the custom radiation testing room keeps the Customer's test engineers safe from radiation exposure. Testing can be conducted quickly, with data and images automatically captured and compiled by the system.

With the advanced CT testing capabilities the Customer now offers, they have been able to take on a broader range of projects, including landing high-profile quality and safety testing contracts for other U.S. government agencies.

## About Adaptive Energy

Adaptive Energy creates customized, non-destructive material evaluation solutions to address mission-critical, time-sensitive testing needs. By combining the latest digital radiography, computed tomography, and ultrasonic imaging technologies with innovative mechanical and robotic assemblies, Adaptive Energy's integrated systems offer rapid deployment, are easy to learn and maintain, and perform reliably under pressure.

Working collaboratively with organizations in the aerospace, automotive, energy, petro-chemical, defense, infrastructure, and materials industries, our experts develop optimized solutions for flaw and crack detection, composite delamination, weld inspection, hardness testing, custom radiation enclosures and overhead gantry systems, and more.

Adaptive Energy is also the exclusive distributor in the U.S. and Canada of FORCE Technology's P-Scan ultrasonic scanners, including the P-Scan Stack with Phased Array, a next generation automated inspection system.



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