

Guide

# Twelve Things You Should Know Before Buying a 3D Industrial Computed Tomography System

**YXLON**

Technology with Passion

If you are beginning the process of choosing a Computed Tomography (CT) X-ray system for purchase there are a few things to consider, above and beyond price. We've put together a dozen important points you'll need to keep in mind as you consider this important purchase. For example, you'll want to think about your specific product and application(s), whether the software and hardware is "easy to use," technical features your specific application requires, training on the system, what to look for in a vendor, and after-purchase support.

### 1. Know your application

This can be a tough one unless you buy the system for a very specific task. Most of the CT system users have a variety of samples they want to image, not just one item imaged repeatedly. Describing the variety of what is required for all samples can be difficult. Applications should be specific in terms of cycle time required, along with an acceptable type and size of defect/tolerance specific in the drawing for each feature. If you'll need to use the equipment in different ways, it would help to categorize your different applications and make sure the system you choose can perform all of them equally well. (See more in #7.)

### 2. Be able to compromise and prioritize your needs

It is always a good idea to express the ideal situation and don't be shy; Do ask for the "perfect world" with regard to your specific needs. With some industrial CT systems, there is one solution for everything. In other cases, the "perfect world" can be far more expensive than the justifiable amount. It might be a good idea to describe applications in groups and assign a priority to each of them. The categories can be as simple as "Sample Sizes," or something like "CAD comparison," "Metrology," or "Wall thickness measurement." By doing this, you are able to see how much each of your requests is worth. The end may not justify the means and you may find one type of application puts you way over your intended budget. If this ends up to be the case, perhaps a discussion with a CT Service provider on the pricey application would be the best idea.

### 3. Inquire about your special requirements

If you want to buy a system for a special project, you are probably looking for a flexible vendor with an experienced engineering group. You will want to make certain the vendor you choose is capable of handling the project with an experienced, knowledgeable staff. You also want multiple employees working on your project. This way, you are never put in a position for your project to stall because one person is on vacation or because the one employee working on your project leaves the company. Typical projects have 3 aspects:



### a) Project management

A good vendor names one Project Manager who will be in direct contact with you, the customer. He or she will play a key role and be your point of contact throughout the entire project. The Project Manager will help engineering to understand your problems and will help you to understand the engineers. The better your relationship and the more comfortable you are with your Project Manager, the better chance of success your project has.

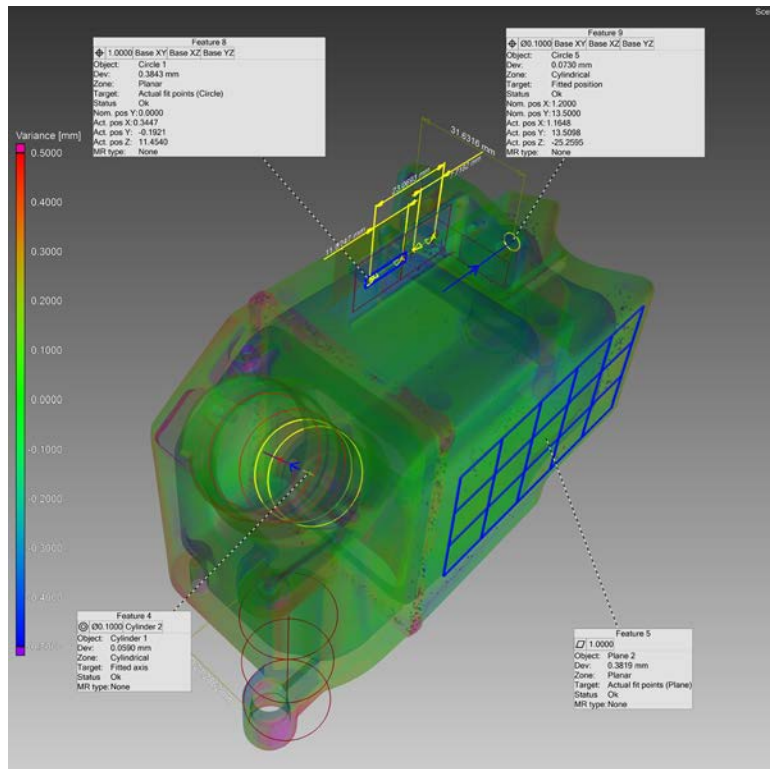
### b) Engineering

If the system you are buying is multifaceted and customized to your needs, perhaps including part handling or interfacing to your company's existing infrastructure, you want to ensure the vendor you are buying from has the power and experience to complete it. Ask for references with similar complexity. Try talking with the engineering group directly and, if possible, visit the vendor's applications lab or factory.

### c) Software development

Depending how special the system is, the software can be critical. It's good to inquire how many software engineers the vendor employs and what levels of skill they have. You want a good mix between control software and image processing people.

CT scan of a medical ICU ventilator's air reservoir, with GD&T analysis examples.



#### 4. Know the system's available technical capabilities

Depending on the task there are a few technical features out there which might help to generate better results. Let's start with Laminography. If the conventional approach cannot create a "good enough" image for your need, then Laminography maybe can create better results. This is typically used when large samples can't be rotated at least 180 degrees inside the CT system and a high resolution image is required. Laminography eliminates the need for the sample to rotate. Instead it penetrates from different angles and the image is processed using a special algorithm. The result is not 100% comparable with CT, as the information in the slice is also influenced by features outside the so called "focus plane".

Another technical feature available is Helical CT and this way of CT scanning has two aspects. First, it can generate a single, seamless 3D dataset for "long" objects (e.g. a pencil shaped object). And second, it creates better images when a normal cone beam CT would generate some blur at high wide cone beam angles. Yet another available technical feature is Scan Modes: On a state-of-the-art, flat panel CT system this feature allows you to toggle between different imaging options.

#### 5. Look beyond the numbers, not just cost

Technical data sheets can be misleading, especially if you are looking for the maximum magnification resolution, speed, etc. You may be very disappointed. Your evaluation should be based on YOUR specific applications—not on claims of highest, lowest, fastest, best, most, etc. A magnification of 1000X won't work if your sample size can only be magnification to 50X. It would be like trying to justify paying thousands of dollars extra for a car that can go 200 mph when the speed limit is usually 70mph. Also, system literature can make a detector's spatial resolution appear relevant when it may not be to your application. There are detectors with high resolution but a poor dynamic range or a high lag, either of which can turn a high resolution into a poor image quality. What should count are the results for your specific applications, not what the data sheet says it can do.

#### 6. Ease of use (a.k.a. user friendly) can be deceiving

"Easy to use" is usually one of those meaningless, over used statements in marketing brochures.

Most likely, in the case of a CT system, they are referring to the "ease of use" of the software, but pay close attention to the user interface when the vendor demonstrates how to use it. You may find it is anything but easy compared to other vendor's software. Another important factor to consider is how the software relates to the hardware. If you choose to purchase hardware based on expense, for example, a less expensive manipulator that can reproduce a mechanical position, then you might end up doing more steps on a daily basis. It sounds like less work but some CT systems require a so-called "calibration scan" before or after the actual CT scan. In this process, the operator has to set up the scan parameter on the actual part, perform the scan, then open the system door and put



*Touch screen technology and remote operation is a plus.*

the calibration standard on the manipulator, without moving anything inside the system, which is very tricky. This process should not be referred to as user-friendly or easy to use. Instead, it is time consuming and certainly not effortless. A good CT system, with a stable manipulator, and a good control system should be able to run a good scan without having to do all of this.

## **7. If one CT System can't cover 100% of your applications, consider a vendor with additional scan services**

In some cases, you may have to compromise and set a certain application aside. When the need for that application arises, you may want to use a CT Service Provider to handle the imaging. If that is the case for you, it is important to have a good source for CT service. Some vendors are able to provide this service for their customers without sending it out to another company. Consider the pros and cons of this factor in your purchasing decision. If you have purchased a system through a vendor, chances are good you will get priority when dealing with them on additional CT Services.

## **8. Investigate the core competency of the vendors**

Try to find out if the company you intend to buy a system from is “just” an integrator or a “real” manufacturer. It will be a benefit for your future support not to purchase from a company who sources components, puts them together and calls it a system. If there is a problem with one of the major components in your system, it is more likely a manufacturer has more knowledge to fix it because the company designed, tested and built the system. And the chances of having a replacement component, now or even years from now, is more likely with a manufacturer.

## **9. Select a vendor with a good support team**

If you are in the process of buying an industrial CT system, you are probably busy with a lot of things including writing justification paperwork, meeting budget, management approvals and speaking with multiple vendors for competitive quotes. Of course, all vendors will be trying hard to sell you their product for your need but a good sales pitch or a likeable sales person doesn't mean you will be supported after your purchase.

Unfortunately, buying an industrial CT, like other capital equipment, isn't a simple decision. You will need to know that the system generates high voltage, which is required to produce X-rays and the X-ray tubes typically run between 100kV and 600kV. Some of the X-ray tubes are open (which means you can release the vacuum) and some are closed (basically maintenance free except for the high voltage cable connections). To receive the

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most from your investment when running a CT system it is important to do preventative maintenance on a regular basis, to ensure operational reliability and operator safety.

Ignoring these factors can lead to maintenance and repair issues. The bottom line is you want to buy from vendor who can support you on a regular schedule and in an emergency situation. Good support means finding a vendor where your priority of keeping the system on-line is just as important to them, as it is to you. Ask how many direct field service engineers would be able to support your specific system (not the total number of service engineers they have), where are they located, how many years of experience with the system to they have and what is average wait time for a service engineer to be on site.



## 10. Try to find a vendor that will be in business as long as your investment is expected to last

X-ray systems are typically in use for more than a decade, sometimes two. Businesses can change a lot during this span of time. Companies are changing more rapidly than they used to, with larger companies spinning off parts and buying smaller companies on a global scale. It wouldn't be prudent to base your decision on the simple fact that a vendor is a multi-billion dollar company. Instead, make sure the company you decide to consider is in a stable situation, and is not depending on a particular single system for all their sales. Also, check into the history of the company, their financial background, and company size, because this can give you confidence that you have made the right decision. You want them to be around as long as you own your system for support throughout the years.



*A hands-on training facility allows you practice your specific test application.*

## 11. Ask for a thorough, and if necessary, on-going training program

When you are buying a CT system for the first time, you need training on the basics of CT. And if you are buying a CT system that is new to you, you will need machine-specific training regardless if you have used another CT system in the past. For the operator, it is more important you are taught how use the system and its software for your specific applications. Ideally, this should be done in a hands-on training facility on the actual equipment you'll be installing. Not all vendors can do this. It is essential that the trainer is very experienced and able to share his expertise. If a trainer is talking over your head or wants to spew knowledge that is not applicable for your needs, then the training is not going to be effective. If possible, try to visit the vendor's lab and have a discussion with the engineers running the lab to see if they understand your application, and are able to provide solutions. Speak with the trainer, or at the very least, get a breakdown of what will be covered in the training class. If you don't see something and you want it covered, ask if they can deviate from their standard training proposal. If you anticipate operator turnover in the future, find out in advance what the approximate cost will be to train a new operator down the road.

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Sample training courses available from YXLON. Each course includes objectives, prerequisites, and a path to certification as part of a fully developed curriculum.

Training Course	Duration	Topic	Dates	Location
Y.Academy-Film replacement/HDR IMAGE x500/x600	Duration: 2 days Intensive-training (German)	Image processing/ Digital Radioscopy	03.03.2014 - 04.03.2014 or Upon request	On site, Hudson, OH, Hamburg GE (Yxlon Academy)
Y.On-site-Y.MTIS ADR Advanced Training (Y.TireAXIS)	Duration: 5 days Intensive-training (German / English)	Image processing/ Digital Radioscopy	Upon request	On-site
Y.Academy-MG Basic-Training 40kHz-X-ray- Equipment	Duration: 2 days Intensive-training (English)	X-ray equipment	14.04.2014 - 15.04.2014 or Upon request	On site, Hudson OH, San Jose CA, Hamburg GE (YXLON Academy)
Y.On-Site-CT Compact Advanced Training	Duration: 3 days Intensive-training (German / English)	Image processing/ Digital Radioscopy	Upon request	On-site, Hudson OH, Hamburg GE (YXLON Academy)
Y.Academy-Microfocus Application Training		Image processing/ Digital Radioscopy	Upon request	Onsite Hudson OH, San Jose CA, Hamburg GE (YXLON Academy)

## 12. Get References

If you have narrowed your choices down to a few potential vendors and you have done your own assessment, it's time to request a list of customers to contact about their entire experience with the vendor. Most likely, the names you will be provided are customers who are pleased with the outcome of their involvement with the vendor. Keep in mind you are discussing the "best case" customer projects, but you can still gain a good overall feel for a vendor. And, you may find what is most important to them, is not what is most important for your project. Put together a list of your top three or four questions you want answered. Then make sure you include a question about when the system went down: Was the vendor responsive? Did they keep in contact and provide you a contact person who could answer questions? How did they handle problem projects?

When budgets are tight and justification is important, we hope this list brings forward some discussions to have with vendors and considerations to weigh prior to your purchase. Non-destructive test is a competitive market and with the right questions in hand, you can make a decision based on what your priorities should be, including your specific application and support for years to come.

