Separating the FACT from Fiction: Common Misconceptions about 3D Scanning

Fact or fiction? Data acquired with 3D scanning is inferior to that acquired via touch probe and CMM—This is FICTION! The fact is that 3D scanning captures tens of thousands of points per second, an enormous amount of data that makes the process statistically superior.

What other misconceptions about 3D scanning have you heard (and maybe believed)? Read on to separate the FACT from the fiction!

Fiction: 3D scanning is expensive.
FACT: The cost of 3D scanning has decreased significantly in the last few years, and while it still may not be "cheap," it can reduce the total expense of projects by making them faster and more accurate with less downtime and fewer re-do's. In today's global economy, being competitive requires the ability to develop and produce new products economically and ahead of your competition. Oftentimes laser scanning from GKS is less than half the cost of conventional measurement methods in a fraction of the time.

Fiction: All service bureaus produce pretty much the same quality of results—inferior.
FACT: If you have tried low-cost "garage band" scanning services in the past, you may have been disappointed with the sketchy results—sloppy data, unacceptable accuracies. However, dramatic advances have been made in the technologies and experienced service bureaus like GKS provide ultra-precise results with fast turnarounds. Compare our results with others and you'll see that even our raw data is smoother and more usable than service bureaus with low-cost low-quality scanners. We are committed to tackling the most challenging metrology problems, providing customers with super fast and accurate results—guaranteed.

Fiction: 3D scanning is not accurate enough for complex applications.
FACT: With the vast improvements in recent years, 3D scanning technologies now surpass the accuracies of manual and touch measurement methods.

GKS metrologists can quickly and accurately scan all kinds of complex, free-form parts with our Laser Design high-accuracy non-contact laser probes and CTs, creating a 3D point cloud with millions of XYZ coordinates. This complete data set is edited down into a data file that represents the detailed shape of the part in three dimensions. We can hold tolerances of 0.0005" (half of 0.001") to 0.001" in the scanning process, depending on a variety of factors including size and color of the part.

Fiction: 3D scanning can only capture the external geometry of parts.
FACT: High-accuracy CT scanning enables 3D scanning of parts with very complex internal geometry. Visual access is not required for CT scanning so the process is very thorough and non-destructive. The speed and precision make CT scanning a viable option for non-destructive testing of production line and critical components. CT is an ideal measurement method in many different industries for inspection of extremely complex parts and assemblies too difficult to measure with conventional touch probe or line-of-sight vision-based scanning technologies. Parts with small, complex, and fine internal geometry from the medical and electronics industries benefit especially from this technology.

Fiction: Size of objects to be scanned is limited.
FACT: Practically speaking, there are no upper or lower boundaries on the size of objects that can be scanned. At GKS we scan parts smaller than a ball point on a pen and larger than a football field. Long-range scanning (terrestrial laser scanning) enables 3D capture of virtually infinite-sized objects and areas because the size of the specimen being scanned is no longer limited to the directional travel of a machine or the reach of an arm.

Fiction: 3D scanning is a slow process.
FACT: Typically a small part takes only 15 minutes to scan. Larger and more complex parts can take a few hours. In general, we have experienced "real world" scanning speeds of 30,000 to 40,000 points per second although some situations may require slower scanning speeds and other situations may permit scanning at full scan rate of the probe which is 225,000 points per second. Laser scanning tends to be much faster than a CMM and somewhat faster than mechanical tracing systems. After scanning, we begin the process of making a CAD model. Our GKS service department is trained and specializes in this type of service so our turnaround time is faster than average.

Fiction: The data is not editable.
FACT: Newcomers to this process are often not aware that editable parametric models can be achieved. However, not all applications require this type of model. The level of complexity of the model is based what it will eventually be used for. Editable models are more complex than ones that are non-editable, so they can take somewhat longer and cost more. If you only need surfaces, then a surface model will suffice. This is the simplest type of model used to replicate a part or manufacture it as is with no future changes, or it can also used in FEA analyses. The surfaces are defined to a high accuracy and are easily manufacturable. However, only simple changes, such as mirroring, scaling up or down, etc. are possible, so if you think you may want to repurpose your design in the future, the non-editable model may not suffice. An editable model, on the other hand will allow you to make part variations and include features and design history. These types of solid models (parasolid or native solid) are more complex and costlier. The designer can easily edit the solid model by defining the part and creating design rules to work with. The software defines the parameters and how to modify them, creating a history of the design process

Fiction: The main application for 3D scanning is reverse engineering.
FACT: Actually, data collected by non-contact 3D scanning systems is as useful and as often used for many applications other than reverse engineering including dimensional inspection, FEA testing, and rapid manufacturing/prototyping.

A) **Inspection:** 3D scanning is ideal for dimensional inspection applications because it precisely replicates the part's entire profile without introducing any distortion from contact pressure. The resulting color deviation map compares the original CAD model (design intent) with the 3D scan data of the part (as-built) to show graphically areas that conform (or do not conform) to set tolerances.
B) **FEA (Finite Element Analysis):** 3D scanning a component or assembly provides the high-accuracy and complete 3D data necessary to perform FEA testing by precisely duplicating all the geometry, external and internal, in digital form without damaging the part. Because 3D laser and CT scan data is so precise, the FEA results are extremely accurate and trustworthy.
C) **Rapid manufacturing (RM)**: Since nearly all manufacturing processes, including RM, currently require a CAD model of the part, prototypes can be *quickly* digitized via 3D scanning to benefit from the competitive advantages of RM. Output from 3D scanning integrates seamlessly in the RM system, making this method of CAD generation most efficient of any in the industry.
D) **Reverse engineering**: Of course fast, precise data collected via 3D scanning technologies can also be used to reverse engineer parts with traditional fabrication methods such as CNC, stamping, and molding.

Fiction: Data acquired with 3D scanning is inferior to that acquired via touch probe and CMM.
FACT: Both approaches use a high-accuracy CMM machine base. However, non-contact 3D scanning captures tens of thousands of points (x-y-z coordinates) per second, quickly and **completely** defining the shape and size of an object. This enormous amount of data makes the 3D scanning process statistically superior to touch inspection technologies and manual methods that take much longer and result in a significantly less complete data set that does not capture the totality of the shape necessary for accurate replication. Typically contact measurement data sets consist of dozens or perhaps hundreds of points on the key features of a part; non-contact 3D scanning gives you millions of data points that define the **whole** part without risking distortion of pliable or delicate items and complex or free-form geometry through surface contact.

Fiction: There is a lot of "noise" in 3D scan data.
FACT: Raw scan data may naturally contain some "noise." But GKS uses effective filters in Laser Design's proprietary SSC software to **automatically** identify and delete erroneous data immediately. The actual surface data is left intact by the software's proprietary denoising algorithms. The software also excels at removing structured point data usually associated with reflections. These filters significantly reduce the time spent processing scan data compared to data processing products on the market for high density scanning applications. Savings can add up to 50 percent of the time spent on the entire data processing project.

About GKS Services / Laser Design
GKS Services and Laser Design have been leading suppliers of ultra-precise 3D laser scanning systems, along with 3D laser scanning, dimensional inspection, CT scanning, and long-range scanning services for three decades. We help customers successfully complete their most complex inspection, analysis, and reverse engineering projects quickly, giving them a competitive advantage. GKS also offers equipment rental and expertise for customers with the occasional 3D scanning project.

For additional information about how GKS Global Services can improve your manufactured product, save you money and decrease your development time, call 952-884-9648 or visit www.laserdesign.com.