

NEW
EDGE
ScanArm**HD**

FARO®

Next Generation 3D Scanning:
Fast, High-Definition, and
Affordable

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Technical Product Manager, FaroArm

Agenda

- Who is FARO?
- What is a Portable CMM?
- What is 3D Laser Scanning and how does it work?
- What is the FARO ScanArm HD?
- Features and Benefits
- Applications
- Case Studies and ROI

About FARO

FARO is the world's most trusted source for 3D measurement technology. We develop and market computer-aided measurement and imaging devices and software.



World-Wide Network



★ Global Headquarters

○ Regional Headquarters

● Office/Service Center

FARO Hardware



Gage



Edge
ScanArm HD



Laser Tracker
Vantage



3D Imager
AMP



Focus^{3D}
X Series



Freestyle^{3D}
Scanner

FARO Software



SCENE



CADZone



Reality



CAM2
Measure 10



CAM2
SmartInspect

FARO Vertical Markets



Automotive



Aerospace



Metalworking
Machining
Assembly



Energy &
Natural
Resources



Architecture,
Engineering &
Construction



Law
Enforcement

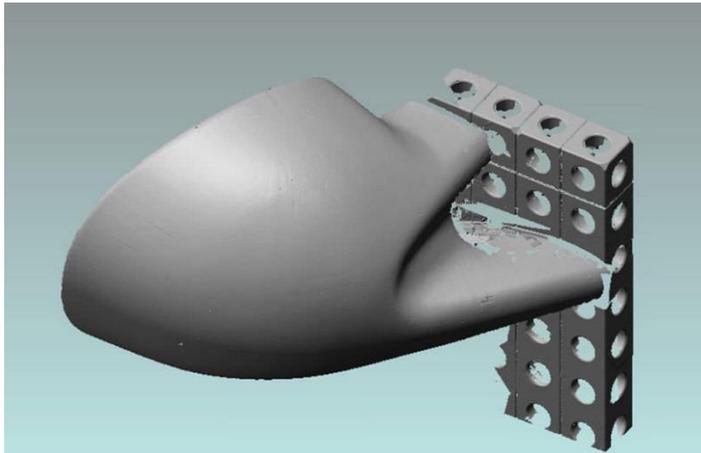
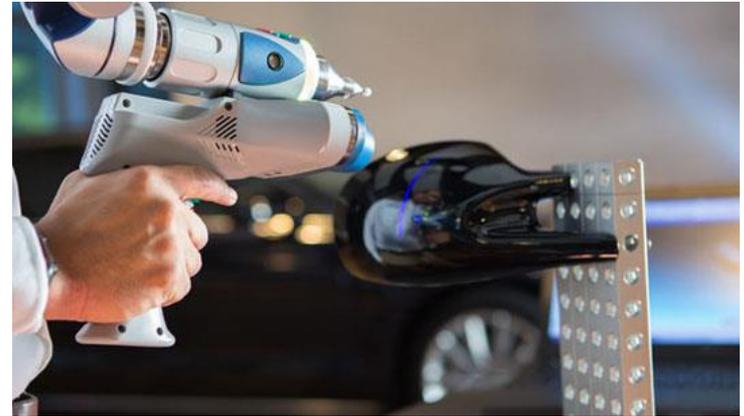
What is a Portable CMM?

- A coordinate measuring machine (or CMM, for short) is a device that can determine and record the location of a probe in 3D space and report the results via software.
- A **fixed** CMM traditionally consists of a measurement bed, a measurement probe fixed to a bridge, and a computer with software to program the movement of the probe in 3 axes.
- Characteristics of a **portable** CMM include:
 - ✓ Lightweight
 - ✓ Easy to transport
 - ✓ Simple to operate
 - ✓ High Accuracy
 - ✓ Various working volumes
 - ✓ Versatile mounting options
 - ✓ More affordable than a fixed CMM



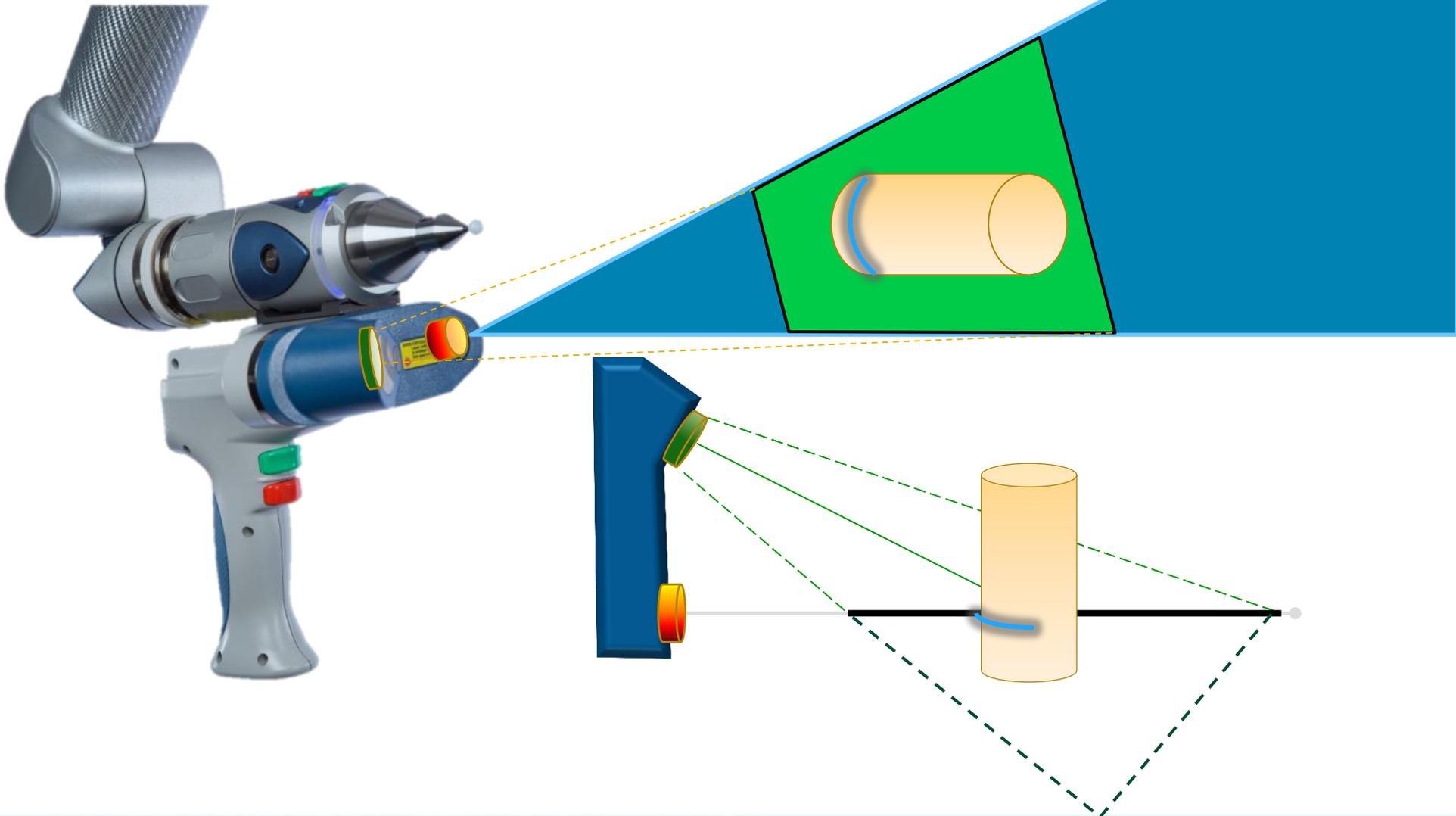
What is 3D Laser Scanning?

- Laser Scanning is a type of a digitization that allows user to collect data without directly touching the part
- Most portable CMMs can be affixed with a laser line scanner



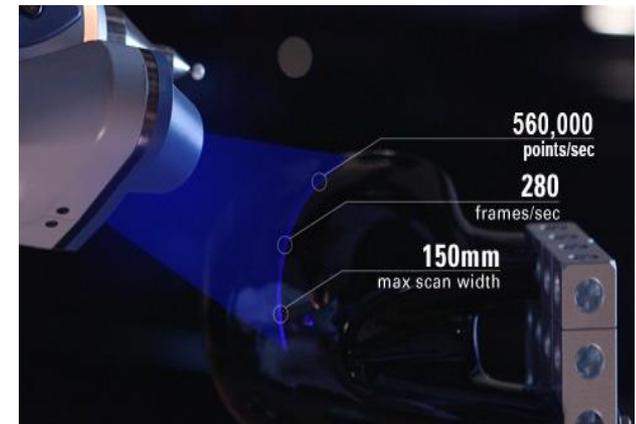
- Characteristics of a laser line scanner include:
 - ✓ Compact and lightweight
 - ✓ Simple to operate
 - ✓ Captures data quickly
 - ✓ High accuracy

How does it work?



Laser Scanning with FARO

- FARO Edge ScanArmHD - The World's First "Smart" Arm, combined with a Hi-resolution, noise defying LLP
- Innovative Integrated touch screen and operating system for truly portable tactile probing in the workplace
- Wireless connectivity via WiFi and BlueTooth with wired connection also available via USB and Ethernet
- The lightweight and low form factor LLP allows obstruction and collision free measurements to be taken with the contact probe or the LLP
- Fast data capture, at up to 560,000 points per second



Features and Benefits

FEATURES	BENEFITS
2000 points per line (True/un-interpolated points)	High definition, greater point density, capture fine details, sharper edges
Up to 280 frames per second	Faster scanning, save time, complete tasks in a fraction of the time
150mm Stripe	Better coverage, fewer scan passes, increase productivity, reduce operator fatigue
HDR Mode (High Dynamic Range)	Capture surfaces of contrasting colors and finishes simultaneously in a single scan pass
Projected Range Finder	Visual optimum scanning range indicator complements LED indicators
Blue Laser	Lower noise, speckle suppression, better on reflective surfaces, higher data quality



Features and Benefits

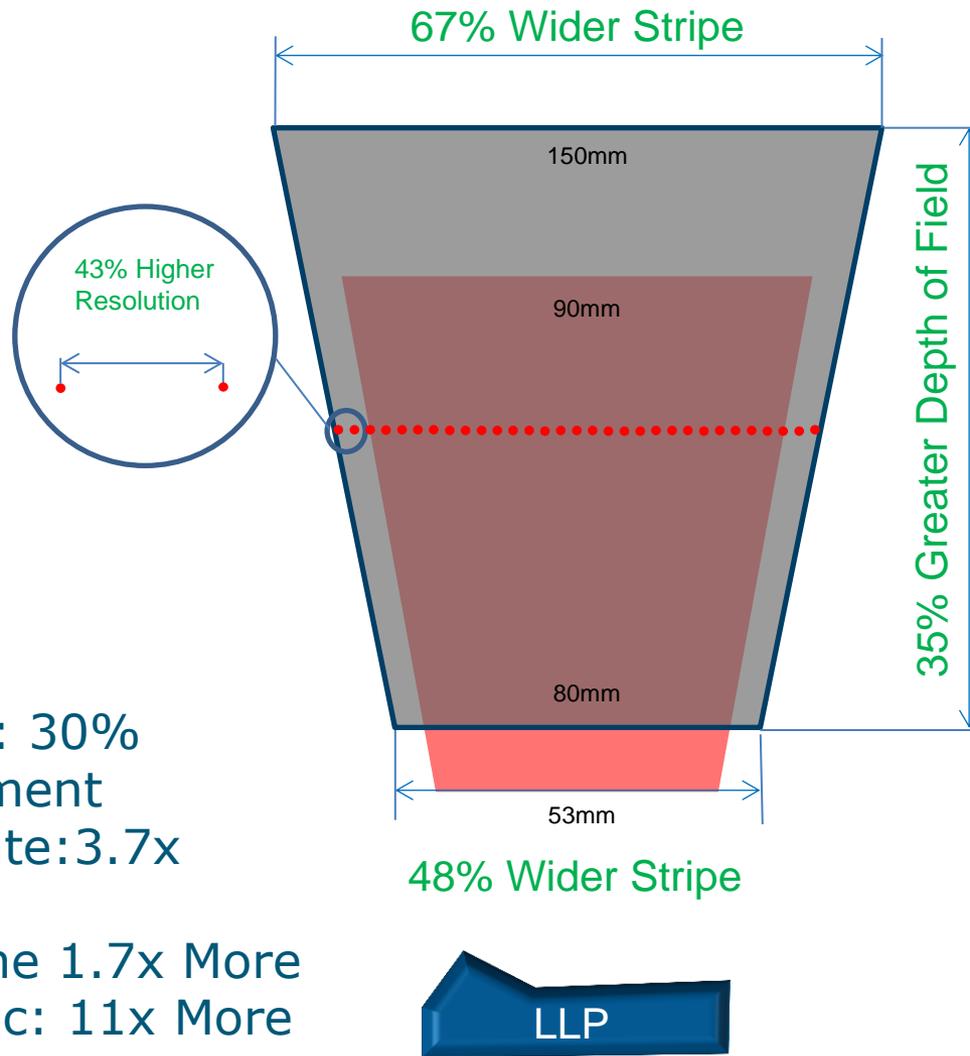


FEATURES	BENEFITS
Compatibility	Works with all Edge Arms
High Accuracy Mode	Trades depth of field to boost accuracy by up to 40% when measuring critical components
Automatic Scan Mode	Scanning parameters are adjusted automatically based on surface properties
Compact / Portable	Single unit does all the processing, connects to Edge's handle port, no additional cables or separate controller boxes
Ergonomic Handle Design	Provides more comfort for operators especially during extended use

Comparison to LLP ES Model

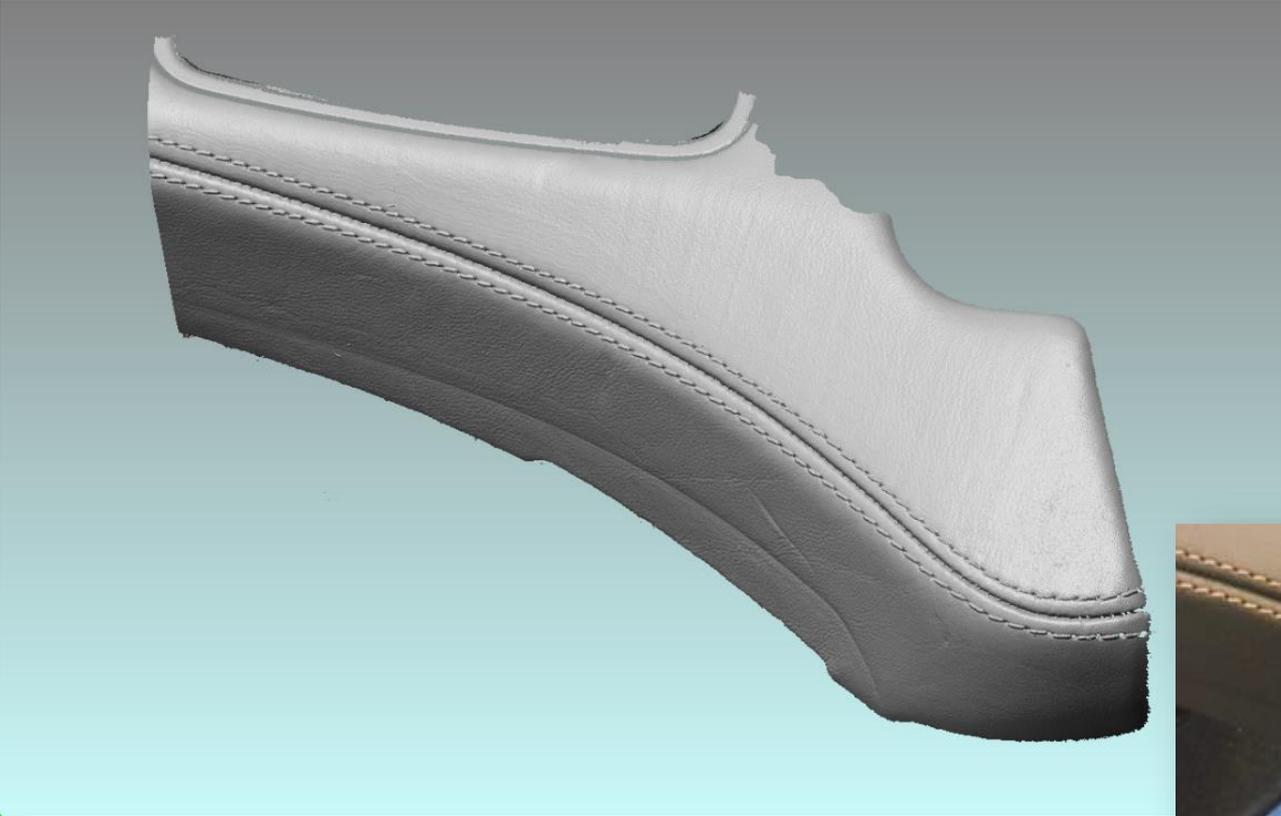
	 Edge LLP ES	 Edge LLP HD	Improvement
Accuracy (microns)	35	25	30%
Depth of Field (mm)	85	115	35%
Scan Width at near field (mm)	53	80	48%
Scan Width at far field (mm)	90	150	67%
Points per Line	752	2000	1.7X
Scan Rate (frames per second)	60	280	3.7X
Points per second	45,120	560,000	11X
Resolution up to (microns)	70	40	43%

Comparison to LLP ES Model



- ✓ Accuracy: 30% Improvement
- ✓ Frame Rate: 3.7x Faster
- ✓ Points/Line 1.7x More
- ✓ Points/Sec: 11x More

Sample Data



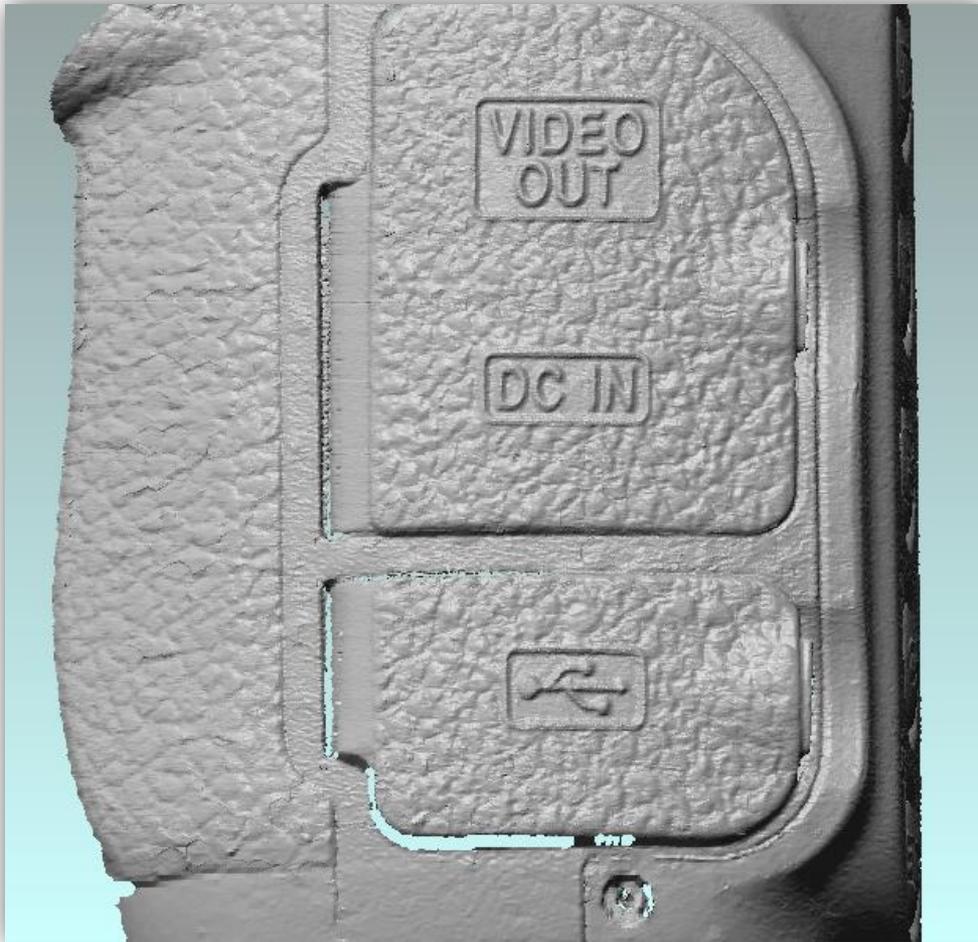
Console

Sample Data



Stapler text

Sample Data



Nikon Camera

Sample Data



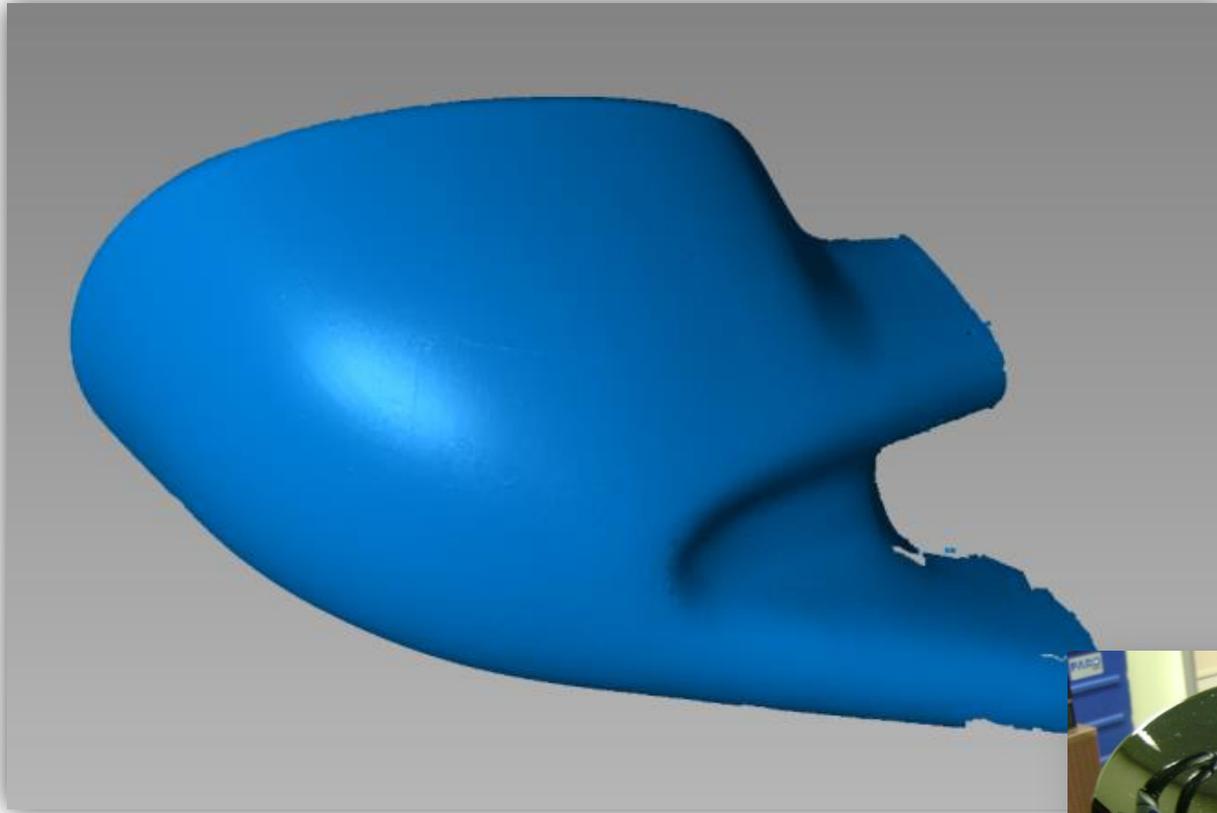
Action Figure

Sample Data



Wiper Control Knob

Sample Data



Side View Mirror

Sample Data



Shiny Rim

Applications

➤ Non-Contact Inspection

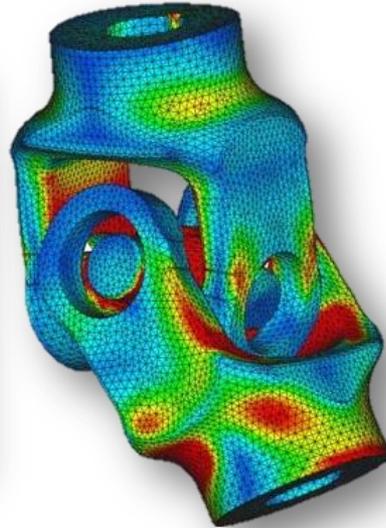
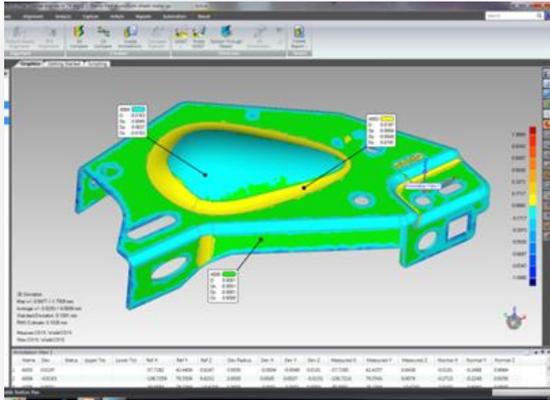
Inspect soft, deformable or complex shapes; perform cloud-to-CAD comparison, rapid prototyping, reverse engineering, and 3D modeling



➤ First Article Inspection

Capture details on an individual part to compare to a CAD model and archive for company records

Applications



➤ CAD-Based Inspection

Measure directly against CAD data; see real-time deviations from nominal

➤ Reverse Engineering

Digitize a part or object as a point cloud to create a fully-surfaced CAD model; rapid prototyping allows engineers to reproduce complex shapes in a fraction of the time



Case Studies –

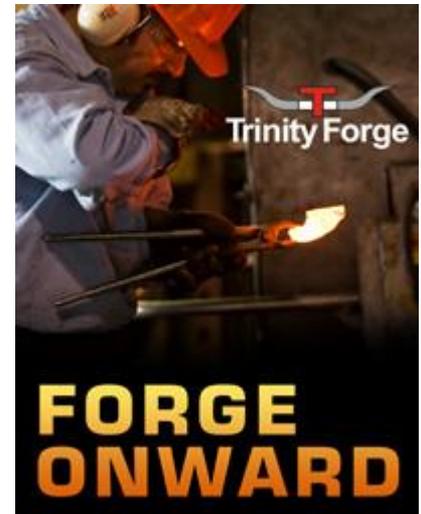


What they do:

- Modern, closed-die forging plant and leading single source for top-quality forged parts specializing in complex shapes in a wide variety of sizes to meet the most stringent customer specifications
- Use frequent quality-control inspections and statistical controls to monitor forging process, ensuring consistency and quality throughout a production run

Problem:

- TF must inspect large dies, weighing from 500 to 4000 pounds.
- Typical practice was to pour a plastic cast and then measure that cast on a fixed CMM (not the actual die)
- TF wanted to improve their inspection process to include scans of the entire die so they can track critical die wear and address potential problems before they became actual problems



Case Studies –



The FARO Solution:



- Implementing a FARO LLP into their processes, TF can now check dies in **half** the time it previously took using older techniques. Inspection now only takes **1 hour** per die and **30 minutes** of modeling time.
- The ScanArm solution **eliminated** the need to make a plaster cast.
- “The speed at which we can operate is a great value to us,” said Sheppard, TF’s VP of Quality and Engineering. “Several new dies from the CNCs can be **scanned in the morning and approved in the afternoon**. Reverse engineering of parts, maintenance of parts, or die models are all a snap using FARO.”
- TF now often completes entire manufacturing runs with minimal rejects and delays, **saving man hours and materials**.

Case Studies –



What they do:

- Committed to the development and manufacturing of components for street and race chassis applications.
- Design, manufacture and distribute installer-friendly chassis kits that minimize the amount of time and effort required by the builder



Problem:

- A large portion of CW product line consists of direct-fit parts and systems that mount on to vehicles and fit properly around OEM components. These parts are then modeled using Pro-E.
- To inspect the parts previously, they used tools such as gauge blocks, calipers, tape measures and plumb bobs followed by trial and error fabrication. Otherwise, work was outsourced to a company.



Case Studies –



The FARO Solution:

- With a complete surface scan of their parts from the FARO LLP, CW can verify fit to their scan model after quickly completing a surface scan. Now with the ScanArm, there is **no need to go back and measure the same vehicle again** to check for adequate clearance for unexpected new products.
- “In the past, we’d take measurements only in key areas and we would find that more information was needed [....]. Now we can **simply reference the surface scan** model for both measurement and visual reference.” said Scott Rieger, Engineering Manager.
- “Maybe the hardest was learning how to actually use all of the data that we now collect. In fact, **the amount of detail** in our recorded data has been increased exponentially using the laser line probe.”
- “Using FARO products has really opened a **new realm of possibilities** for us,” said Mr. Rieger. “The types and levels of sophistication in product systems we can develop are almost limitless.”

Case Studies –



What they do:

- Deliver a full range of integrated services for companies seeking an outsourcing partner for design and/or manufacturing of equipment and products. 3DE excels at developing innovative, cost effective solutions and highly manufacturable products that meet the specifications of their commercial, medical and military clients.



The Problem:

- 3DE was tasked with working with Myers Motors to discover how to best mass-produce a three-wheel NmG (No More Gas) personal electric vehicle.
- They needed a portable, laser-based solution to capture data from the vehicle for modeling and reverse engineering quickly and efficiently.



Case Studies –



The FARO Solution:

- 3DE **reduced the time** it takes to analyze the tooling and production for a part, what used to take weeks can now be **accomplished in a matter of hours**
- Were able to develop computer models for all 42 parts in a specialized vehicle in **only 3 days** (previously taken months)
- “The amount of data that is collected **in a matter of hours** with minimal setup time is comparable to that which would take days or even weeks by previous conventional inspection equipment methods,” says James T. Irwin, president of 3D Engineering Solutions.
- “Our ability to **dramatically reduce data collection and analysis time** is an advantage that even small job-shop manufacturers can afford,” says Irwin. “We are saving customers **thousands of dollars per year** by using FARO’s technology.”



Case Studies – ARJ Manufacturing

What they do:

- A part of Toyota Boshoku America, ARJ Manufacturing manufactures metal components for automotive seats for Toyota. ARJ's main focus is on sheet metal stamping and weldments for automotive seat components and assemblies

The Problem:

- In the past, ARJ used an assortment of traditional tools such as hand gauges, micrometers, calipers, and even a fixed CMM to inspect their assemblies
- Even a traditional fixed CMM could not define the issues they were seeing with sun roof components. Customer requests were more demanding on root cause and capability of parts produced.
- During PPAP (Production Part Approval Process), a ScanArm was brought in to inspect the sun roof components.



Case Studies – ARJ Manufacturing

The FARO Solution:



- “When I saw this technology in action, I was sold in less than two minutes!” said Pat Reagan, Tool Manager at ARJ.
- Previously, they would send tools and dies out to a vendor to be scanned as part of their PPAP, which would take approximately **2 days**. Implementing FARO in-house, they can do the scans themselves in **less than 3 hours**.
- During the PPAP, ARJ compared the first article to the CAD model and then back to the die, discovering a concern with the die. The die tool had been engineered and was creating change that was not documented by the customer. The customer ended up making adjustments to their process **based on the ScanArm’s findings**.

Case Studies – ARJ Manufacturing

The FARO Solution:

- “Using FARO 100-percent of the time has removed emotion from our measurement and **has created data as fact**. The data we are now able to capture points out variations in some of our processes and gives us a direction to make corrections. We can make **better, more informed, decisions** with FARO.”
- “This is a **whole new level of measurement and process** and should be in every tool and production shop. THIS is what they should be using too,” said Mr. Reagan. “I’m a tool maker and this is the way of the future. If you know die making and quality and processes, this tool will save you **millions!**”



Summary

- ✓ A portable CMM with a Laser Line Probe combines accuracy, flexibility, consistency and ease of use for any shop floor environment interested in part inspection and quality improvement
- ✓ Incorporating a LLP into your workflow can yield cost savings by reducing
 - scrap,
 - man-hours
 - hard-to-discover defects
 - valuable re-work time
- ✓ 3D Scanning can help streamline both the manufacturing and quality aspect of a product, benefitting both the manufacturer and their customers
- ✓ With an increase in speed, accuracy and resolution over its predecessor, the FARO Edge ScanArm HD is a considerable improvement in the 3D marketplace

FARO®

Thank you for attending!



www.faro.com



(800) 736-0234