VERSION 4

AUGUST 9, 2022

VTUBE-LASER ADVANTAGES

COMPARED TO OTHER SYSTEMS

AUTHOR: MICHAEL CONE

ADVANCED TUBULAR TECHNOLOGIES, INC.

MICHAEL.CONE@ADVANCEDTUBULAR.COM

ICON LEGEND

This icon means Advanced Tubular Technologies invented and/or were the first to introduce this technology for the tube fabrication industry.

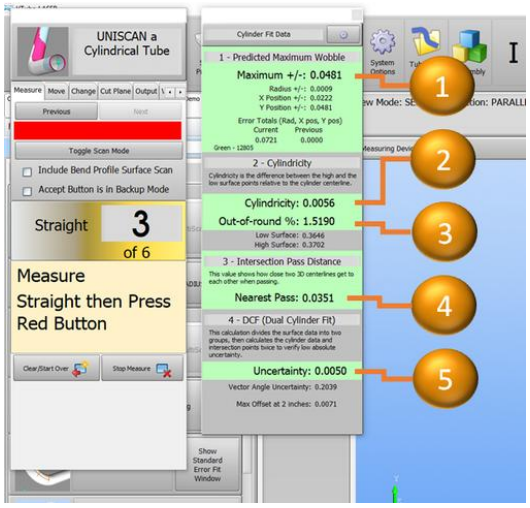
This icon means that the technology is unique to VTube-LASER and scan arms when compared to other tube fabrication measuring systems.

ADVANTAGE 1 – EXTREME MULTI-LEVEL CYLINDER QUALIFICATION FOR EVERY STRAIGHT

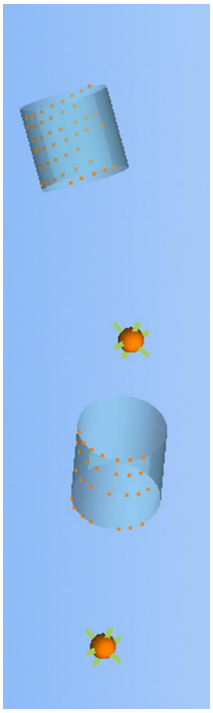
VTUBE-LASER USES A 5-LEVEL CYLINDER FIT TEST TO QUALIFY EVERY CYLINDER MEASUREMENT IN REAL TIME

VTube-LASER is the first tube fabrication application to use the idea.

This is unique to VTube-LASER. No other system uses this feature like VTube-LASER.



Every cylinder that is scanned is required to pass a **5-level cylinder test** that ensures that the surface points and calculation are excellent before moving to the next scan.



1. **Wobble Deviation:** The math engine reports this value to indicate how much possible wobble it predicts in deviation in the centerline of the cylinder. The smaller the wobble, the higher the confidence in the cylinder calculation. If the wobble is too high, then VTube-LASER asks for a remeasure.

2. **Cylindricity:** This is the measurement of the distance between the highest point and the lowest point in the cloud relative to the centerline. When this value is too high, VTube-LASER asks for a remeasure.

3. **Out-of-round%:** Every tube cylinder is out of round. This calculation tests for too much out of round in the surface data. If the OOR% is too high, then VTube-LASER asks for a remeasure.

4. **Nearest Pass:** This feature checks how near the two 3D lines are when they intersect. If the lines do not pass near enough, then VTube-LASER asks for a remeasure.

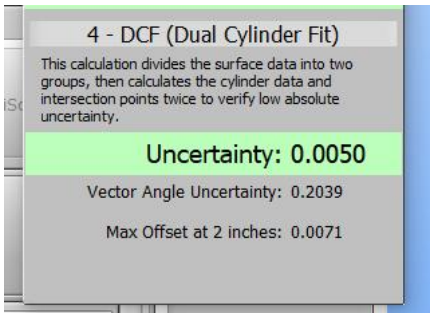
5. **Dual Cylinder Fit (DCF) Uncertainty:** DCF splits the odd stripes and the even stripes into two subgroups and then calculates two centerline end points for comparison to each other. (**See Advantage 2 on the next page.**) If the uncertainty value is too high, then VTube-LASER asks for a remeasure.

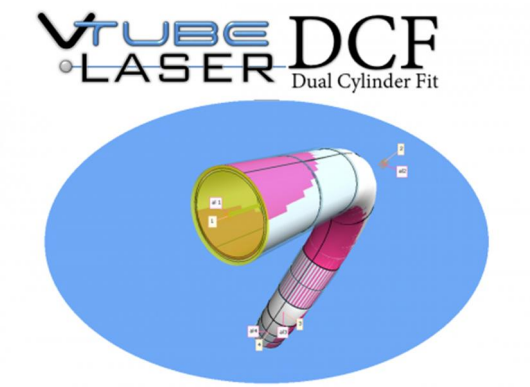
ADVANTAGE 2 – DUAL CYLINDER FIT (DCF)

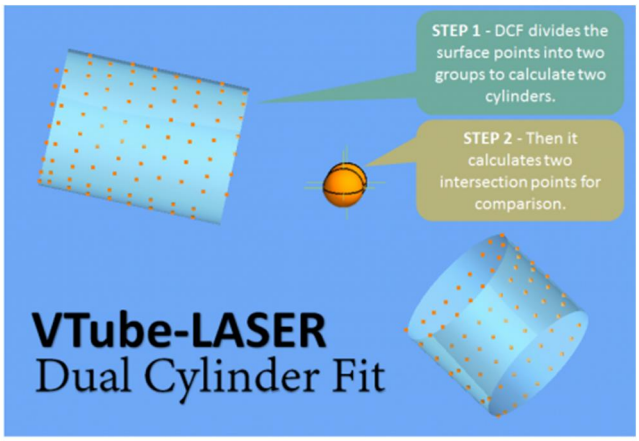
WE INVENTED THE D C F ENGINE TO ENSURE REDUCED UNCERTAINTY IN MEASUREMENTS

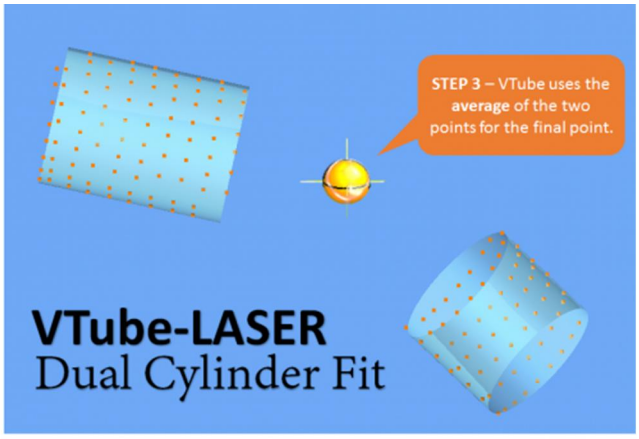
We invented DCF in 2017.

This is unique to VTube-LASER. No other system uses this feature.









This was a major invention for the tube fabrication industry in 2017. It introduced a better way to ensure that the incoming data is good.

1. It measures the tube twice in one pass when the user measures the tube the first time.

2. This approach effectively detects and removes fliers in the incoming surface data.

ADVANTAGE 3 – USES A DENSE CLOUD OF SURFACE DATA FROM SCANS TO RETURN MORE DATA

BECAUSE OF THAT CLOUD, VTUBE-LASER SHOWS DATA ABOUT THE DIAMETER THAT ONLY A LASER-SCANNED SURFACE CAN RETURN

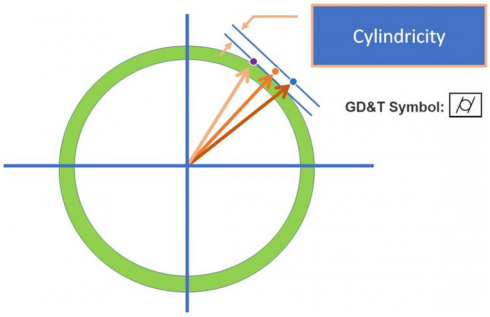
Some measurement systems only scan the edge of tubes - but VTube-LASER scans a dense point cloud from the actual surface of the tube. This allows VTube-LASER to calculate more information from the tube than the edge-only systems.

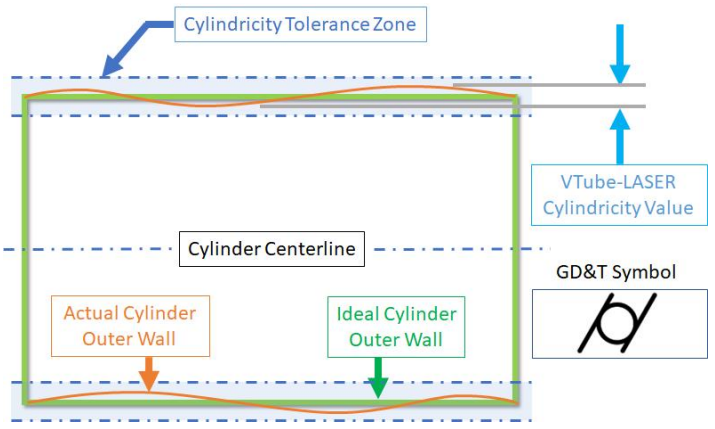
Vision-based systems only examine the OD silhouette (like the shadow or edge). Most fork-probe systems take in 2 surface points from either end of each straight for a total of 4 points used to calculate the centerline. This limits their ability to return calculated information about the diameter.

With the laser scanner, VTube-LASER always takes in a dense point cloud of the diameter *surface* and then solves for a cylinder centerline. This allows VTube to do additional checks on every straight that other systems cannot do – like **Out-of-round%** and **cylindricity**.

This is also why VTube is immune to changing diameters – because it calculates diameters on-the-fly with all that surface data.

VTube-LASER has built-in filters that let you control the density of the point cloud on the scanned surface.



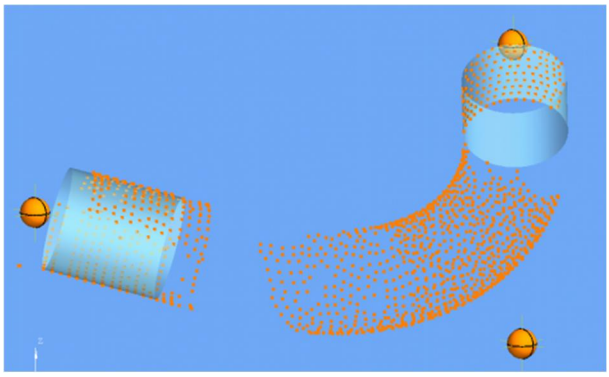


ADVANTAGE 4 – BEND PROFILE MEASURING

VTUBE-LASER CAN CALCULATE THE INSIDE RADIUS, CENTERLINE RADIUS, AND RADIUS FLATTENING

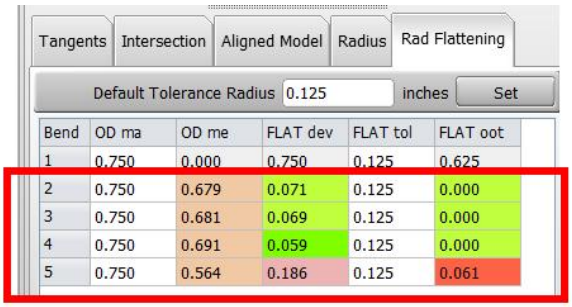
VTube-LASER takes advantage of special math that will find the center of the bend for the operator, then consistently calculate the centerline radius and the radius flattening.

Because VTube-LASER takes in dense point-cloud surface data, it can calculate the centerline radius and radius flattening using the Bend Profile measure process.



Rather than expect the operator to find the center of the bend, VTube-LASER finds it for the operator based on the two adjacent cylinder centerlines. There is no guessing where the center of the radius is.

The qualification values are shown in both the Inspection Data menu in the Radius and Rad Flattening tabs, but also in reports. (See the tab menus here.)



Bend	OD ma	OD me	FLAT dev	FLAT tol	FLAT oot
1	0.750	0.000	0.750	0.125	0.625
2	0.750	0.679	0.071	0.125	0.000
3	0.750	0.681	0.069	0.125	0.000
4	0.750	0.691	0.059	0.125	0.000
5	0.750	0.564	0.186	0.125	0.061

Radius Section Flattening is documented at the center of the bend by VTube-LASER

Bend	CLR ma	CLR me	CLR dev	CLR tol	CLR oot
1	1.500	1.500	0.000	0.125	0.000
2	1.500	1.500	0.000	0.125	0.000
3	1.500	1.500	0.000	0.125	0.000
4	1.500	1.988	0.488	0.125	0.363
5	1.500	1.993	0.493	0.125	0.368

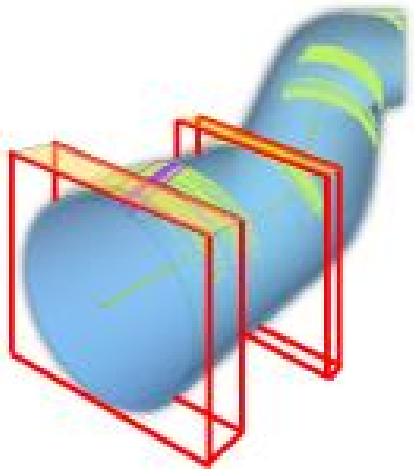
Radius Calculations are documented at the center of the bend by VTube-LASER

ADVANTAGE 5 – LASER STRIPE ZONES CAN OVERCOME HEAVY CYLINDER DEFORMATION

VTUBE-LASER USES THIS FEATURE TO INCREASE BEND CORRECTION REPEATABILITY FOR DEFORMED PARTS

We invented this algorithm in 2019.

No other tube measuring system has this feature.



We added the LASER STRIPE ZONES feature to VTube-LASER to overcome repeatability issues for parts that have high deformation that is unpredictable.

The goal is to carefully control which section of each straight is allowed to influence the centerline calculation.

The method is to recalculate cylinders from the stripes found in predefined zones along the measured centerline. This method acts as a filter that can consistently reduce the change in bender data corrections from measure to measure.

Correction Data from BEFORE Stripe Zones applied

Bender Adjustments

Add this data to the bender data to correct the shape of the tube

Bend	Length	Rotation	Angle
1	-0.1	0.0	-0.2
2	2.5	-0.3	-0.1
3	-1.5	0.5	-0.1
4	-2.3	-0.1	0.0
5	2.2		

Correction Data from AFTER Stripe Zones applied

Bender Adjustments

Add this data to the bender data to correct the shape of the tube

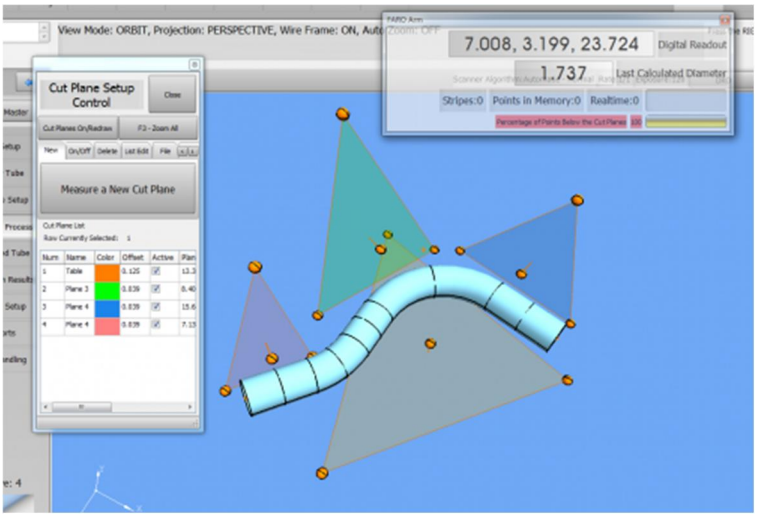
Bend	Length	Rotation	Angle
1	-1.0	0.0	0.1
2	0.6	-0.2	0.0
3	1.1	-0.2	-0.1
4	-0.3	0.2	0.0
5	-0.9		

ADVANTAGE 6 – LAY THE PART ON THE TABLE OR FLOOR WITHOUT THE NEED FOR TUBE HOLDERS

MEASURE TUBES ON ANY TABLE OR FLOOR USING OUR "CUT PLANE" FEATURE

VTube-LASER is the first tube fabrication application to use the idea.

This is unique to VTube-LASER because fork-probe measuring systems cannot use this feature.



Tube holders are not needed with VTube-LASER. Measure the table surface as a Cut Plane, then lay the tube on the table during scanning. VTube-LASER will automatically ignore the table.

This has the advantage of allowing flexible tubes to rest on a large surface to control flexing - rather than placing them in tube clamps.

- See VTube-LASER Cut Planes

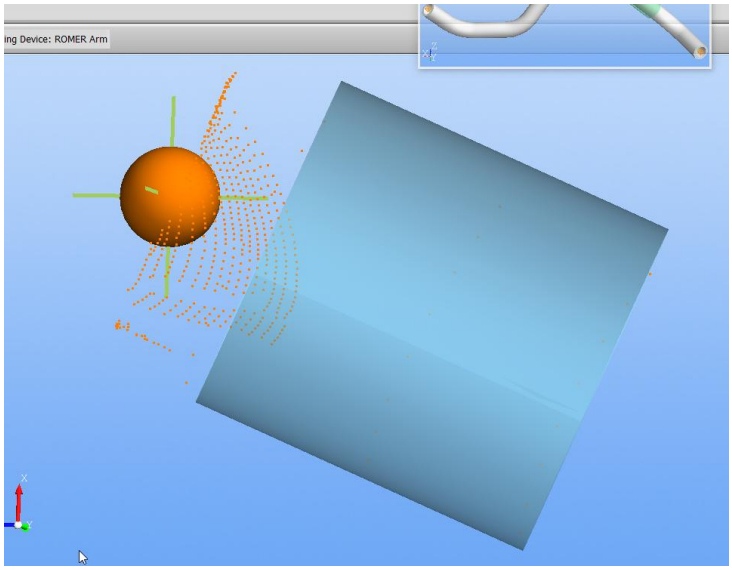
ADVANTAGE 7 – SUPERIOR END SCANS BECAUSE OF DENSE LASER POINT-CLOUDS

VTUBE-LASER LASERS WILL NOT MISS THE END DURING END SCANS – NO MATTER THE DIAMETER

We invented this style of end-scan for VTube-LASER in 2010.

This approach is unique to VTube-LASER.

Infrared fork-probe systems often struggle with acquiring the end measurements on smaller diameter parts because it is hard to find the ends of small tubes using that style of probe.



Some measurement software assumes a plane at the end of the tube.

VTube-LASER scans any shape and size of tube end by laser scanning a *point cloud.* The shape of the end (flat or not) does not affect VTube-LASER.

Also, because this method uses a visible and very accurate laser line, it is not possible to miss the end of the tube – even if the diameter is very small.

ADVANTAGE 8 – UNIQUE END SCAN FLIER FILTER

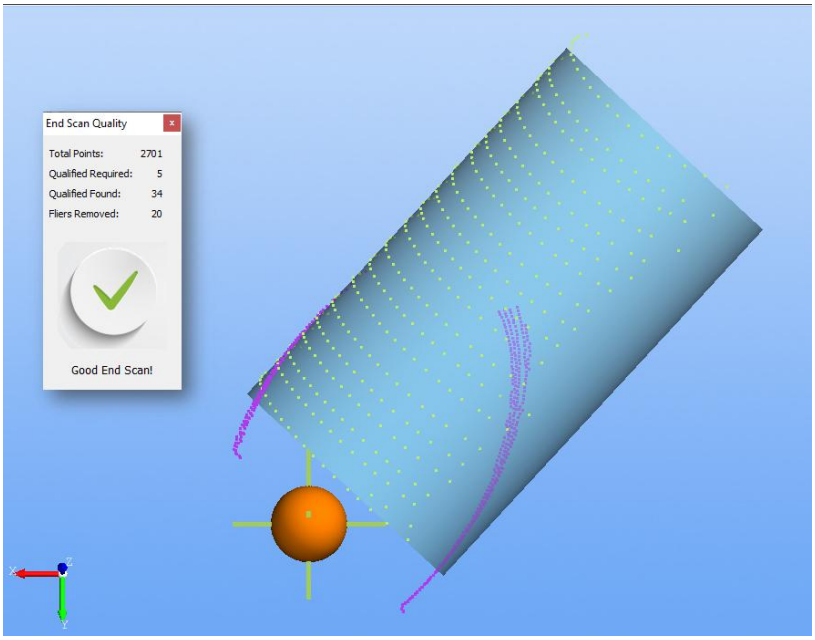
VTUBE-LASER CAN CONSISTENTLY REMOVE STRAY POINTS FROM END SCANS TO FIND THE END WALL

We invented this feature in 2021.

This approach is unique to VTube-LASER.

This invention is a powerful filter that removes flier points from end scans automatically to ensure that the end scans of walls are rock solid.

With the new filter comes an **End Scan Quality** window that indicates how well the end scan performed - and whether VTube accepts or rejects the end scan.



This was a major invention for the tube fabrication industry in 2021. It introduced a better way to ensure that the incoming end scan data is always good.

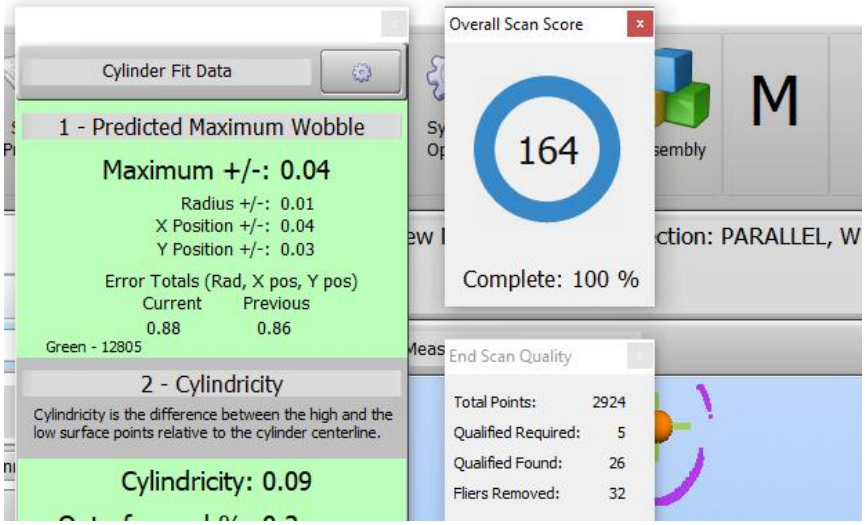
ADVANTAGE 9 – GAIN CONFIDENCE WITH THE UNIQUE SCAN SCORE FEATURE

VTUBE-LASER SHOWS A SCAN SCORE TO TEACH OPERATORS HOW WELL THEY ARE MEASURING

We invented this feature in 2020.

This feature is unique to VTube-LASER.

The Scan Score is based on a system where **100** is interpreted as **"perfectly consistent with all the previous measures combined"**, *less* than 100 means not as good, and *greater* than 100 means the scan was better when compared to all the previous scans.



This was a major invention for the tube fabrication industry in 2020. It introduced a better way to allow operators to self-check their scan technique.

ADVANTAGE 10 – AUTOMATICALLY REMOVE FLIERS FROM CYLINDER EDGES

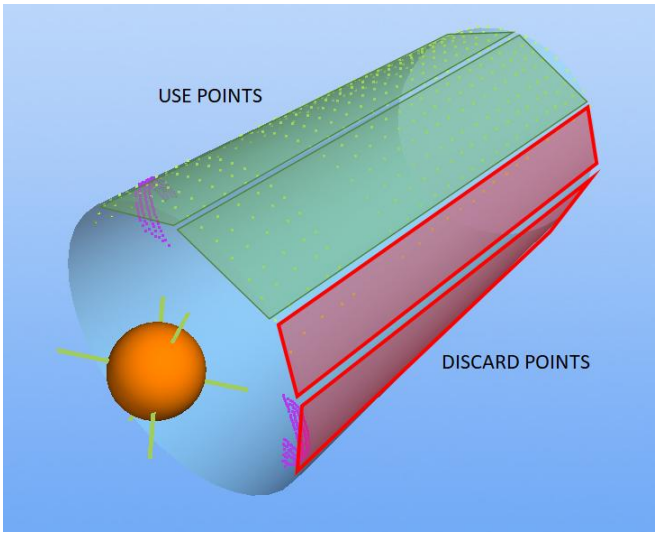
THE D C P (DIAMETER CUT PLANE) FEATURE REMOVES FLIER DATA FROM THE EDGE OF SCANNED CYLINDERS

We invented DCP in 2016.

This is unique to VTube-LASER because no other tube measuring system uses this feature.

Only VTube-LASER uses DCP (Diameter Cut Planes) to remove any fliers (stray points) from the edge of diameters.

This ensures super crisp and accurate diameter surface measurement automatically.



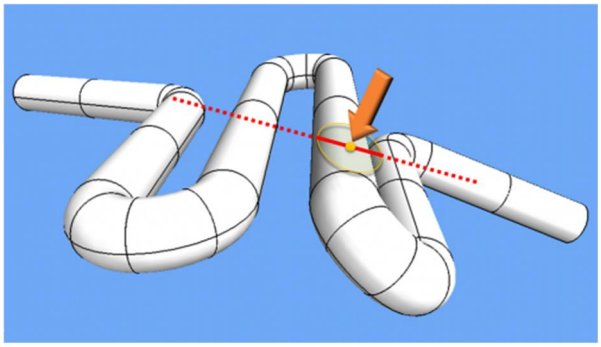
ADVANTAGE 11 – MEASURE NEAR OTHER PARTS AND ASSEMBLIES WITH THE LASER

THE D C P (DIAMETER CUT PLANE) FEATURE REMOVES THE EXTRA LASER TAIL DATA AUTOMATICALLY

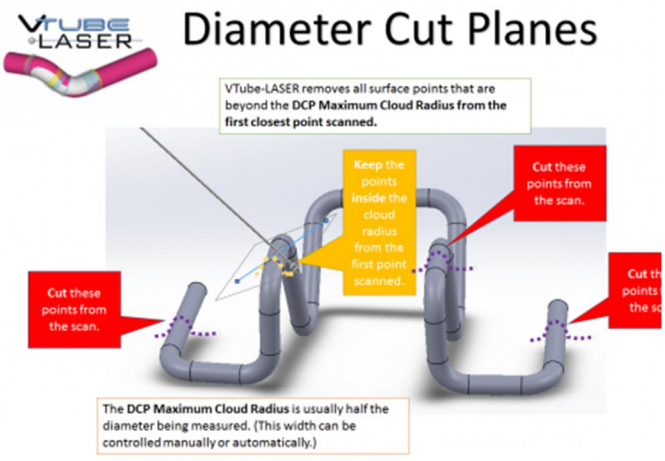
We invented DCP in 2016.

This is unique to VTube-LASER because no other tube measuring system uses this feature.

Only VTube-LASER uses DCP (Diameter Cut Planes) to keep the first tube the laser finds and remove any other tube (or any object) scanned beyond the allowed DCP radius width limit.



For example, Holly MSD uses this feature to scan tube headers.



- See DCP - Diameter Cut Planes

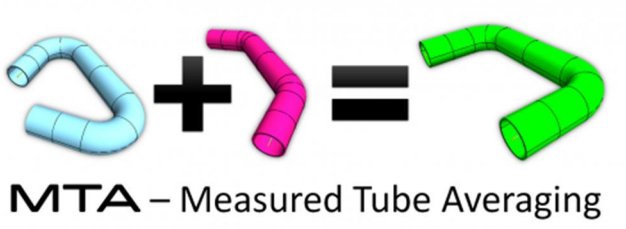
ADVANTAGE 12 – SUPER EASY TUBE MEASURE AVERAGING

THE M T A (MEASURED TUBE AVERAGING) FEATURE ALLOWS USERS TO EASILY MEASURE BOTH SIDES OF THE TUBE OR PIPE, THEN CREATE AN AVERAGED TUBE

We added MTA in 2018.

This is unique to VTube-LASER because no other tube measuring system allows for an unlimited number of averaged tube measures from surface data on all sides of the tube.

We worked with MEC Inc. (Mayville Engineering) to prove the concept of MTA. We found that calculating the true centerline of larger pipes is possible with MTA because VTube-LASER gathers data from all sides of the surface of the pipe.



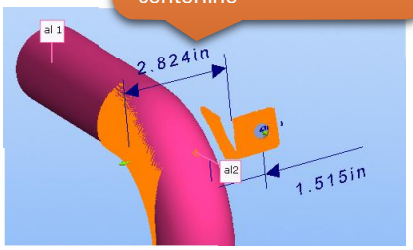
While tube measure averaging is not a new concept, using VTube-LASER MTA with cylinder *surface* data is new. Other systems either detect only the tube edges or take only 8 points per straight. VTube-LASER takes in thousands of points on *all parts of the surface*. **Then, with MTA, VTube-LASER can see nearly all sides of a tube fabrication. This allows for a very precise calculation of a true centerline.**

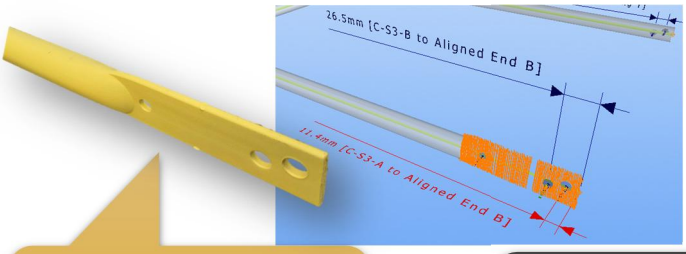
ADVANTAGE 13 – MEASURE GENERAL PRISMATICS WITH S P A C E O B J E C T S

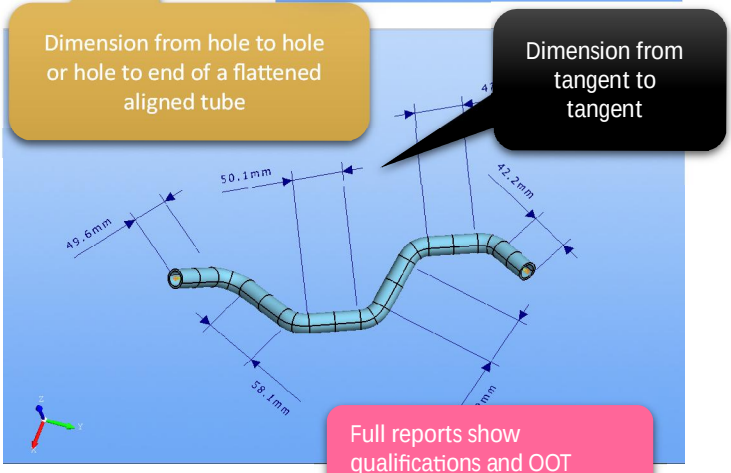
EXTRACT AND MEASURE THE TRUE POSITION OF COMPONENTS WITH PLANES AND HOLES – OR EVEN DRILLED HOLES IN TUBE STRAIGHTS

We added Space Objects in August 2022.

This feature in VTube-LASER version 4 is an easier way to laser-scan brackets and holes for true-position qualification. Space Objects are created using either the ball probe or scanner.







General metrology with Space Objects is a huge step forward for VTube-LASER v4.

Scan surfaces to extract planes and holes with the laser scanner.

- Space Objects can be planes, holes, and linear dimensions.
- Space Object dimensions are regenerated dynamically – if you change a source or a target Space Object position, the dimension automatically changes with it.
- Dimensions can even reference individual scanned points or any generated point along the centerline of a tube model – for example, from a tangent point to the center of a drilled hole.
- You can associate holes and planes to tube straights to automatically **calculate the vector angles of the hole or plane relative to the plane of any bend** in the tube.
- Chose which metric to qualify and print in **reports like this one:**

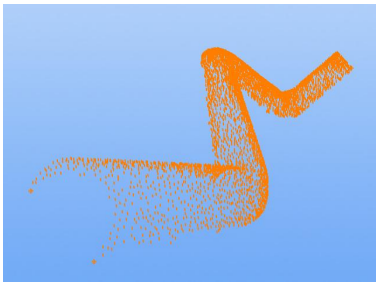
Space Objects Qualification List

Object Name	Metric	Nom	Meas	Dev	Tol	OOT
C-S1 Left A	Center X	-0.500	-0.518	-0.018	0.060	0.000
C-S1 Left A	Center Y	23.450	23.426	-0.024	0.060	0.000
C-S1 Left A	Center Z	0.150	0.095	-0.055	0.060	0.000
C-S1 Left A	Center True Position	0.000	0.063	0.063**	0.060	0.003**
C-S1 Left A	NormV Angle to Next Bend Plane	90.000	90.736	0.736	1.000	0.000
C-S3 Right A	Center X	8.500	8.546	0.046	0.060	0.000
C-S3 Right A	Center Y	23.450	23.438	-0.012	0.060	0.000
C-S3 Right A	Center Z	0.150	0.173	0.023	0.060	0.000
C-S3 Right A	Center True Position	0.000	0.052	0.052	0.060	0.000
C-S3-A to Aligned End B	Dim True	0.433	1.885	1.452**	0.039	1.412**
C-S3-B	NormV Nearpass Distance	0.000	0.057	0.057**	0.039	0.017**
C-S3-B	NormV Angle to Previous Bend Plane	90.000	89.796	-0.204	1.000	0.000
C-S3-B to Aligned End B	Dim True	1.024	2.478	1.454**	0.039	1.415**
C-S1-A to C-S1-B along Y	Dim True	0.591	0.594	0.003	0.039	0.000

ADVANTAGE 14 – USE HAND SCANNER DATA

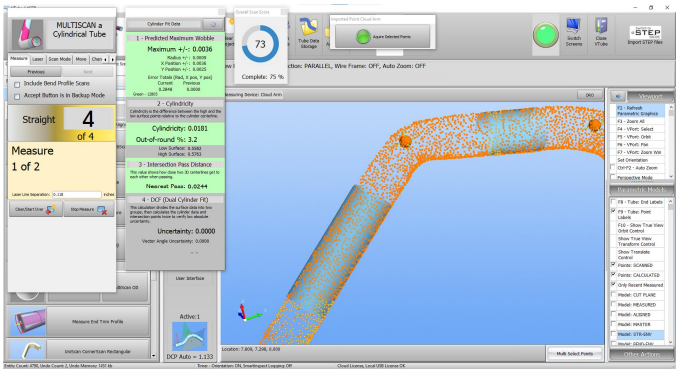
IMPORT AND MEASURE POINT CLOUDS FROM HAND SCANNERS

This is unique to VTube-LASER because we are unaware of any other tube measuring system that can import point clouds from any hand-scanning device for measurement and qualification.



While VTube-LASER is optimized for scanning arms, it can also import and handle clouds of data from any hand scanners that can output XYZ+IJK data files in one of the common formats (tab, space, or comma delimited). (To the best of our knowledge, that allows it to connect to *all* hand scanners.)

VTube-LASER has a built-in simulated arm called a “Cloud Arm” that lets users measure the points as if they are measuring the surface of a tube with a scanner.



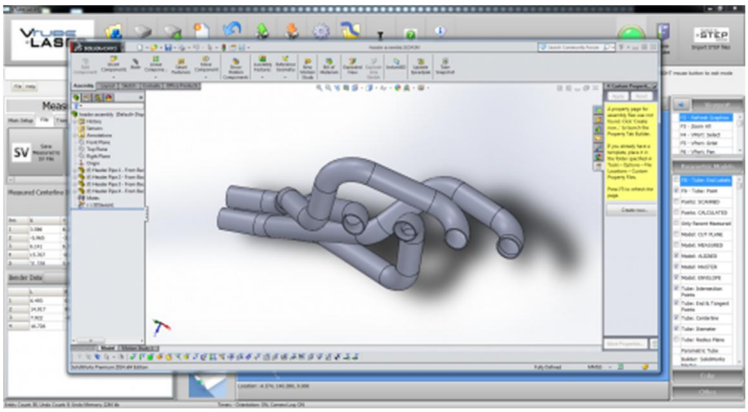
Using the S P A C E O B J E C T S feature, it is also possible to extract planes and holes from the point clouds.

ADVANTAGE 15 – EASY REVERSE-ENGINEERING TO SOLIDWORKS

MEASURE THEN AUTOMATICALLY BUILD TRUE PARAMETRIC 3DSKETCH PARTS IN SOLIDWORKS

This is unique to VTube-LASER because we are unaware of any other tube measuring system that can build directly to SOLIDWORKS – both parts and assemblies.

VTube-LASER can draw measured individual parts or an assembly of parts in SOLIDWORKS in just a few seconds.



Multiple tubes can be built in the same SOLIDWORKS part file, or in a SOLIDWORKS assembly.

- See examples in videos 58 and 77 on the videos pages.

  Link to Video 77

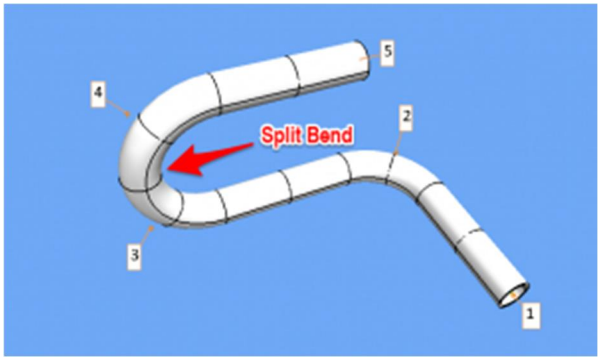
  Link to Video 58

ADVANTAGE 16 – SUPERIOR 180-DEGREE MEASURES USING OUR “SPLIT BEND” FEATURE

THIS FEATURE HANDLES 180-DEGREE BENDS ACCURATELY *EVERY* TIME

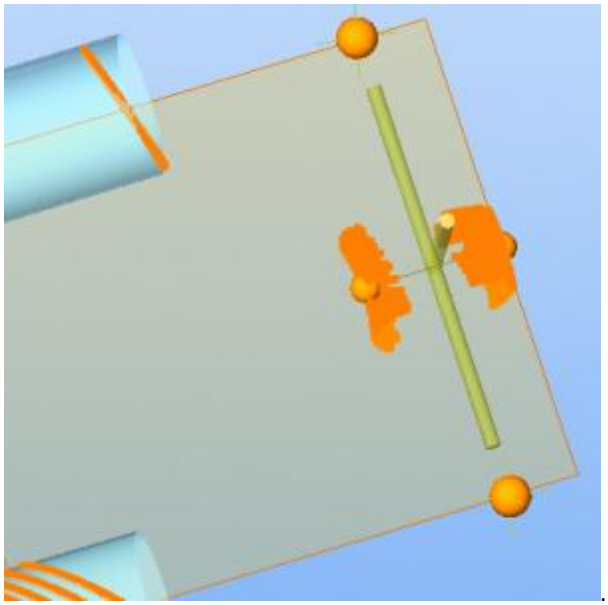
We invented the SPLIT BEND feature in 2011 to accurately measure bend angles from 180 degrees through 359 degrees.

This is unique to VTube-LASER because no other tube measuring system uses this feature.



This feature solves a huge accuracy problem that other measuring centers have when trying to handle 180-degree (or greater) bends.

VTube-LASER uses the SPLIT BEND process to accurately measure any bend that equals or exceeds 180 degrees using math based on point-cloud data from the inside and outside apex area of the bend.



Any collapse or ovality in the bend region **does not reduce the accuracy of the Split Bend centerline placements** in VTube-LASER.

VTube-LASER assumes that the bend is an unpredictable shape and uses math that finds the exact center of *whatever shape it measures* at the apex of the bend.

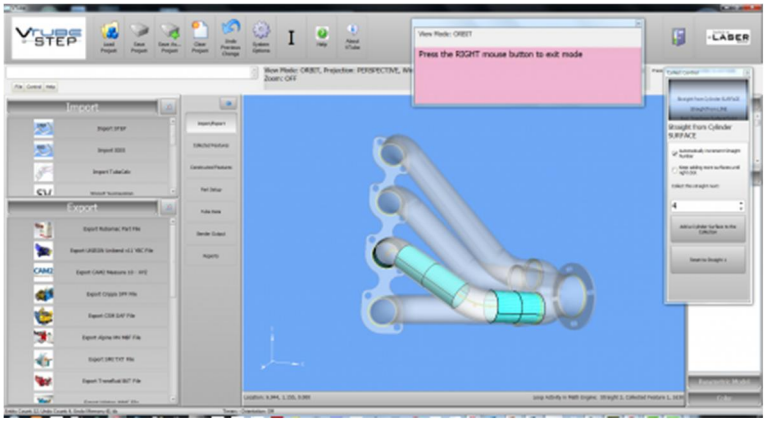
- See VTube-LASER video 40
- See VTube-LASER video 56 for how to set up for a Split Bend.

For details, see the VTube-LASER Split Bend Feature page.

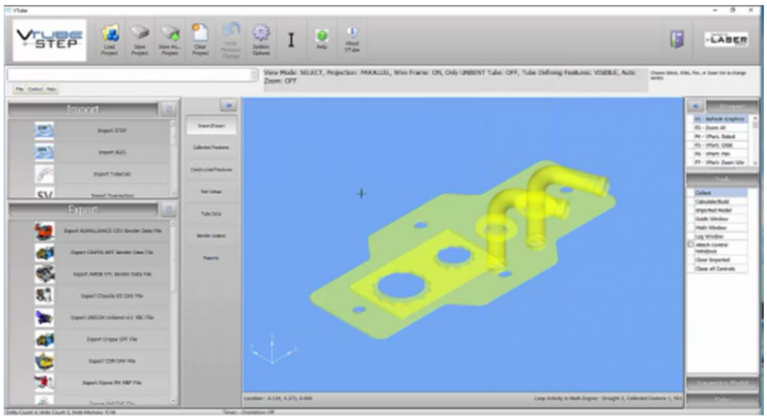
ADVANTAGE 17 – SOPHISTICATED IMPORT OF STEP AND IGES ASSEMBLIES

TROUBLE-FREE IMPORT OF TUBE MODELS FROM ENTIRE ASSEMBLIES WITH COMPONENTS

Unlike other systems that often struggle with importing tubes with extra objects in the file, VTube-LASER can easily import entire assemblies that include components other than tubes.



VTube-LASER can import entire assemblies in STEP and IGES formats. This software lets you find the centerline of any solid model tube inside any assembly.



VTube-LASER can even find the centerlines of straights that are drilled with holes or end copings.

ADVANTAGE 18 – INCLUDED BENDER COMMUNICATIONS WITHOUT EXTRA CHARGES

COMMUNICATE WITH UP TO 100 BENDERS OUT-OF-THE-BOX

Only VTube-LASER allows you to connect to up to 100 benders for no additional charge. Also – all embedded interfaces are included in the license purchase price.

VTube-LASER includes communication with up to 100 benders with no additional license charge for any bender type embedded in VTube-LASER.

This means that, unlike other systems, there are no charges for connection to multiple benders.

- See one protocol example: Setup VTube for Supravision Network Communication

ADVANTAGE 19 – NO NEED FOR SEPARATE PROBES OR SCANNERS

ONE SCANNER WORKS FOR ALL DIAMETERS

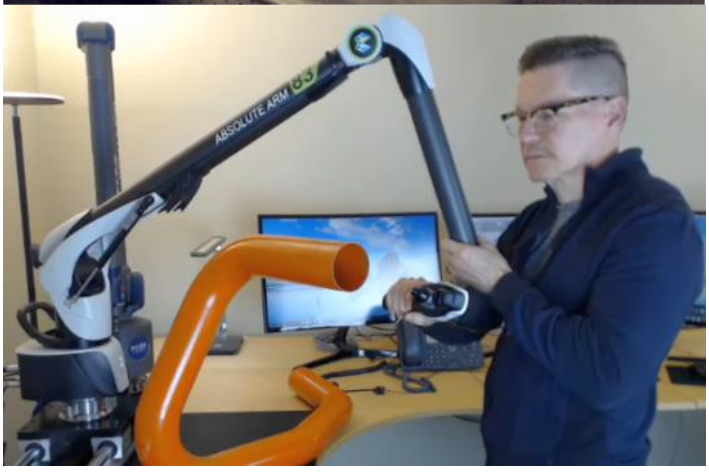
VTube-LASER uses the same scanner for all diameters because it measures the diameter using surface point clouds.

This means that there is no purchasing of extra probes for unusual diameters (like is required for fork probes). Also, VTube-LASER is completely immune to diameter changes **because it measures the diameter on-the-fly**. (The diameter value entered in Part Setup is only for visualizing the model on the screen.)

This means that VTube-LASER can measure ANY diameter without changing the probes or scanners. The same scanner can measure a coat hanger rod or a 12-inch diameter pipe.

VTube-LASER uses either a ball probe or the laser probe in the same tube. This feature lets you alternate measuring techniques depending on what works best for each straight.

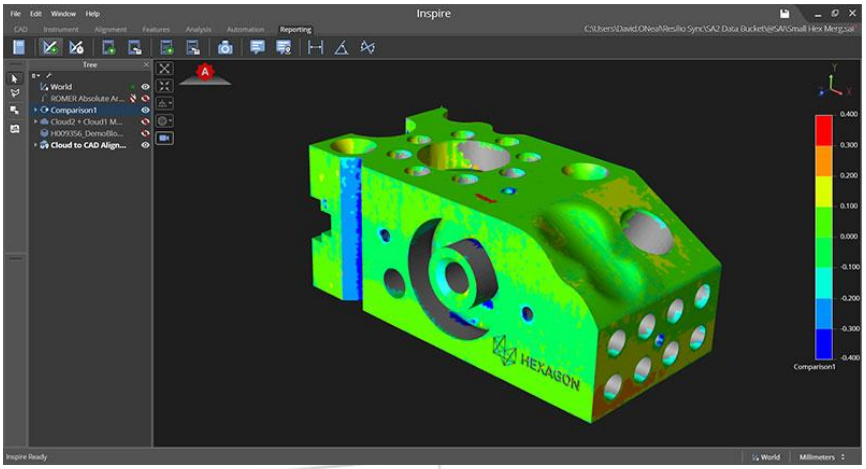
VTube-LASER even has a feature for measuring CENTERLINE STRINGS that we added for the US Navy.



ADVANTAGE 20 – SCAN ARMS CAN SCAN ANYTHING WITH THE OPTIONAL SOFTWARE

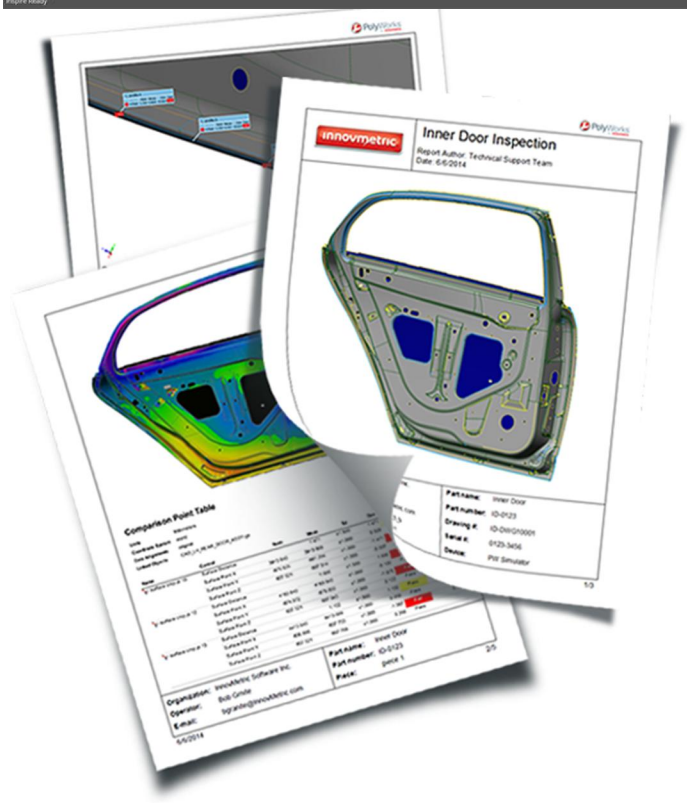
CHANGE THE SOFTWARE TO MEASURE ANY SHAPE

Laser scan arm systems are super flexible compared to other tube-only systems.



While other tube-measuring systems measure only tubes, the arms that VTube-LASER works with allow for scanning anything just by switching software.

- Inspire
- PC-DMIS
- PolyWorks
- DesignX
- VISI Reverse



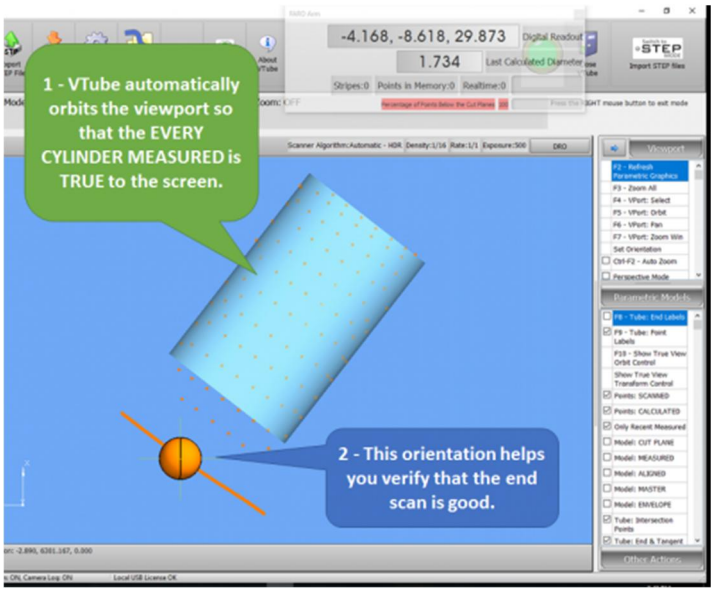
ADVANTAGE 21 – SUPERIOR VISUAL FEEDBACK

BETTER REAL-TIME VISUAL FEEDBACK GIVES HIGHER CONFIDENCE TO OPERATORS DURING MEASURING

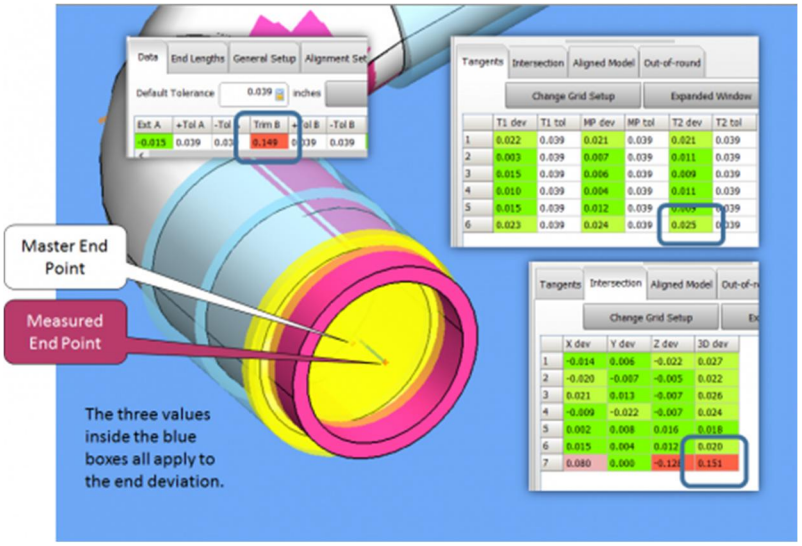
We introduced the idea of *enhanced visual verification* with displayed models that give important feedback while measuring. For example, users can easily prove with our visual models when ends scans are perfect (and when they are not).

Only VTube takes advantage of graphic model close-ups to help users qualify the measurement in real-time. This removes stress from the operator by allowing them to prove that a measure is good.

VTube-LASER shows you the actual model of the scanned points on the screen immediately after the scan in its TRUE VIEW orientation. This allows the operator to visually verify that the scan was good before moving to the next straight or end. If there are outliers or flyers - you can easily see them on this screen.

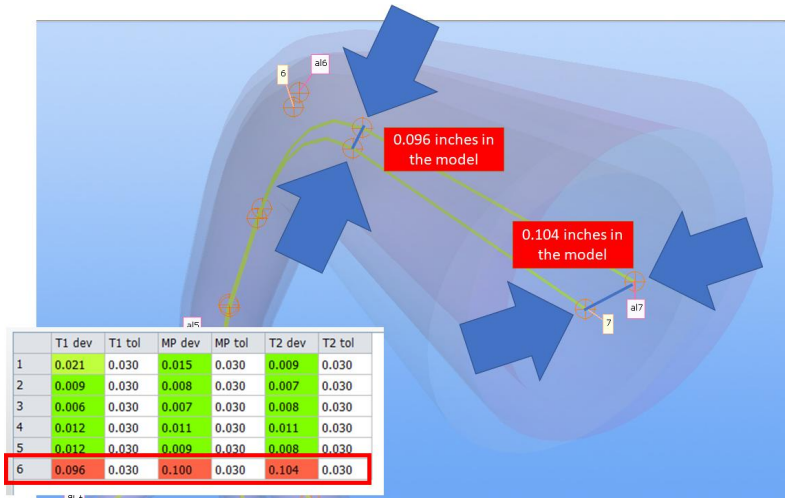


After the inspection is complete, VTube-LASER creates solid model images that are designed to clearly show you where the tube passes or fails the tolerance envelope. In this image, it is easy to see that the measured-aligned tube (the pink tube) is too long because it moves far past the end length tolerance envelope - which has turned bright yellow because the measured tube is outside the envelope.



You can see exactly how far it exceeds the tolerance by looking at the Inspection Results grids.

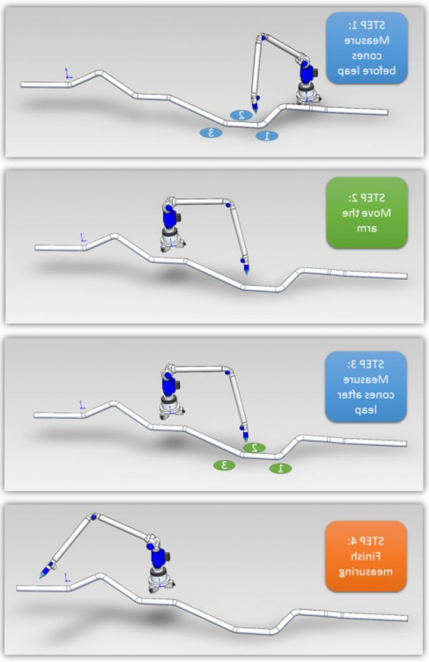
You can visualize any deviation by pressing Ctrl-T to toggle the model transparency and then zooming in on the area of interest.



ADVANTAGE 22 – ACCURATE MEASURE OF LONG TUBES

USES THE SUPER-ACCURATE LEAPFROG METHOD

VTube-LASER uses very accurate leapfrog technology. It is more accurate than the tube MOVE method typically used in other systems.



The LEAPFROG feature allows VTube-LASER to measure any length tube shape accurately by moving the arm around longer tubes and pipes.

This method of measuring tubes longer than the arm's reach is far more accurate than operations that use TUBE MOVES.

Leapfrog also works regardless of how long the preceding straight is. When other systems use a MOVE command, they require you to measure a preceding bend or two. VTube-LASER can measure even a straight tube with no bends that is longer than the arm reach with leapfrog.

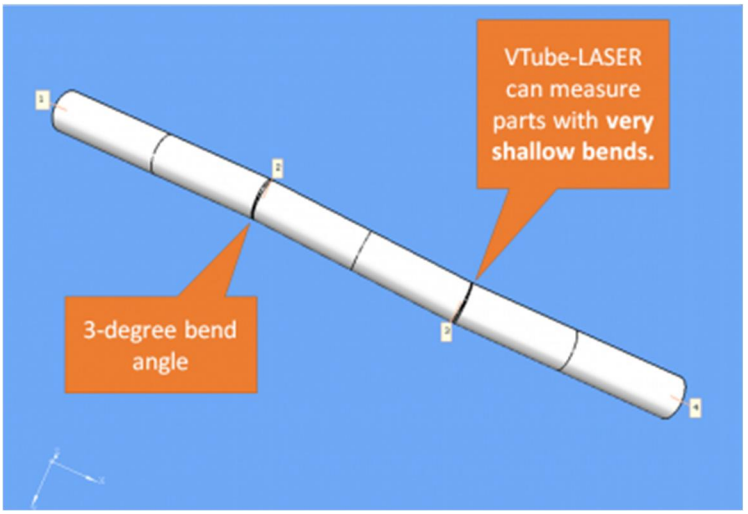
See VTube-LASER Leapfrog

Combine our TRAX rail system (shown on the right) with leapfrog technology to measure very long tubes.

ADVANTAGE 23 – MEASURES SMALL ANGLES

SMALL-ANGLED BEND MEASUREMENT IS POSSIBLE

VTube-LASER handles small-angled bends.

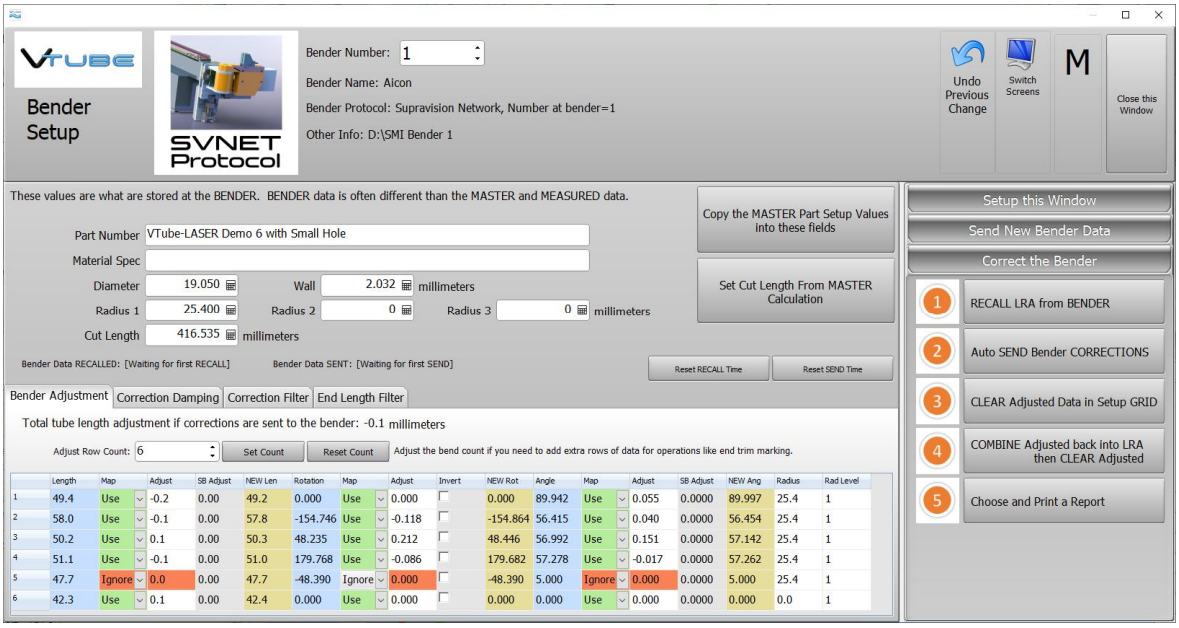


Unlike other systems, VTube-LASER can measure and align tubes with very small bend angles because…

1) VTube does not have a lower limit on the smallest bend angle allowed.

2) VTube has built-in intelligence to properly handle shallow bend tube alignment.

3) VTube allows operators to choose to ignore corrections on shallow bends in Bender Setup (see the image below).



	Length	Map	Adjust	SB Adjust	NEW Len	Rotation	Map	Adjust	Invert	NEW Rot	Angle	Map	Adjust	SB Adjust	NEW Ang	Radius	Rad Level
1	49.4	Use	-0.2	0.00	49.2	0.000	Use	0.000		0.000	89.942	Use	0.055	0.0000	89.997	25.4	1
2	58.0	Use	-0.1	0.00	57.8	-154.746	Use	-0.118		-154.864	56.415	Use	0.040	0.0000	56.454	25.4	1
3	50.2	Use	0.1	0.00	50.3	48.235	Use	0.212		48.446	56.992	Use	0.151	0.0000	57.142	25.4	1
4	51.1	Use	-0.1	0.00	51.0	179.768	Use	-0.086		179.682	57.278	Use	-0.017	0.0000	57.262	25.4	1
5	47.7	Ignore	0.0	0.00	47.7	-48.390	Ignore	0.000		-48.390	5.000	Ignore	0.000	0.0000	5.000	25.4	1
6	42.3	Use	0.1	0.00	42.4	0.000	Use	0.000		0.000	0.000	Use	0.000	0.0000	0.000	0.0	1

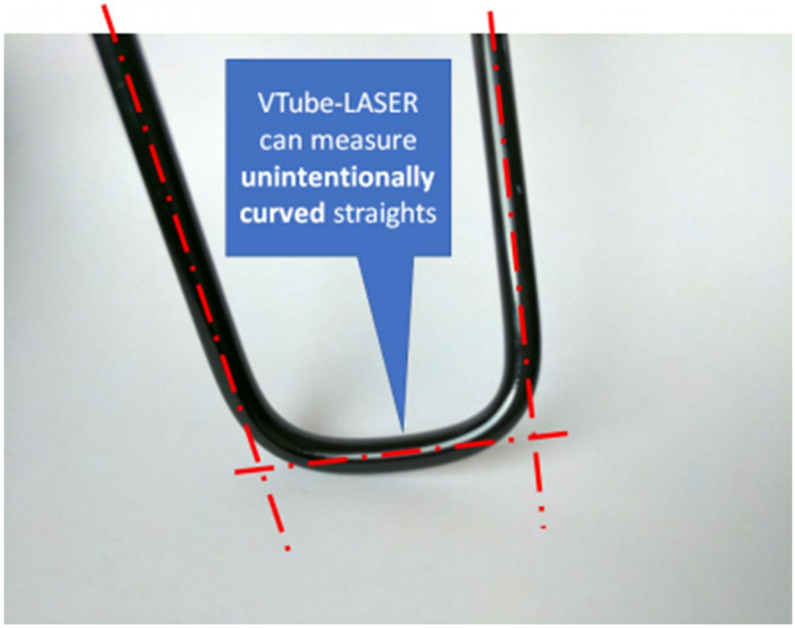
ADVANTAGE 24 – HANDLES IMPERFECT CURVED STRAIGHTS

THE ALTERNATIVE MULTISCAN ALLOWS OPERATORS TO MEASURE LESS THAN PERFECT STRAIGHTS

Only VTube-LASER can switch between UniScan and MultiScan modes to measure very curved/bowed straights when necessary.

VTube-LASER can measure curved straights using the **MultiScan** feature, then switch back to UniScan to measure straighter cylinders using a dense point cloud.

This gives operators the ability to choose the best type of scan depending on the current straight.



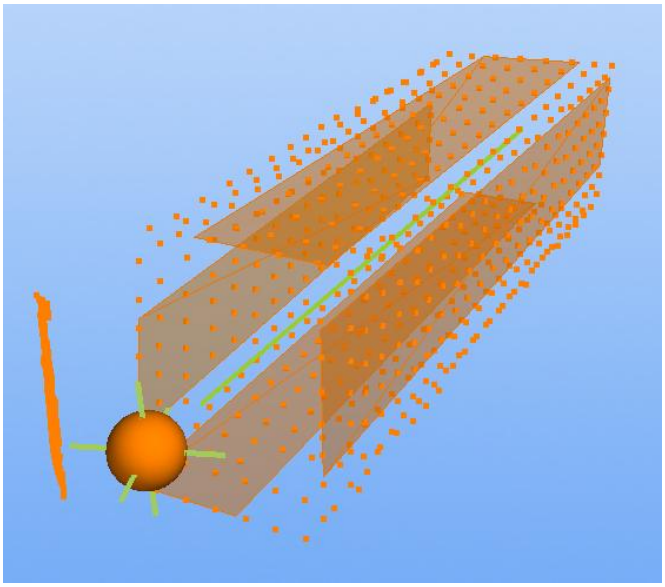
ADVANTAGE 25 – MEASURE SQUARE AND RECTANGULAR TUBES

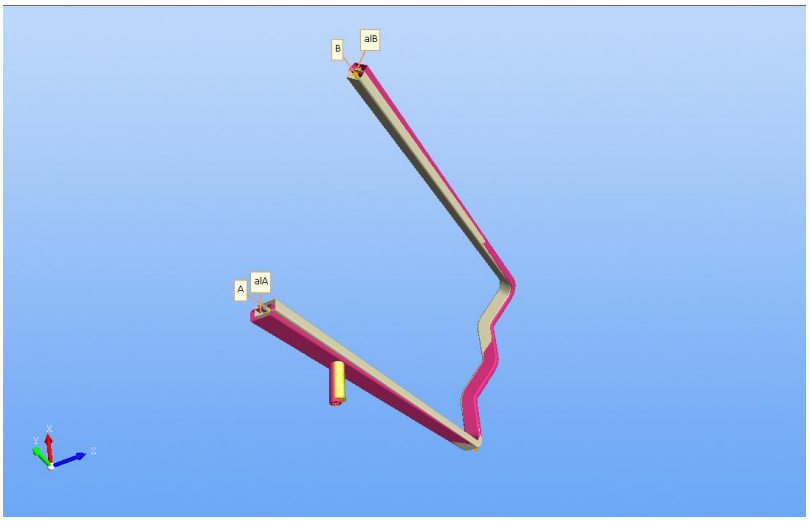
SCANS SQUARE AND RECTANGULAR TUBES WITHOUT ADAPTERS

VTube-LASER can measure square and rectangular tubes.

VTube-LASER can import and measure square and rectangular tubes with the ball probe or laser scanner.

Most other tube-measuring systems cannot measure square or rectangular tube without special adapters.





ADVANTAGE 25 – END TRIM PROFILE MEASURE

MEASURE END GD&T PERPENDICULARITY

We invented this feature in 2021.

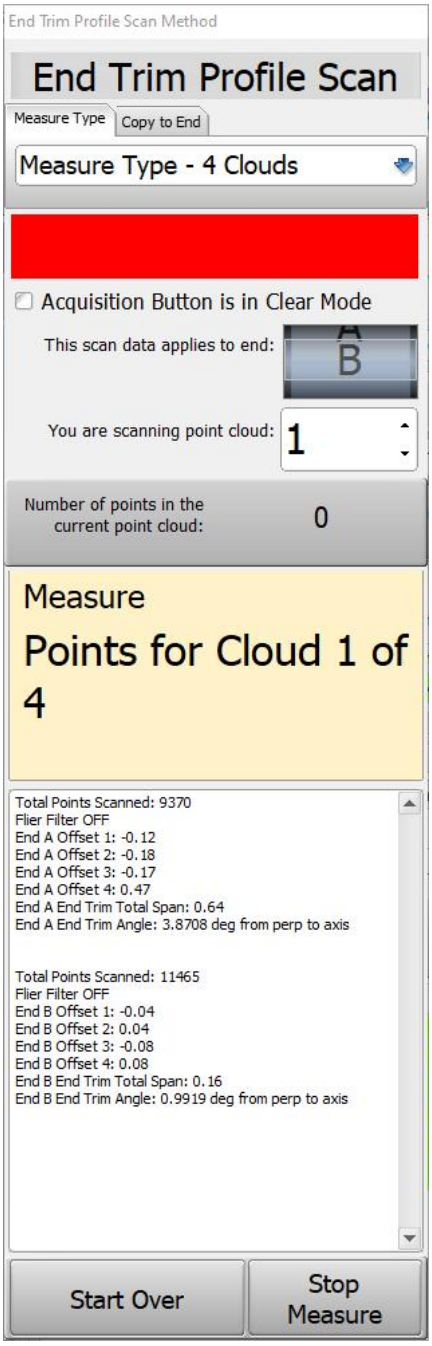
Only VTube-LASER uses this method to qualify the end plane of tube shapes.

VTube-LASER allows you to scan the end of a tube in groups of scan clouds in order to calculate the perpendicularity of the end cuts. First, measure the tube to get its orientation in space. Then use this scan to capture scanned clouds around the end of the tube.

In this example, we measured four quadrants of the end of the tube to calculate the "**Total Span**" value – which is identical to **GD&T perpendicularity**.

In the example on the right, End A has a perpendicularity of 0.64 mm (see the Total Span value in the top group of numbers).

End B has a perpendicularity of 0.16 mm.

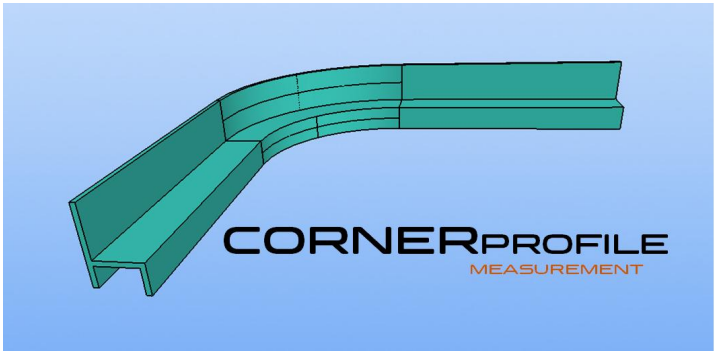


ADVANTAGE 26 – MEASURE CORNER PROFILES

SCANS SQUARE AND RECTANGULAR PROFILES

We invented this in 2019.

Only VTube-LASER can measure square profiles to find corner centerlines.



VTube-LASER can import and measure extruded corner shapes like the one shown in the image.

Most other tube-measuring systems cannot measure square or rectangular corner profiles without special adapters.

TARGET MARKET AND JUSTIFICATION

- VTube-LASER is for any customer that measures and qualifies tube shapes for CNC Bender correction.
- This is true even if the customer already uses a generic software solution like POLYWORKS or GEOMAGIC. Customers that use these packages always prefer to measure tube shapes in VTube-LASER because VTube-LASER is much easier to use for measuring tube shapes.
- Adding VTube-LASER to existing customer scanning systems is cost-effective because customers do not have to purchase new systems for VTube-LASER.
- VTube-LASER is still one of the least-expensive licenses on the market compared to other solutions.
- VTube-LASER uses the same laser scan technology that can be used to scan anything else too. Just add the appropriate software to the system, then start scanning any shape.
- If the customer uses tube bending machines, then VTube-LASER is easy to justify because it can correct bending machine programs quickly and accurately. VTube-LASER saves hours per setup for each new part. One customer reported to us that they reduced their setup scrap rate by 95% with VTube-LASER.
- Unlike other tube measuring systems, VTube-LASER allows you to connect to up to 100 benders without additional charge per bender. (Some benders require extra costs like electronics and external transfer programs we call Benderlink. But when the protocol is embedded in VTube – we do not charge extra to activate them.)
- VTube-LASER can support any language in the user interface. It comes with English, Chinese, Japanese, German, Spanish, and French translations. The languages are stored in standard Microsoft Excel files. Anyone can easily edit them.

SOFTWARE MAINTENANCE AGREEMENT (SMA) SUPPORT

- Every new license that is purchased with on-site training includes one year of free updates with our SMA if training is purchased.
- Every new license that is purchased with on-site training includes one year of technical support by telephone, email, and/or remote internet connection with an active SMA.
- Every customer with an active SMA has direct access to the VTube-LASER software developers and engineers. We do not hide them from customers.
- An SMA can be renewed annually for 20% of the current license price of VTube-LASER.
- We never require SMA renewal. The license purchased is good forever.