LASER MEASUREMENT

ALLIANCE SUPPLIES SDN.BHD. T: +6 06 3338889/ 8887/ 8898 F: +6 063338899 Email: info@alliance-supplies.com

LASER MEASUREMENT

Profile360 is an in-line, real-time, non-contact measurement system for continuously monitoring key profile dimensions in complex shapes such as rubber, ceramic, plastic, and wood-plastic composite extrusions, roll-formed metal profiles, and profiled wire. Profile360 employs CrossCheck Line Laser Sensors to digitize the profile, compare it to a CAD template, and continuously monitor key dimensions. Dimension changes often indicate a change in material, equipment, or process, resulting in poor quality or high scrap or reclaim cost.

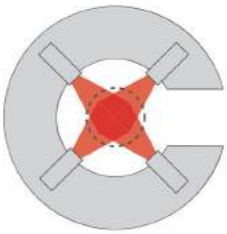
Profile360 continuously monitors the size and shape of complex profiles in order to assure quality and avoid the high cost of defects. The system acquires thousands of data points around the profile and matches them to a CAD template, where key measurement parameters such as width, thickness, gap, radius, and angle are extracted. Measurement parameters are compared to allowable control limits and displayed on the operator's terminal with a pass/caution/fail status indicator. Profile360 runs at rates up to 14 profiles per second. The system is available in standard sizes and can be custom-built for almost any size and shape.

IN-LINE MONITORING IS DISPLACING OFF-LINE CHECKING METHODS:

- Alarms immediately when the dimensions change so that operators can intervene to correct the process, resulting in improved quality, improved production yield, and reduced cost of scrap and rework
- Provides instant measurements, so the operator can immediately see the results of all line adjustments
- Provides 100% inspection of the entire run compared to periodic off-line checking, which can miss many disturbances
- Used by many to decrease start-up time, resulting in higher production yield and lower scrap cost

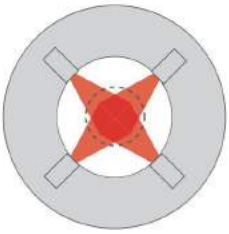
THE PROFILE360

Unlike oscillating measurement systems, Profile360 has no moving parts – no slides, motors, controllers, or encoders to require maintenance and calibration. The system is sealed and temperature controlled to assure a constant internal temperature. This results in a greatly reduced thermal drift for the system and assures a long laser diode life, even in tough environments.



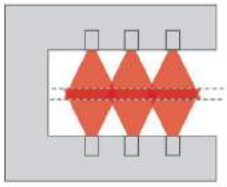
C-Frame Systems

- Available in 10, 25, 50, 75, and 100mm diameter fields-of-view
- Available in 2, 3, 4, 5, or 6 sensor configurations
- Available with the Industrial Mobility Package, including a lift cart, junction box, panel PC, and alarm tower assembled into an "all-in-one" package
- An alarm beacon signals when control limits are exceeded



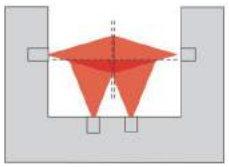
O-Frame Systems

- Available in 150mm diameter field-of-view
- Available in 2, 3, 4, 5, 6, 7, or 8 sensor configurations
- Available with the Industrial Mobility Package



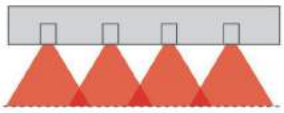
Two-Sided Systems

- Available using any sensor size, in overlapping and non-overlapping sensor orientations



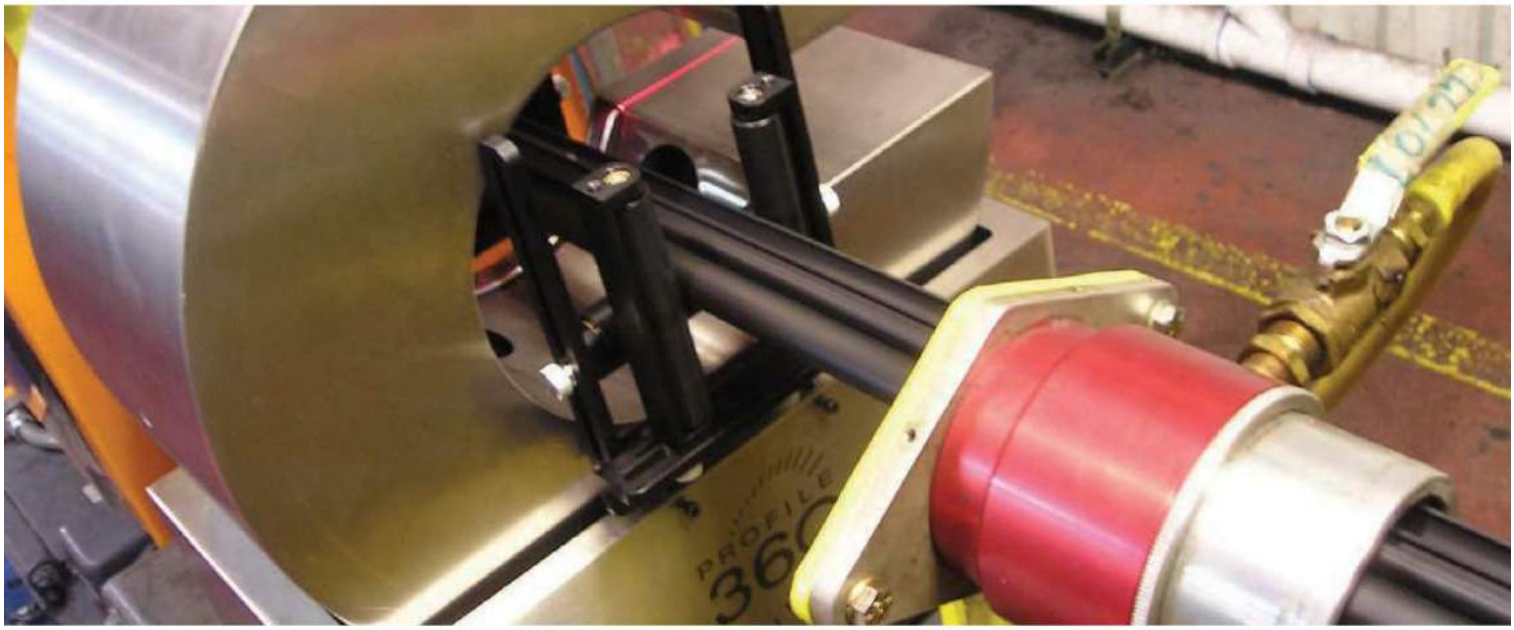
Three-Sided Systems

- Available using any size sensor, in overlapping and non-overlapping sensor orientations



Single-Sided Systems

- Available using any sensor size, in overlapping and non-overlapping sensor orientations



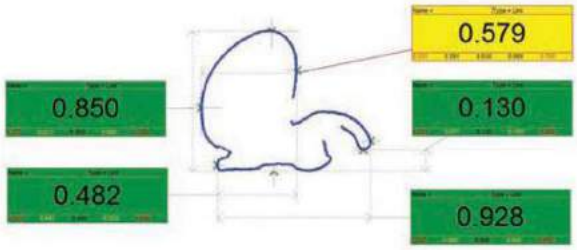
AUTO SEALS

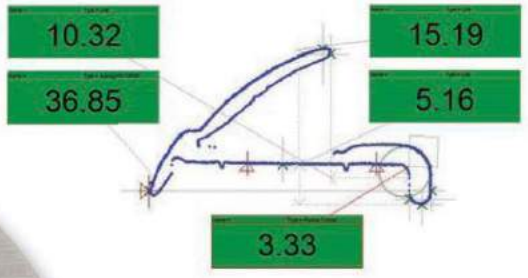
When auto sealing extrusion lines go out of specification, they produce about $1,400 per hour in scrap. The scrap is not recyclable because the rubber is vulcanized, and often is cured over metal reinforcement. The result is a loss in raw materials, labor, energy, landfill cost, and production time.

Profile360 alarms any time dimensions change so the operator can act to correct the process, save scrap, and improve production. The Profile360 investment payback period is achieved in only 32 hours of scrap savings. If you can avoid 1 hour's worth of scrap per week, your Profile360 investment is realized in 32 weeks.

Savings with Profile360*		
Compound Cost	2.97	$/kg
Profile Weight	0.37	kg/m
Line Speed	21.3	m/min
Compound Cost/hr	1,404	$/hr
Profile360 Investment	45,000	$
Payback Period	32	hrs

* If you can reduce scrap by 1 hour per week, you can achieve a payback in 32 weeks based on raw materials cost avoidance alone, not to mention the cost of customer returns.





PVC Extrusion

PVC profiles can distort during calibration and cooling, resulting in non-usable profiles.

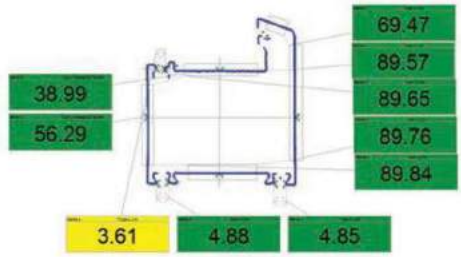
In-line checking with Profile360 assures that the operator will be alerted any time there is a change in size, shape, or squareness. This helps reduce the time and cost of rework and improves yield.

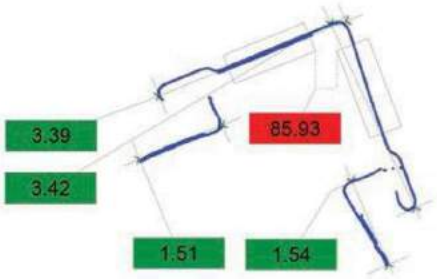
Since Profile360 provides real-time measurement, there is no need to cut samples, de-burr the cut edges, and walk to a central off-line inspection station in order to check dimensions. Profile360 greatly reduces the cost of dimension checking, and provides a much faster result.

Which of These is the Most Efficient Way to Start Up Your Extrusion Line?	
Profile360	**Off Line Methods**
View Real-Time Profile Dimensions In-Line	Cut Part
Adjust Extruder Immediately	Walk to Metrology Lab
Allow Adjustment to Stabilize and Pass Through Profile360	Cut Sliver
Repeat	Clean and Prep Sliver
Time Required: 5 min per adjustment	Put Sliver in Queue for Measurement
	Upload File/Find Mylar Place Sample On Scanner/10x
	Complete Measurement Routine
	Print Report
	File Report
	Walk Back to Extruder
	Adjust Extruder
	Wait for Adjustment to Stabilize
	Repeat Entire Process
	Time Required: 30 to 60 min per adjustment

Features

- Monitor angles, squareness, gaps, grooves, and other key dimensions in real-time with on-screen optical comparator and trend graph displays
- Alarm immediately when any dimensions change
- View real-time profile geometry from any PC on your network
- Report complete dimensional statistics for each run
- Available with industrial mobility package

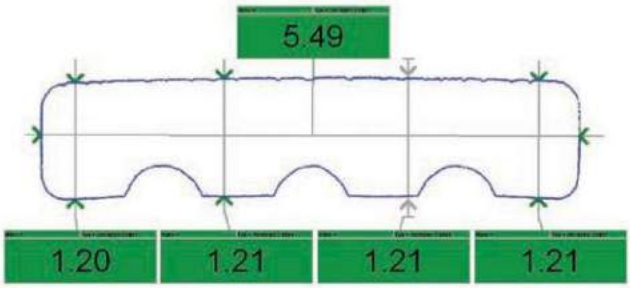


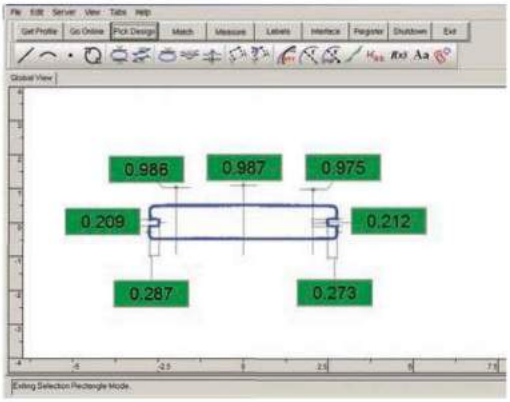


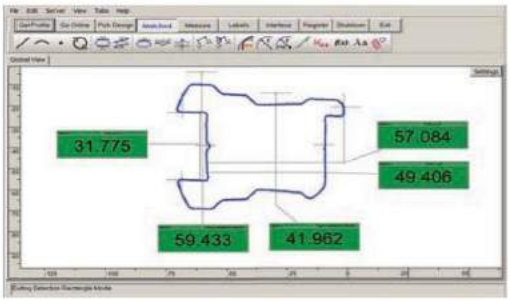
WOOD-PLASTIC COMPOSITE

Wood-plastic composites have variations in raw material properties, humidity, and barrel temperature, and these variations can result in profiles that swell or sag, resulting in defective boards. Profile360 is employed to continuously monitor profiles coming out of the die to assure the process is under control and the size and shape is correct. Profile360 can measure boards to the lower end of the allowable tolerance range in order to reduce the raw material cost per board, resulting in payback within 100 days.

Cost Savings	
Nominal Board Size	5.5in²
Target Area Reduction	.1in² (1.8%)
Material Cost	$.60/lb
Density	.04lb/in³
Line Speed	144in/min
Target Savings	14.4in³/min
Cost Savings	$477/day
Payback Period	100 days

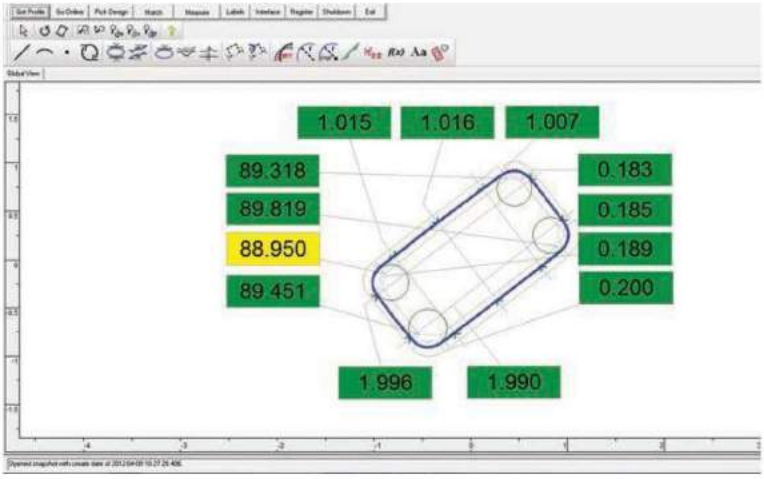






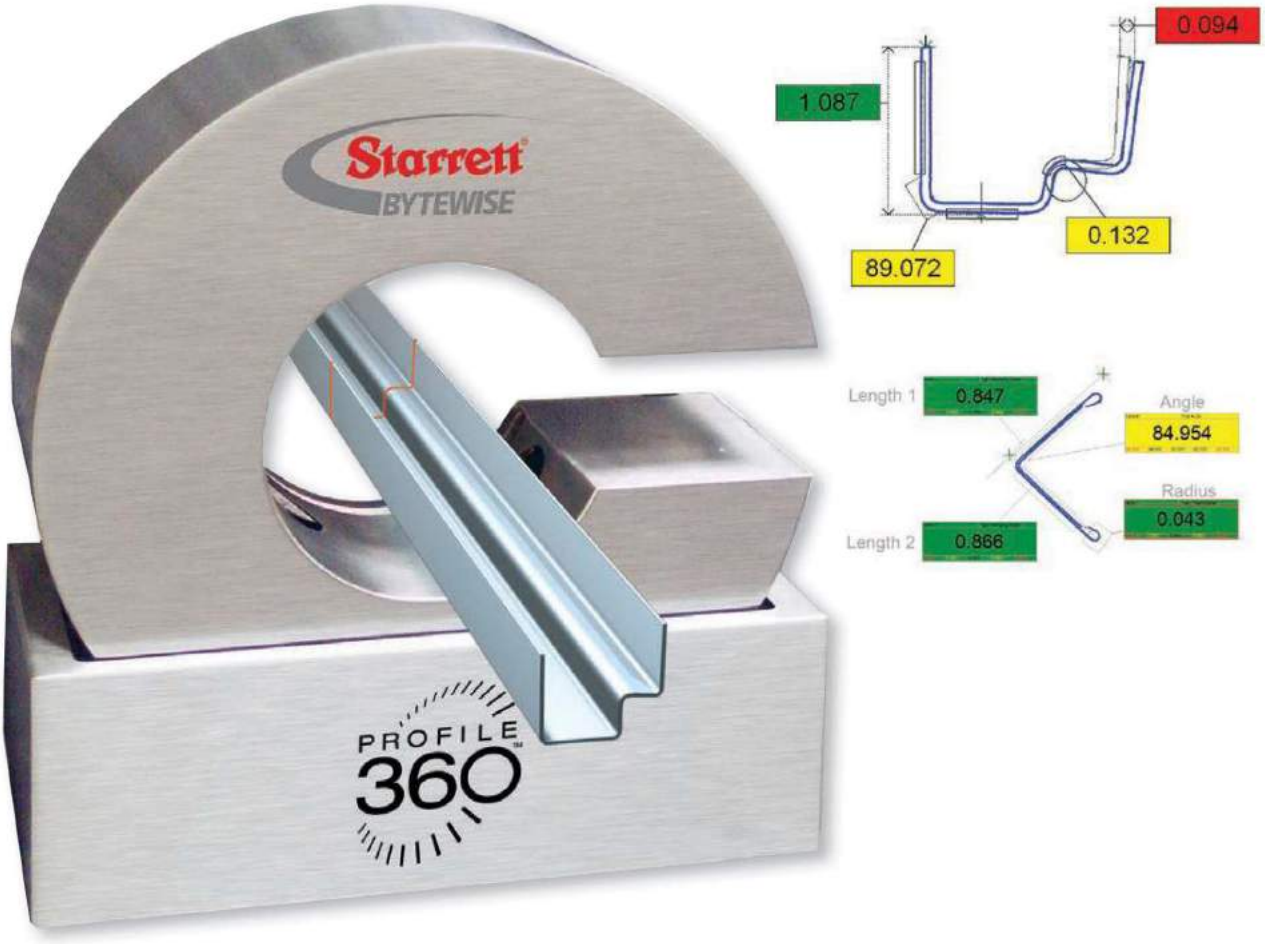
METAL PROFILES

Roll-formed profiles often go out of specification during a run because the incoming coils have lot-to-lot variations in width, thickness, crown, camber, and physical properties. Requiring the setup technician to adjust for the material changes. Pending manual inspection, to isolate the out-of-specification material, a long run can produce materials not to specification.



PROFILE360 ADVANTAGES

- Quickly validate the roll stand setup
- Make progressively small roll adjustments and immediately see the result
- Decrease the set-up time by eliminating off-line checking process
- Assist in reducing the time required to reach stability
- Continuously monitor the dimensional quality of any profile, and alarm the operator when any problem occurs
- Produce data histories that can be used to compare any run with its historical performance
- Quantify quality improvement initiatives
- Assist tooling development
- Export DXF point files that can be opened in the die design CAD application and compared to the intended design



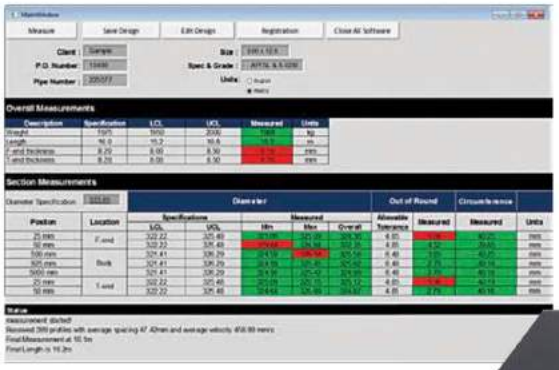
PIPE AND TUBE

The system in final inspection produces an automated dimensional inspection report for the OD and OOR of the pipe ends and body to assure compliance with API and other standards. When installed prior to cutting, the measurements can be used to fine-tune the tooling during a set up change, and then alarm whenever OD or OOR values approach the allowable limits so that an operator can intervene before a quality fault occurs.

Sensors are mounted on a precision space-frame and aligned via patented software techniques. Data sets from each sensor are internally transformed into a global coordinate system to render the complete cross-sectional profile image. Software measurement tools can be configured to display and record up to 180 OD values, one per degree, as well as maximum and minimum OD and OOR for the pipe ends and body.

FEATURES

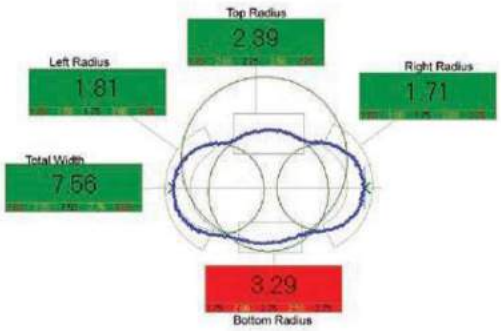
- Reliable due to its simple design
- Automatically measures pipe OD and OOR from 6" up to 24" (150 to 600mm) at two locations: in-line before cutting, and in final inspection
- Utilizes CrossCheck™ Line-Laser Sensors to achieve the range and accuracy required for pipe mills
- A single measurement cycle instantaneously acquires about 5,000 data points (for a 24" pipe) in a precise cross-sectional plane in 1 millisecond

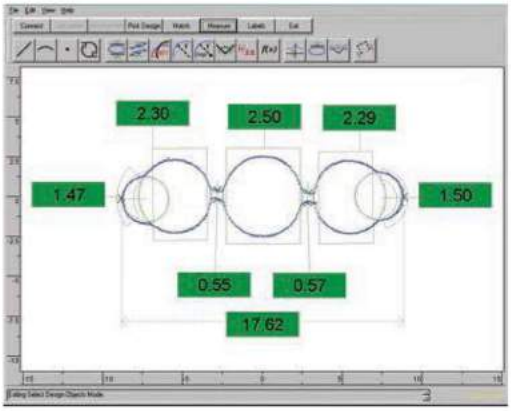


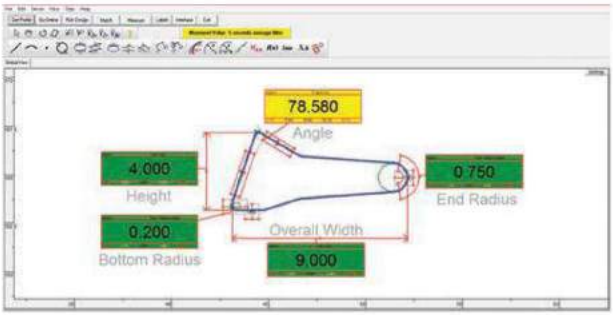
WIRE AND CABLE

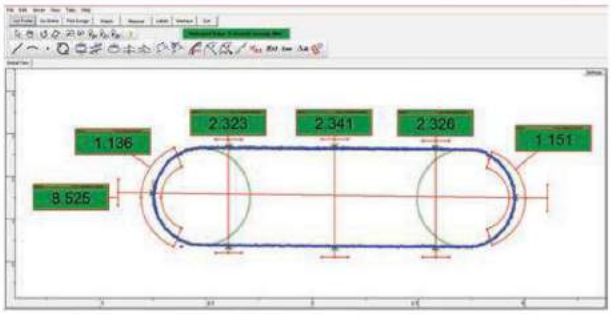
Multi-conductor cables, sub-sea cables, and fiber optic cables rely on the cover extrusion to isolate the conductors from the environment to assure safe and reliable power and data transmission. Profile360 is employed on the line for 100% inspection of the cover geometry.

Profile360 is also used to monitor shaped wire profiles such as magnet wire for size and shape uniformity.









SPECIFICATIONS AND ACCESSORIES

Field of View (FoV) Diameter											
		Inches					Millimeters				
	All[2]	1	2	3	4	6	25	50	75	100	150
Repeatability[1]	0.03% FoV	0.0003"	0.0006"	0.0009"	0.0012"	0.0018"	0.0075mm	0.0150mm	0.0225mm	0.0300mm	0.0450mm
Accuracy[1]	0.06% FoV	0.0006"	0.0012"	0.0018"	0.0024"	0.0036"	0.015mm	0.030mm	0.045mm	0.060mm	0.090mm

Specifications	
Measurement Rate	Selectable up to 14 profiles/second
Communication Interface	Analog and Digital Outputs; Ethernet
Run Modes	Clock Frequency or Encoder
Data Output	Modbus TCP or OPC Server native; conversion to other platforms available
Operating Temperature	32 to 113 °F (0 to 45 °C); cooling systems available
Profile360 conforms to the Machinery Safety, Electromagnetic Compatibility, and Low Voltage directives of the EC	
Laser safety class by the CDRH standard is Class 3A, and the IEC 60825-1 classification is Class 3R	

1. Repeatability is representative of the system's ability to monitor process variation. It is expressed as the three-sigma standard deviation in a series of measurements of a known gage block. Accuracy is representative of the system's error in measuring a known value. It is expressed as the Bias in a series of measurements of a certified gage block. Repeatability and Accuracy are based on 2012 standardized test procedure. Field results may be better or worse depending on caliper type, size and placement.

   2012 Test Procedure includes thickness measurements of an independently certified test block. 20 measurements are taken at each of 10 different locations throughout the system field of view. Repeatability (3σ) and Accuracy (bias) are calculated at each position. The Repeatability and Accuracy at each of the 10 positions must be less than the specification.

2. All measurements are taken at one update per second.

INDUSTRIAL MOBILITY PACKAGE

The Profile360 Industrial Mobility Package has been employed by large extrusion operations during line set-up so that one unit can serve multiple lines. The in-line measurement provides instant information to help the operator tune-in the extruder, calibrator, and down-stream equipment, and to assure all dimensions are stable before moving on to the next line.

Industrial Mobility Package with C-Frame System

SOFTWARE

PROFILE360 SOFTWARE PROVIDES:

- Test plan management for all profile designs
- Matching and comparison of measured profile to a CAD template
- Caliper-based utilities to program each profile design for specific measurements
- Display of all real-time measurement data
- Display of trend data
- Data logging for all measurement results
- Standard report printing
- Installation of software on any network PC and connection to the instrument to view real-time data

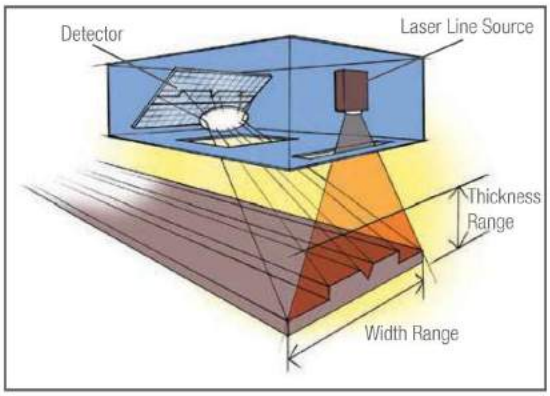
Software Features			
Data Matching	Match profile to CAD template	**Calipers**	Averaging caliper
	Anchor profile to multiple datums		Half caliper
	Match to user-defined sub-regions		Integrating caliper
	Match multiple profiles independently		Bump caliper
Display	Measured values with pass/fail/warning status		Area caliper
	Error values		Link multiple calipers
	Cp and Cpk		Link to fixed position
	Standard deviation		Radius and XY centerpoint
	Trend charts		Line regression fit
	Histograms		Formula caliper
	Optical comparator		Angle caliper
	Error vectors		
	Mean over a user-defined time period		
	Display actual profile		
	Display thickness profile	**Alignment Check**	Automatic software alignment
Report Writer	Print trend graph	**Data Logging**	Log caliper values to history file
	Print histogram		Save point cloud to .txt
	Print exceptions		Save snapshots to history file

TIRE INDUSTRY

GUIDE TO TECHNOLOGY

At Starrett-Bytewise, we employ three types of sensor technologies: fixed point laser, displacement sensors, CrossCheck low-speed laser line sensors, and CrossCheckHD high-speed laser line sensors. All laser line sensors are designed and built by Starrett-Bytewise.

CrossCheck Sensors project a laser line across a profile, digitize the image, and transform the image into a geometric coordinate system. Multi-sensor systems acquire thousands of data points around the profile and match them to a CAD template, where key measurement parameters are extracted.



Component Preparation		
Tread and Sidewall Extrusion	**Calendar**	**Apex Extrusion**
On-Line Profilometer	Gum Calendar Monitor	Profile360 On-Line Profile Measurement System
Off-Line Profilometer	Overlapping Ply Splice Monitor	
Off-Line Profilometer SL	CrossCheck Width	
Tire Building		
Carcass Drum	**Belt/Tread Drum**	**Shaping Drum**
Overlapping Inner Liner and Body Ply Splice Monitor	CrossCheck Belt Edge and Dog-Ear Splice Monitor	GTU Radial Runout and Lateral Runout Monitor
GTU Diagnostic System	GTU Diagnostic System	GTU Diagnostic System
Tire Development & Testing		
Tread Wear	**Tire Profile**	**Sidewall Profile**
CTWIST - Circumferential Tread Wear Imaging System	Bead-to-Bead Tire Profile Measurement System	CrossCheck Laser Line Sensor

CROSSCHECK SPECIAL APPLICATIONS

Easy to use CrossCheck "shape tools" measure radius/diameter, height, width, angle, and location. Master Profile Comparison provides Pass/Fail testing for contours, and makes small variations easily visible. All for less than the price of a single point laser sensor. CrossCheck is ideal for OEMs who need a fully designed, calibrated, and environmentally sealed 3D laser machine vision solution.

- CrossCheck's affordability and simplicity bring profile measurement to the entire organization
- R&D: Reverse Engineering
- Engineering: Design Validation
- Production: Monitor and control
- Quality: Process Studies
- Maintenance: Set Up and Adjustment

Real Time Shape Measurements for	
Process Control	**Robotic Guidance**
Pultrusion	Weld Steam
Extrusion	Glue Bead
Calendering	Pick and Place
Roll Forming	Chassis Location
Part Inspection	**Shape Check**
Forging	Crimp Validation
Casting	Flush and Gap
Machining	Embossing Depth
Injection Molding	Blade and Vane Rework

On-Line Profilometer

Tread profile geometry has a strong influence on the cured tire uniformity. Treads that are non-symmetrical produce cured tires with uniformity and balance problems. Over-sized treads are a waste of materials. In order to assure the most precise tread and sidewall extrusion quality, tire makers worldwide have adopted the On-Line Profilometer (OLP) as their standard for extrusion monitoring. The On-Line Profilometer (OLP) provides automatic, high speed, non-contact measurement of tread and sidewall extrusions. OLP outperforms scanning systems by collecting an instantaneous cross-section profile rather than measuring in a zigzag pattern.

OLP can be installed after the die exit to monitor and alarm when key dimensions exceed the allowable tolerances. Dimension changes at the die often indicate changes in rubber visco-elastic properties or changes in the equipment set-up. When dimensions change, the operator is alerted to intervene. Early intervention can lead to faster startup, reduced rework, better production rates, and better tread uniformity.

OLP can also be installed after cooling to make 100% quality inspection of all treads before they are released to the tire building operation. This enables the QC organization to compare the current run to the historical standards, to pass or fail each run, and to maintain an audit trail for each lot.

Uses

- Use OLP at the die during the startup of any run to assist in reducing the time required to reach stability
- Use OLP at the die to continuously monitor the dimensional quality of any profile, and alarm the operator when any problem occurs
- Use OLP at the die to immediately recognize changes in die swell associated with batch change so that the operator can adjust the extruder settings
- Use OLP after cooling to produce data histories to compare any run with its historical performance and verify the effect of quality improvement initiatives
- Use OLP after cooling to check for die wear
- Use OLP data alongside other process data such as material theology, extruder die head pressure, screw RPM, screw power, and various temperatures to develop better knowledge of the complex interactions between materials, process set-points, and profile geometry

High-Resolution System OLP-HR with Operator's Terminal and Extend/Retract Slide

Specifications

	Measurement Range Inches				Millimeters			
	Thickness	Width			Thickness	Width		
	2.36"	11.81"	17.72"	23.62"	60	300mm	450mm	600mm
Absolute Accuracy[1]	.003"	.012"			±0.075mm	0.30mm		
Relative Accuracy[2]	.001"	.004"			0.0225mm	0.09mm		
Gage Repeatability[3]	.001" (0.025mm)							
Resolution[4]	.00004" (0.001mm)							
Measurement Rate	Selectable up to 7.5 profiles/second							
Outputs	Analog and Digital I/O; Ethernet (Modbus TCP, Text over TCP); tab-delimited .txt measure log							
Laser Classification	IIIa CDRH, 3R IEC							

1. Absolute Accuracy: The average error of all dimensions of a certified gage block using the mean of 75 consecutive measurements. Error is defined as the difference between the OLP measured value and the certified target value.
2. Relative Accuracy: The maximum amount of error present when comparing successive measurements of a target with changing dimensions and located at a fixed position within the field of view (This also can be considered as "accuracy in measuring product variation.").
3. Gage Repeatability: An offline assessment calculating the standard deviation of the thickness of a certified gage block over 75 measurements.
4. Resolution: The smallest meaningful unit of measurement that is reported by the system.

Off-Line Profilometer

Tread and sidewall extrusions can be no more precise than the dies used to make them. When a new die is cut it should be well-centered, so the Operator has the flexibility to optimize the extruder set-up. After some time in service, die wear can be uneven so that certain areas along the profile get excessive rubber flow. This is a very costly waste of raw materials. Unbalanced flow can also disrupt the symmetry of the tread - a factor that influences cured tire uniformity and balance.

The Profilometer was developed as an automated, non-contact measurement system to displace checking with hand tools. The Profilometer is used to verify the accuracy of newly-cut dies. Its accuracy and speed helps reduce the number of die trials needed to approve a new die for production. Once in production, the Profilometer is used to check each run for overall quality, and to monitor for die wear.

Specifications

Measurement Parameter	Car Tire Model	Truck Tire Model
Thickness Measurement Range	30mm	60mm
Width Measurement Range	600mm	900mm
Gage Repeatability on Flat Surfaces	<0.0125mm	<0.025mm
Gage Accuracy on Flat Surface	<0.060mm	<0.060mm
Area Calculation Repeatability	<.25%	<.25%
Area Calculation Accuracy	<.25%	<.25%
Sample Interval (Width Resolution)	0.1mm	0.1mm
Measurement Spot Size	0.3mm	0.3mm
Dimensions (W x D x H)	1225 x 775 x 1400mm	1524 x 775 x 1400mm

Features and Specifications

- Visual display overlays the measurement onto the specified design
- Point and gage analysis measures the thickness and width of each breakpoint
- Conicity analysis compares the right and lef extrusion halves
- Regional analysis reports the area and center o gravity for each region
- Statistical analysis allows export of data fo analysis in spreadsheet applications
- Experienced users report that fewer die trials are needed, conserving time and raw materials
- Dies can be designed to increasingly tighte tolerances for materials that are more difficult to extrude uniformly

Off-Line Profilometer SL

The Profilometer SL (PSL) combines the CrossCheck Line Laser Sensor technology with our proven Profilometer software platform to produce a low cost, reliable, and accurate tread and sidewall extrusion measurement system. PSL is an all-in-one package, with C-Frame, PC, and electronics combined into a mobile cart. PSL is non-contacting and has no moving parts, so reliability is uncommonly high. The measurement is instantaneous, so there is no waiting for results. With this new instant-scan capability and portability, geometry checks on tire components can be performed quickly at any location in the factory.

Specifications	
Measurement Parameter	
Thickness Measurement Range	60mm
Width Measurement Range	300mm (4 sensors) 450mm (6 sensors)
Gage Repeatability of Flat Surfaces	<0.025mm
Gage Accuracy on Flat Surfaces	0.075mm
Area Calculation Repeatability	<0.25%
Area Calculation Accuracy	<0.25%
Sample Interval (Width Resolution)	0.1mm
Scan Speed	Instantaneous
Dimensions (W x L x H)	77cm x 110cm x 104cm (excluding LCD monitor)
Laser Classification	IIIa CDRH, 3R IEC

Features and Specifications

- No moving parts
- Instantaneous cycle time
- Portable
- Visual display overlays the measurement onto the specified design
- Point and gauge analysis measures the thickness and width of each breakpoint
- Conicity analysis compares the right and left extrusion halves
- Regional analysis reports the area and center of gravity for each region
- Statistical analysis allows export of data for analysis in spreadsheet applications
- Experienced users report that fewer die trials are needed, conserving time and raw materials
- Dies can be designed to increasingly tighter tolerances for materials that are more difficult to extrude uniformly

PROFILE360 FOR APEX EXTRUSION

Profile360 is an in-line, real-time measurement system for continuously monitoring key profile dimensions in complex profile extrusions. Profile360 employs CrossCheck Line Laser Sensors manufactured by Starrett-Bytewise. These multi-sensor systems acquire thousands of data points around the profile and match them to a CAD template, where key measurement parameters such as width, thickness, radius, and angle are extracted. Measurement parameters are compared to allowable control limits and displayed on the operator's terminal with a green/yellow/red (pass/caution/fail) status indicator. Profile360 runs at rates up to 14 profiles per second.

Specifications	
Measurement Rate	Selectable up to 14 profiles/second
Communication Interface	Analog and Digital Outputs; Ethernet
Run Modes	Clock Frequency or Encoder
Data Output	Modbus TCP or OPC Server native; conversion to other platforms available
Operating Temperature	32 to 113 °F (0 to 45 °C); cooling systems available
Profile360 conforms to the Machinery Safety, Electromagnetic Compatibility, and Low Voltage directives of the EC	
Laser safety class by the CDRH standard is Class 3A, and the IEC 60825-1 classification is Class 3R	

PLY SPLICE MONITOR

The In-Line Splice Width Monitor enables continuous, real-time product and process quality feedback for both automatic and manual fabric ply splicing operations. This effectively minimizes finished tire sidewall bulges and depressions caused by out-of-tolerance splice widths created during material preparation.

Specifications	
Encoder Resolution	0.10mm (0.004")
Splice Width Accuracy	±0.15mm (0.006")
Splice Width Repeatability (1 Sigma)	0.15mm (0.006")

The above measurement specifications are based on material line speed of 1 meter/second (3 feet/second). A faster laser (32kHz sampling frequency) may be required if line speeds are much greater than 1m/second.

FEATURES

- High-speed, non-contact laser sensors.
- In-line configuration
- Splice width trend and variation analysis software.
- Multi-channel systems measure at several locations across the product width
- Enables repeatable detection of leading and trailing splice edges resulting in a more accurate splice width measurement
- Enables splice width to be measured without affecting cycle time
- Provides immediate product and process feedback
- Provides real-time data output to a PLC for automatic process control in automatic splicing operations
- Provides instant feedback to the operator of a manual splicing operation, thereby enabling immediate corrective actions to be made
- Enables width tolerances to be confidently reduced, eliminating heavy splices and saving material
- Improves splice width consistency across the entire product, minimizing open splices and improving tire radial uniformity

Green Tire Uniformity System

Tire building is the most complex operation in the tire factory. Multiple components are centered, applied, spliced, turned-up, inflated, and stitched. Component stock variations combine with machine variations to produce green tires with variations in radial runout, tread snaking, lateral runout, and splice quality. Green tires with the largest variations invariably produce tires with the worst cured tire uniformity and balance performance.

The Green Tire Uniformity System (GTU) utilizes the CrossCheckHD Line Laser Sensor to scan green tires at any stage of production. The GTU Software has a suite of viewing and analysis tools for assessing all aspects of the green tire uniformity. The system is available in either configuration - portable or fixed.

The portable tripod-mounted version can be moved from drum-to-drum, and from machine-to-machine. This provides a way to thoroughly study the carcass, belt/tread package, and final shaped green tire for radial and lateral runout, tread snaking, and splice quality. This can be used by the Set-Up Technician to verify the TBM set-up, and can be used by the Uniformity Engineer to troubleshoot tires with uniformity problems.

The fix-mounted version provides a means to perform 100% inspection at any drum for any parameter. This is useful for understanding the population characteristics of green tire runouts and to alarm when limits are exceeded.

Features

- Start scan from keyboard or relay contact
- Scan with encoder count
- Scan number of profiles
- Scan from encoder start/stop
- View runout color map
- View 3D image
- View circumferential or lateral waveform
- View harmonics
- Filter, rotate and crop data
- Radial and lateral runout caliper
- Tread splice caliper
- Width caliper
- Set pass/fail limits
- Subtract layers
- Export caliper waveform as .csv
- Export point cloud as .csv
- Portable system includes sensor, notebook PC, and carry case
- Fix-Mounted System includes sensor, PC, and PLC interface module

Radial Runout	0.23mm
Lateral Runout	0.42mm
Splice Bump	0.33mm

Specifications	
Input Voltage	110-240 VAC
Power Usage	50 W
Operating Temperature	32 - 104 °F (0 - 40 °C)
Sensor Sample Rate	700 Hz
Laser Classification	660 nm Wavelength; IIIa (CDRH); 3R (IEC)
Interfaces	Telnet PLC Input for Triggering Incremental Encoder Input

TREAD WEAR MEASUREMENT SYSTEM (CTWIST)

Tire designers are challenged to develop new tread patterns and compounds that deliver longer tread life and more uniform tread wear. Starrett-Bytewise partnered with Ford Motor Company and several leading OEM tire makers to develop CTWIST as a way to measure and characterize tread wear so the designers could better understand wear behavior. With the CTWIST process, new tires are scanned after break-in, then periodically scanned during the wear cycles. CTWIST predicts the tread life for each rib, and produces several tread wear reports to help the designer understand where improvements are needed.

CTWIST utilizes a non-contacting high-speed laser sensor to collect about 1,000,000 measuring points in less than 5 minutes.

FEATURES

- Tread Depth Profile Report shows the tread depth profile for each wear cycle
- Heel/Toe Wear Report shows the heel-toe wear profile across the tread
- Irregular Wear Report shows a 3D color map of the tread loss
- Tread Loss Report shows the tread loss profile across the tread
- Tread Life Mileage Projection shows the predicted tread life of each rib

System Specifications	
Typical Measurement Time	5 minutes
Measurement Technology	Scanned Laser Triangulation
Measurement Range	32mm
Laser Standoff	180mm
Measurement Spot Diameter	0.1mm
Laser Classification	Class IIIb Gallium Arsenide
Laser Resolution	< 0.008mm
Data Signal	Digital with Invalid Data Signal
Data Points per Scan Line	4096
Senor Frequency	16kHz
Encoder	= 16,000 PPR
Typical Data File Size	1Mb
Compatible Tire Radius Range	200 to 625mm
Compatible Tire Widths	Up to 400mm
Maximum Tire and Wheel Assembly Weight	100kg
Maximum Tire Rotation Speed	120RPM
Machine Dimensions (W x D x H)	1000mm x 1150mm x 900mm

BEAD-TO-BEAD PROFILE MEASUREMENT SYSTEM

Tire and mold designers are tasked with creating new tire designs that meet strict dimensional requirements when the tire is inflated. The inflated growth is predicted using powerful CAD modeling software. The inflated tire is traditionally measured with hand tools to check compliance to the design target. Checking with hand tools is time consuming, imprecise, and operator dependant.

The Starrett-Bytewise Bead-to-Bead Measurement System (B2B) is a non-contact scanning system that provides instantaneous acquisition for tire profiles from one bead to the other, across both sidewalls and the tread. Data is rendered in a visual display. Drag and drop caliper tools enable easy measurement. The CAD model can be imported into the Bead-to-Bead software so that the actual profile can be overlaid to the design. Data can be exported back to the CAD system for further analysis.

Bead-to-Bead can scan tires rotating at high speed to measure centrifugal growth and deformation.

FEATURES

- Acquires 4,000 or more data points per profile
- Acquires complete profiles in less than one second
- Profiles are rendered in a visual display and matched to a CAD template
- Profiles are analyzed with easy-to-use tools for section width, crown radius, and other parameters
- Data points are output in .dxf and .txt formats

Specifications	
Tire Size Capability	Various configurations to accommodate tire sizes ranging from passenger to truck and bus
Sensor Accuracy	0.15mm (based on standard sensors)
Measurement Accuracy*	0.15mm or 0.3mm
Triggering	Keyboard
Point Data Output Formats	DXF, TXT
Communication Interface	Digital and Analog I/O, Ethernet (Modbus TCP)
Laser Classification	IIIa

* Measurement accuracy will depend on whether the data required to complete the desired measurement comes from one or two sensors.