



Precision, Quality, Innovation

## MEASUREMENT SYSTEMS FOR THE TIRE INDUSTRY

### GREEN TIRE UNIFORMITY (GTU)

GEO-360

Off-Line Profilometer (OFLP)

Off-Line Profilometer SL (PSL)

Off-Line Profilometer 3D (3DP)

On-Line Profilometer (OLP)

Ply, Belt, and Extrusion Feature Tracker (FT)

Profile360 for Apex and Bead Measurement (P360)

Green Tire Uniformity Diagnostic System (GTU)

Green Tire Uniformity Integrated System (GTUint)

Bead-to-Bead Profile Measurement System (B2B)

Bead-to-Bead Tire Scanner (Tire360)

Circumferential Tread Wear System (CTWIST)



LASER MEASUREMENT  SOLUTIONS

# GREEN TIRE UNIFORMITY

## INSPECT GREEN!

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 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 two configurations - portable and fixed.

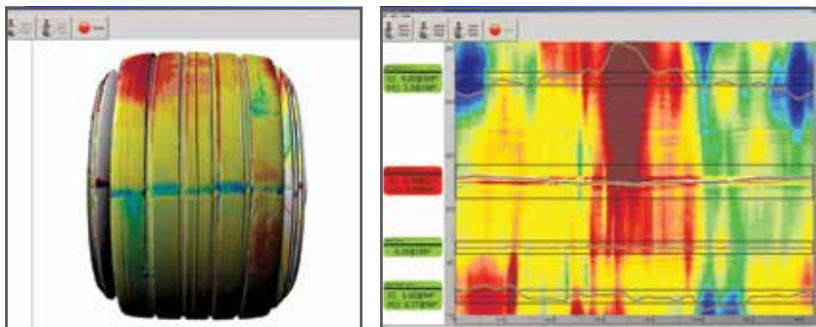
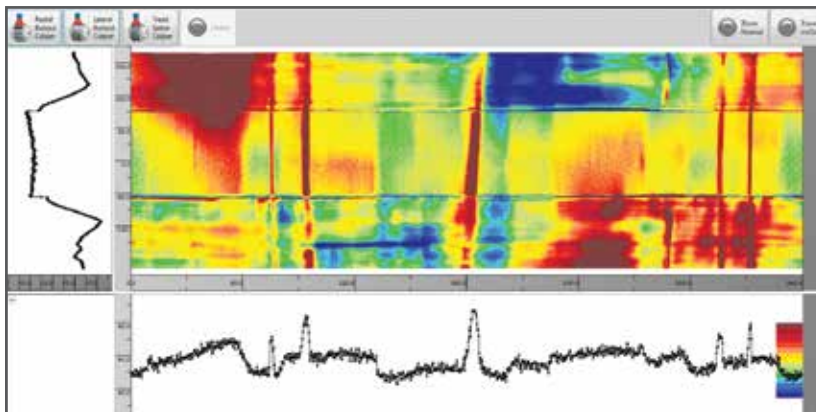
The portable tripod-mounted version can be moved from drum-to-drum, and from machine-to-machine. This provides a way to thoroughly study the carcass, belt/tread package, and final shaped green tire for radial and lateral runout, tread snaking, and splice quality. This can be used by the Set-Up Technician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

## SYSTEM CHARACTERISTICS

- Start scan from keyboard.
- Start scan from relay contact.
- Scan with encoder count.
- Scan number of profiles.
- Scan from encoder start/stop.
- View runout color map.
- View 3D image.
- View circumferential waveform.
- View lateral waveform.
- View harmonics.
- Filter data.
- Rotate data.
- Crop data.
- Radial runout caliper.
- Lateral runout caliper.
- Tread splice caliper.
- Width caliper.
- Circumference 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.

## DIAGNOSTIC SOFTWARE



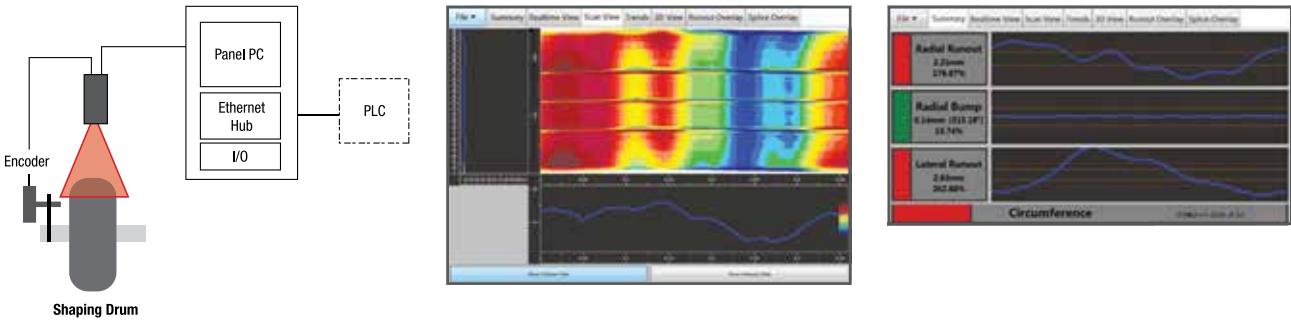
Analyze any scan for radial runout, lateral runout, and splice using convenient drag-and-drop tools. Display harmonic magnitudes and angles. Export in \*.csv format. Visually inspect the green tire using the 3D topography map.

### INTEGRATED SHAPING DRUM SYSTEM

Since RRO and LRO of the green tire have the strongest association with cured tire uniformity most agree that a check of the final shaped green tire provides the most comprehensive way to verify quality before sending the green tire to curing. This is done by integrating a single GTU sensor at the final shaping drum.

The parameters measured include LRO of the center groove, RRO, circumference and tread splice bulge. Runout values include harmonics and angles.

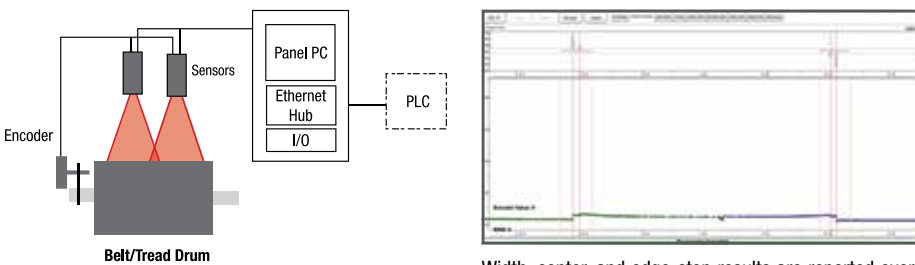
The software is optimized for a touchscreen operation. The Scan View tab shows a false-color map to display the runout topography. The bottom window displays the circumferential waveform and the left window displays the lateral waveform.



### INTEGRATED BELT/TREAD DRUM SYSTEM

The system checks for belt geometry conditions associated with cured-tire uniformity:

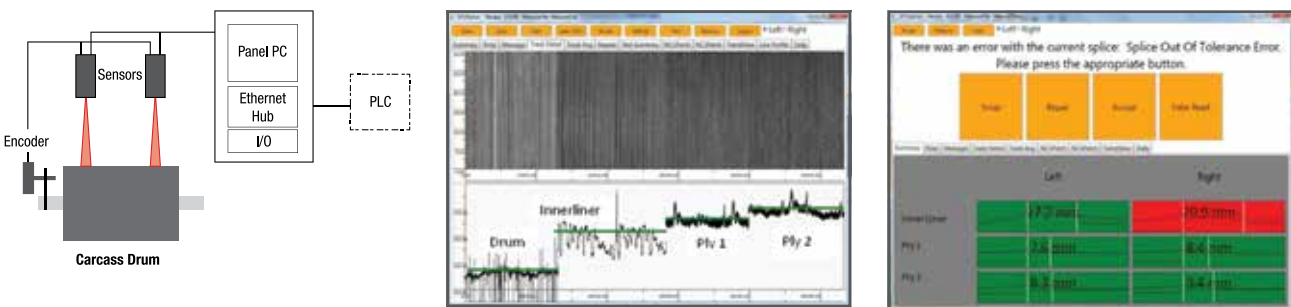
- Off-center and snaking belts are associated with conicity, LRO, LFV, and couple imbalance
- Dog-ear belt splices are associated with lateral effects
- Overlapping belt splices are associated with radial effects
- Belt 1 to belt 2 edge-step is associated with lateral effects
- Open belt splices risk failure after curing and inflation



Width, center, and edge-step results are reported every 45 degrees.

### INTEGRATED CARCASS DRUM SYSTEM

Overlapping carcass splices have strong associations with cured-tire RRO/RFV. The carcass system detects the leading edge and trailing of each component, associates each to an encoder tick, and calculates the splice overlap. The system also detects slipping of the plies on the inner liner and compensates the splice measurement. The reported measurement is right and left side splice overlap.



The software is optimized for a touchscreen operation. The screen above shows the progressive waveforms of the carcass layers.

Any time a parameter breaches a control limit a screen pops up so the operator can scrap, repair, or accept the tire.



## MEASUREMENT SYSTEMS FOR THE TIRE INDUSTRY



### CORPORATE HEADQUARTERS

Phone: (978) 249-3551 | Fax: (978) 249-8495  
121 Crescent Street-Athol, MA 01331-1915-USA

### STARRETT-BYTEWISE MEASUREMENT SYSTEMS

Phone: (706) 323-5142  
1245 Broadway, Columbus, GA 31901-USA  
sales.bythewise@starrett.com | service.bythewise@starrett.com



Follow us!

