

Precision, Quality, Innovation

MEASUREMENT SYSTEMS FOR THE TIRE INDUSTRY

TIRE360

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)



TIRE360

Tire360 is a 3D tire scanning system that digitizes the cured and inflated tire surface and presents the data as a large point-cloud file. The system utilizes CrossCheckHD™ sensors in a multi-sensor c-frame array. Tire360 is packaged as an off-line station that scans tires that have been pre-mounted on rims and inflated. The tire/rim assembly is manually mounted onto the spindle tooling. The machine rotates the spindle and scans the tire automatically. The measurement cycle is triggered by a keyboard command.

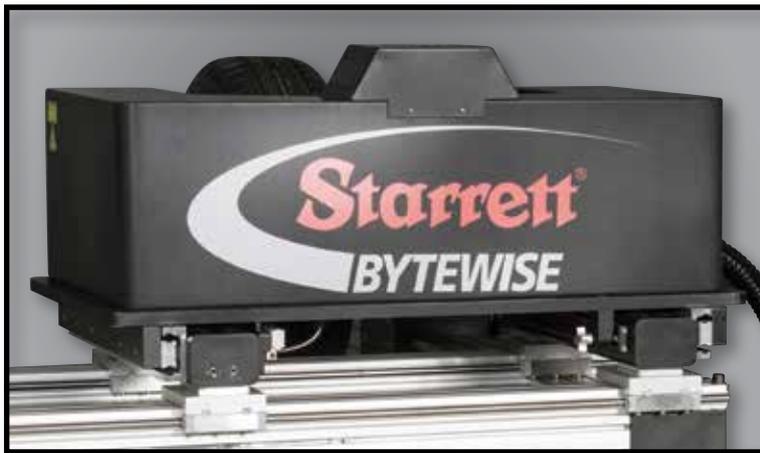
The measurement head is mounted on a two-stage slide with one radial axis radial and one lateral axis. Axes are manually positioned and lockable. The radial axis is encoded in order to capture the true radius and circumference.

Tire360 is a giant leap in cured tire surface digitization:

- It supports size and shape verification for the tire designer
- It supports competitive analysis programs
- It supports first article inspection on the shop floor for the factory QC team
- It produces a data set that be archived for quality recordation in a form that supports detailed inspection in the future
- It supports mold assembly verification
- It supports automated tread wear analysis for the tire test engineer
- It is a development platform that will eventually support automated tire surface flaw inspection in the tire factory

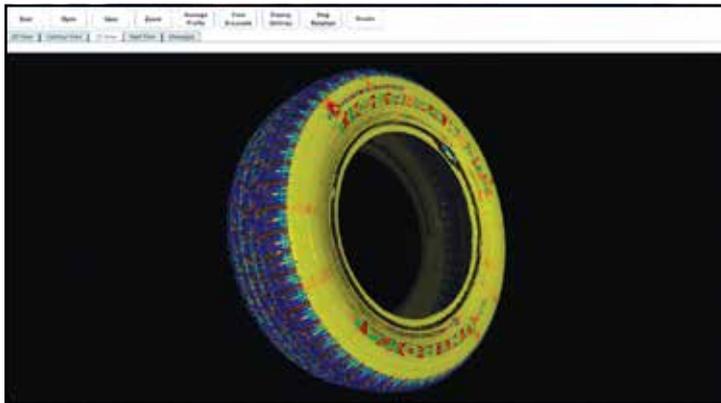
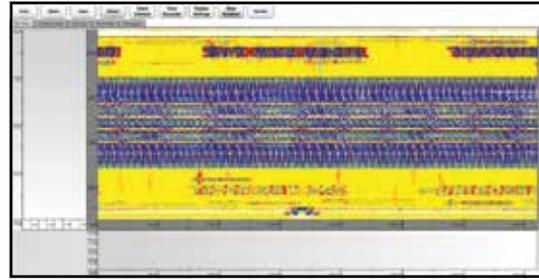
We are actively developing software tools on this platform, and seek customer feedback in order to prioritize our development program.

TIRE360



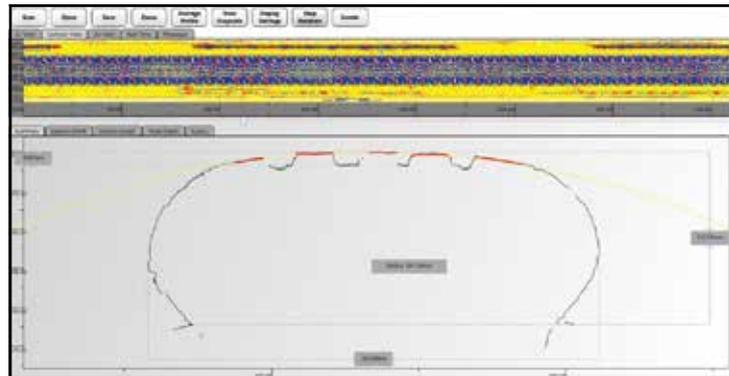
SOFTWARE

Tire360 software combines the individual sensor data sets into a single bead-to-bead point-data file for each scan, and combines the data sets into a 3D model by associating the profiles to the encoder. The data set is unfolded to visualize a 3D surface topography as a color map. This color map is normalized using a filtering tool-set to remove low-frequency runout. In the image seen on the right there are 16,000 columns and 7,500 rows of data. Each radial and lateral waveform can be displayed in the windows.



The 3D solid model can be rendered as and manipulated for pan, zoom, pitch, yaw, and rotation.

The Contour View permits the user to scroll across all 16,000 lateral profiles while applying tools for measuring section width, section height, tread depth, and tread radius. Each contour is characterized to visualize the road contact surfaces in red, groove bottoms in green, and all other surfaces in black.



USES

TIRE DEVELOPMENT - Tire manufacturers dedicate substantial effort in finite element modeling tires in order to design molds that produce tires that inflate to the intended design size and shape. Once the first tire is molded it is measured to see how close the "as-built" tire complies to the "as-designed" tire. Differences can be analyzed to improve the design process. Tire360 reduces the time required to measure a new tire from one day to one minute.

COMPETITIVE TIRE STUDIES - Tire manufacturing is a fiercely competitive business; and tire makers routinely buy competitors' tires in order to analyze materials, construction, dynamic properties, tread wear, styling, size and shape, and tread design. Tire360 makes it easy to scan any tire and export the model to the designer's CAD system to compare all aspects of the physical design.

FIRST ARTICLE VERIFICATION - Good quality management calls for inspection of the first tire molded after a mold change. Tire360 enables the user to scan the first tire and compare it to a design standard to verify the initial quality in a way that cannot be duplicated using manual and visual techniques. In addition, Tire360 captures a highly-resolute snapshot that can be archived by the QC organization so that it can be studied if needed in the future using whatever tools are suitable. This enables you to look back and take measurements that were not anticipated when the tire was first checked.

TIRE TESTING - Production tires can be scanned and automatically analyzed for test parameters like crown radius, section width, section height, circumference, and location and height of tread wear indicators.



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