Measurement Systems for the Tire Industry -
On-Line Profilometer (OLP)

Off-Line Profilometer
Off-Line Profilometer SL (PSL)
On-Line Profilometer (OLP)
Ply Splice Monitor
Ply, Belt, and Extrusion Width Monitor
Profile360 for Apex Extrusion
Green Tire Uniformity (GTU)
Circumferential Treadwear Imaging System (CTWIST)
Bead-to-Bead Profile Measurement System (B2B)
Tire Identification System
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 Starrett-Bytewise On-Line Profilometer (OLP) as their standard for extrusion monitoring. The Starrett-Bytewise On-Line Profilometer (OLP) provides automatic, high speed, non-contact measurement of tread and sidewall extrusions. OLP outperforms scanning systems by collecting 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.

**Applications**

- 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 changes 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 rheology, extruder die head pressure, screw RPM, screw power, and various temperatures to develop better knowledge as to the complex interactions between materials, process set-points, and profile geometry.
**Measurement Principle**

OLP uses Line Laser Sensors manufactured by Starrett-Bytewise.

**Features**

- Caliper-based utilities to program each profile design for specific measurements
- Recipe management for all profile designs
- Matching and comparison of measured profile to design template
- Display of all real-time measurement data
- Display of trend data
- Data logging for all measurement results
- Standard report printing

**High-Resolution OLP for Gum Calender Applications**

**Hardware Options**

- Operator’s terminal package
- Sensor cooling system
- Extend/retract slide
- Remote trigger package
- Analog output package
- KVM extender
- PLC bus protocol converter

Extend/retract slide

Operator’s Terminal

706-323-5142
<table>
<thead>
<tr>
<th>Specifications</th>
<th>Standard OLP Width (mm)</th>
<th>Thickness (mm)</th>
<th>High-Resolution OLP Width (mm)</th>
<th>Thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeatability¹</td>
<td>0.120mm</td>
<td>0.030mm</td>
<td>0.050mm</td>
<td>0.010mm</td>
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<tr>
<td>Accuracy¹</td>
<td>0.250mm</td>
<td>0.060mm</td>
<td>0.100mm</td>
<td>0.020mm</td>
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<tr>
<td>Measurement Rate</td>
<td>Selectable up to 14 profiles/second</td>
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<tr>
<td>Communication Interface</td>
<td>Analog &amp; Digital Outputs; Ethernet</td>
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<tr>
<td>Run Modes</td>
<td>Clock Frequency or Encoder</td>
<td></td>
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<tr>
<td>Data Output</td>
<td>Modbus TCP or OPC Server native; conversion to other platforms available</td>
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<tr>
<td>Operating Temperature</td>
<td>32 to 113°F (0 to 45°C); cooling systems are available</td>
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<tr>
<td>Profile360</td>
<td>conforms to the Machinery Safety, Electromagnetic Compatibility, and Low Voltage directives of the EC</td>
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</tbody>
</table>

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.

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