



# Higher Tire Grading Yields with TTOC Software Algorithms

Downgraded tires are a major source of lowered revenue for tire manufacturers. TTOC6 features two powerful algorithms that reduce the number of false rejects, resulting in improved yield.

Tires that do not meet first class Uniformity requirements represent a significant loss of revenue. Any tire that is downgraded during the uniformity measurement and grading process cannot be sold to meet premium customer specifications. Worse, if tires are graded to a scrap classification they must be disposed of in a manner that satisfies government regulations; a situation that adds further cost. Since every effort must be taken to increase overall yield, a tire uniformity machine that downgrades 'borderline' tires is costing the tire manufacturer money.

CTI, a Poling Group company, has developed and patented two powerful software algorithms and associated hardware to reduce the unnecessary downgrading of tires.

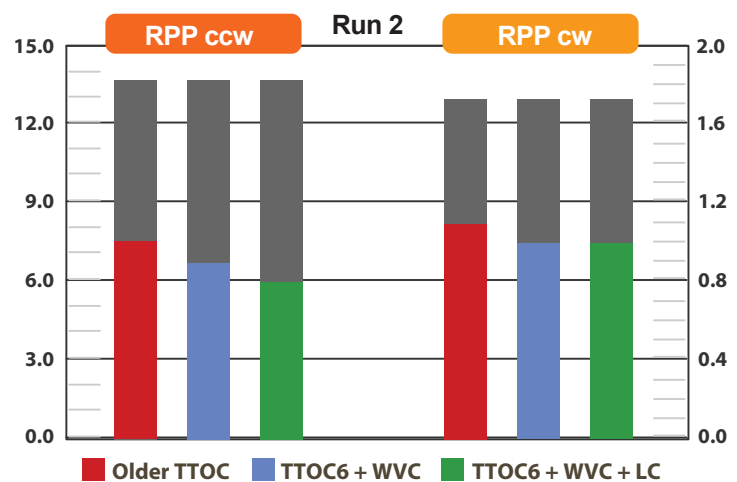
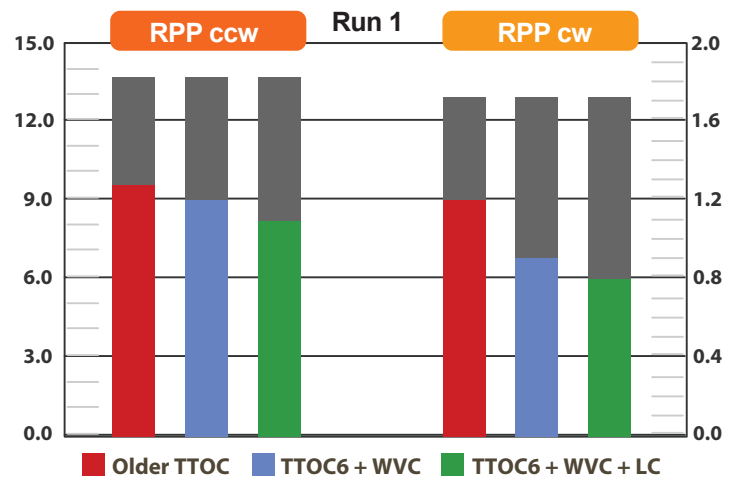
Waveform Validation and Correction (WVC) ensures that the radial and lateral force uniformity data snapshot is collected during a stable timeframe after measurement stabilization is complete. WVC also applies correction to the measurement data based on proven proprietary methods. Loadwheel Correction (LC) is a component of our patented Machine Effect Characterization and Compensation (MECC). The LC algorithm, with associated hardware, subtracts a correction waveform from the tire uniformity measurement waveform to eliminate out-of-roundness present in the loadwheel.

A more detailed description of these algorithms can be found at the following URLs:

[www.comtime.com/wvc.php](http://www.comtime.com/wvc.php)

[www.comtime.com/mecc.php](http://www.comtime.com/mecc.php)

To illustrate the effectiveness of these claims, CTI ran two 5x5 machine certification tests and collected three sets of data simultaneously: 1) the original data collection method used by older-generation TTOC controllers (shown in the graphs in red), 2) the TTOC6 data collection method with WVC enabled (shown in the graphs in blue), and 3) the TTOC6 data collection method with both WVC and LC enabled (shown in the graphs in green).

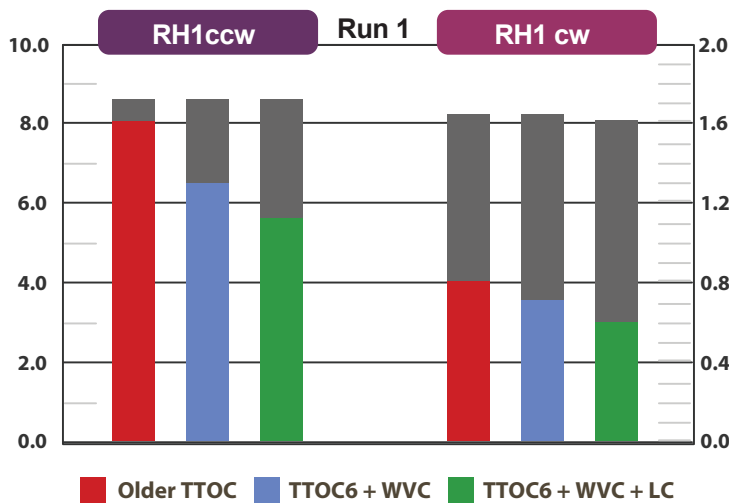
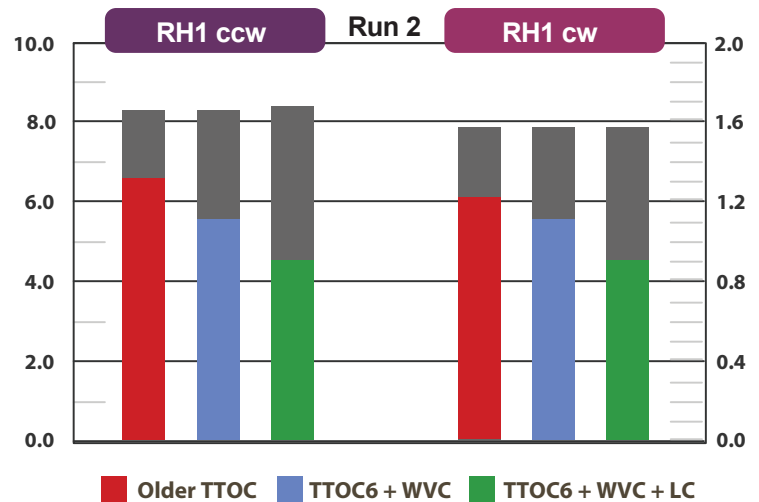


The gray bars represent the average value of Radial Peak-to-Peak force (RPP) for all 5 tires and use the left axis (0-15). The colored bars represent the average measurement range for all 5 tires and use the right axis (0-2). CCW was collected first, followed by CW. All values are in pounds. Note how the average value of RPP for all 5 tires remains practically unchanged while the measurement range decreases!

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The RPP measurement range decrease is detailed in the chart below. The fact that measurement precision is increased without affecting measurement accuracy is very significant because it allows the grading limits to be reduced by a statistical factor that approaches the range reduction, which is consistently several tenths of a pound of radial force.

		RPP ccw			RPP cw		
Run 1	Average	13.5	13.5	13.5	12.8	12.8	12.7
	Range	1.3	1.2	1.1	1.2	0.9	0.8
Run 2	Average	13.4	13.4	13.5	13.0	13.0	13.0
	Range	1.0	0.9	0.8	1.1	1.0	1.0



During certification testing, abnormally high values within a set of passes of the same tire are commonly referred to as 'outliers.' In all 10 sets of 5 tire passes, the TTOC6 software with WVC and LC algorithms reduced the highest RPP and RH1 measurements by an average of 0.21 lbs. and 0.25 lbs. respectively. Of these 'outliers,' 90% of the TTOC6 + WVC + LC measurements were lower or equal in magnitude compared to older TTOC measurements.

Two conclusions can be drawn from these findings. 1) TTOC6 measures with greater precision than older machines without affecting accuracy. 2) Fewer tires will be incorrectly downgraded which increases yield and generates a higher amount of revenue for the manufacturer – all thanks to TTOC6, WVC, and LC!

Similar results can be seen for the Radial Force First Harmonic (RH1) in the chart below. This data is from the same set of 5x5 certification tests. Again, the average measurement value is practically unchanged, and the measurement range is reduced significantly.

		RH1 ccw			RH1 cw		
Run 1	Average	8.5	8.5	8.5	8.1	8.1	8.0
	Range	1.6	1.3	1.1	0.8	0.7	0.6
Run 2	Average	8.2	8.2	8.3	7.8	7.8	7.8
	Range	1.3	1.1	0.9	1.2	1.1	0.9

**Together we can make a big difference in your company's overall performance!**

### TO LEARN MORE ABOUT

#### TTOC6 Controller

[www.comtime.com/ttoc.php](http://www.comtime.com/ttoc.php)

#### Waveform Validation and Correction

[www.comtime.com/wvc.php](http://www.comtime.com/wvc.php)

#### CX111 TU

[www.PolingGroup.com/cx111](http://www.PolingGroup.com/cx111)