Achieving a Smooth Ride by Automated Machine Guidance

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Acknowledgments Contractor: Pike Industries, Inc. Vendor: Topcon Corporation

SmoothRide Solution

The SmoothRide Solution is an all-inclusive road resurfacing system, consisting of pre and post surface scanning, resurfacing design software, 3D machine control milling and paving, and intelligent compaction. The purpose of this demonstration is to use e-construction technology to repair the wearing course deficiencies within a limited scope of work. The benefits of using e-construction are to save time, decrease labor, improve quality, and to allocate materials and resources to where they are needed the most.

Figure (Left): Realistic Dimensioning – Mapping One (RD-M1) surface scanner mounted on truck
Figure (Right): 3D– Machine Control (3D-MC) and modem mounted on Mill

Construction Demonstration

VTrans is working with Pike Industries and Topcon Corp. to perform a 1-mile automated machine guidance demonstration of Topcon's SmoothRide Solution on Swanton NH FPAV (58) mill and fill project on VT 78. The demonstration is still in progress with preliminary surface scanning, profile milling, post scanning and pavement design completed. Subsequent operations are paving with intelligent compaction, core analysis, and VTrans surface testing.

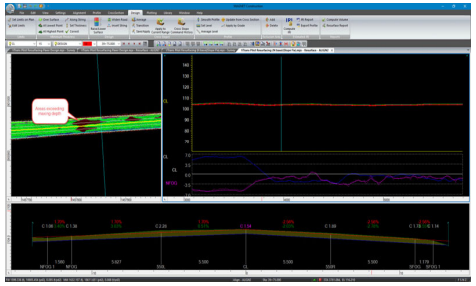

Figure (Left): Spot checking mill cut depth
Figure (Right): MAGNET design software

Results

Quality Improvement:

- VTrans preliminary surface testing: Average IRI: 156 in/mi & max rut depth: 4".
- Preliminary roadway scan using SmoothRide: Mill depth range: 0"- 3.5" mill depth.
- Post mill roadway scan using SmoothRide: Actual tolerance: 0.01". Average CL pave depth 1 ½" with a 1/8" tolerance.
- Profile milling removed all surface irregularities. No spot shim is required.
- Will not use SmoothRide for profile paving. Will use standard paver automation.

Time & Manpower Savings:

- SmoothRide 3D survey data obtained by 2 personnel at 2 hours for each scan vs. Typical 2D design data generated in 5 days by design team.

Increased Safety:

- SmoothRide Scan performed within the vehicle at highway speeds vs. design and inspection team working in live traffic to establish baseline and initial survey.
- Pending results: VTrans density testing by core analysis & final surface testing.

Smoothness and Longevity

Reduction in Roughness	Average % Increase in Pavement Life		
	10%	25%	50%
HMA	5.3	13.3	26.7
PCC	7.3	18	36

US NCHRP 1-31 Study

Figure (Left): Conventional milling. Figure (Center): SmoothRide milling. Figure(Right) NCHRP Study Smoothness and Longevity.

Conclusion

The demonstration is on track to achieve a smoother riding surface over conventional construction methods, as shown in the figures above. The post milling scan indicated that profile milling was completed to an accuracy of 0.01" of design and removed all surface irregularities found in the preliminary surface scan. With a consistent roadway slope across the travel lane and shoulder, spot shimming is not required, and paving within the designed 1/8" depth tolerance for the wearing course is attainable. The SmoothRide Solution improves safety within the work zone, allows for projects to be constructed on time and on budget, and improves resurfacing quality resulting in extended pavement life.

References

The SmoothRide Solution
https://www.topconpositioning.com/smoothride#main