

# Paving for Smoothness



1

# Who is Topcon?



2

**27 COUNTRIES**

**86 COMPANIES**

**5142 EMPLOYEES**

**1.8 Billion GLOBAL REVENUE**

**WELCOME TO TOPCON**

Topcon boasts a global development, manufacturing and support network that is talent rich and interconnected.



3

**WELCOME TO TOPCON**

- 1932**  
Founded in Japan
- 1947**  
Ophthalmic and medical instruments business
- 1970**  
Global expansion into USA and Europe
- 1980**  
World's first EDM Theodolite
- 1991**  
World's first robotic total station
- 1993**  
World's first target scanning lasers

- Tokyo Optical Co., Ltd. was established September, 1932
- Listed on Tokyo Stock Exchange
- Expanded manufacturing to include binoculars, cameras, ophthalmic and optical instruments
- Entered construction laser business in 1990
- Acquired Advanced Grade Technology to enter machine control business in 1993

- Positioning Company started as Topcon Laser Systems in 1994
- Acquired GNSS technology in 2000
- Accelerated growth of 3-D machine control with Millimeter GPS
- Acquired precision agriculture software developer in 2006
- Created JV telematics company—pioneered development of cloud-based workflow and site management solutions

- 1994**  
Established Topcon Positioning in CA
- 1999**  
World's first LPS 3-D machine control system
- 2000**  
World's first GPS+GLONASS system
- 2005**  
World's first vehicle mounted scanning
- 2006**  
Entered global Precision Ag Market
- 2012**  
Launched cloud-based site management
- 2016**  
Topcon Agricultural Group formed in EU

4

**TOPCON** 



To be first to market with products customers never before imagined, but realize immediately that they need.

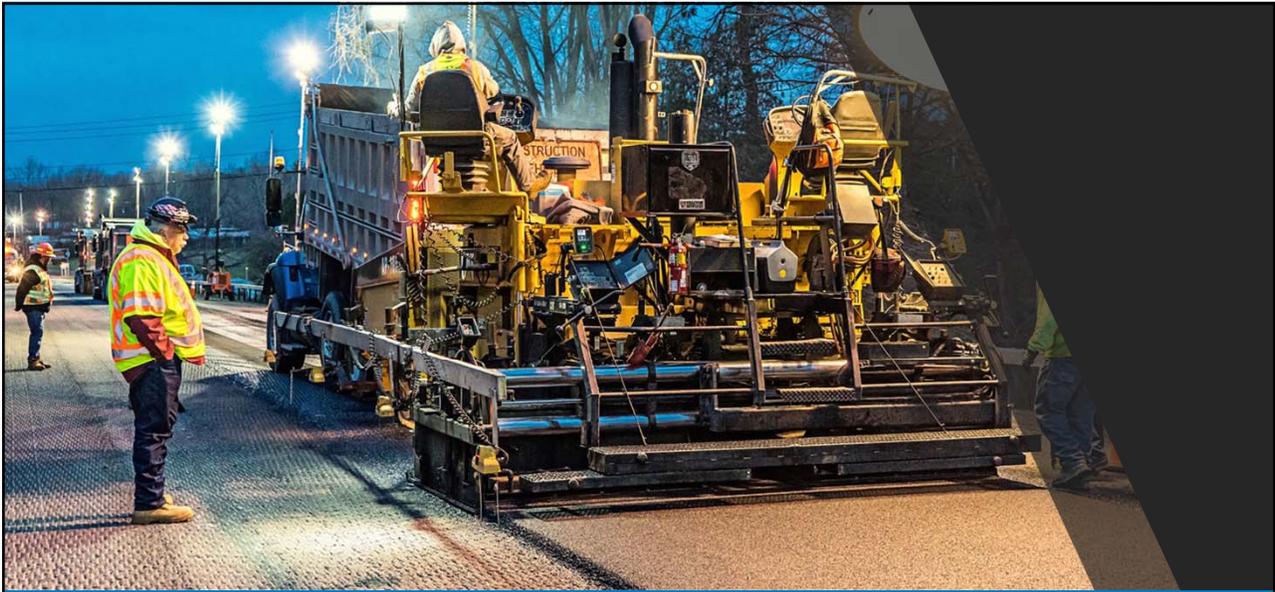
5

**TOPCON** 

## Road construction process and Topcon

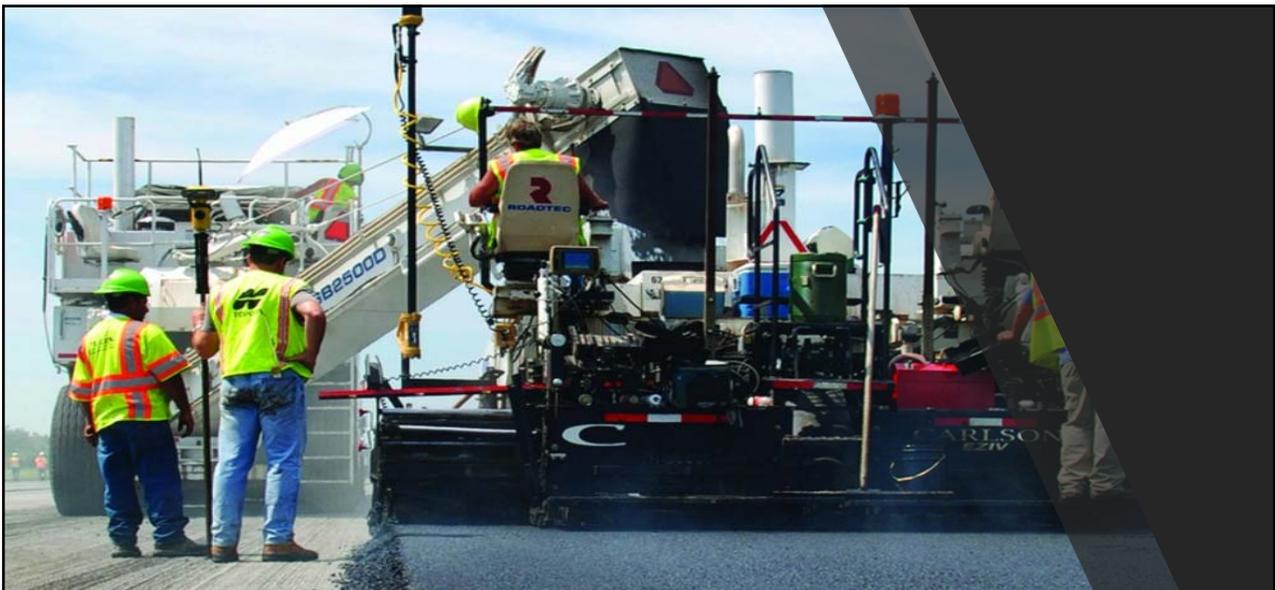
	Inspect Monitor	Decide Budget	Calculate	Plan	Survey	Design	Logistic plan	Production	Logistics	Milling	Paving	Compact	Inspect Report
<b>Mapping and survey</b>													
<b>Machine control</b>													
<b>MAGNET™ Software and cloud</b>													
<b>sitelink3D Cloud</b>													
<b>SMOOTHRIDE Workflow</b>													
<b>Pavelink Cloud</b>													

6



## P-32 Sonic Paver System

7



## MMGPS and LPS HMA Paving

8



## Intelligent Compaction

9



## Thermal Mapping

10

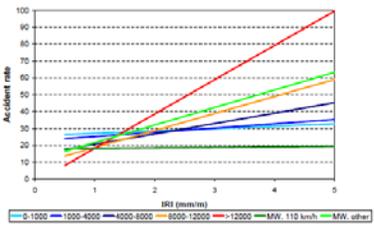


# PaveLink Real Time Data Sharing

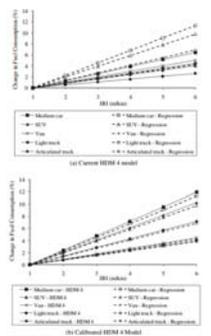
11



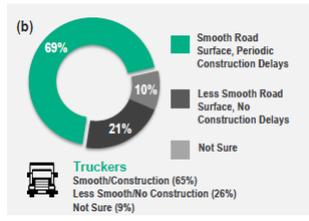

## Smoothness



Accident rate vs IRI (mm/m)



Change in Fuel Consumption vs IRI (mm/m)



(b) Truckers

- Smooth Road Surface, Periodic Construction Delays: 69%
- Less Smooth Road Surface, No Construction Delays: 10%
- Not Sure: 21%

Truckers  
Smooth/Construction (65%)  
Less Smooth/No Construction (26%)  
Not Sure (9%)

Figure 3-9. Effect of roughness on fuel consumption at 68 km/h (55 mph).

12

# SmoothRide

Time

Safety

Quality

Cost



13

## Smoothride uses these Core **Technologies**



GNSS



Equipment  
Automation



Mobile  
Mapping

14



## SmoothRide

RD-M1

- A purpose-built data collection tool for precision scanning of road surfaces to be utilized by machine control for elevation reference.

Collage

- Point cloud software used to process and edit scanned data.

Magnet  
Resurfacing

- Design software used to create a smooth road within material thickness requirements.

RD-MC

- A way of controlling milling machines and asphalt pavers based on the data collected.

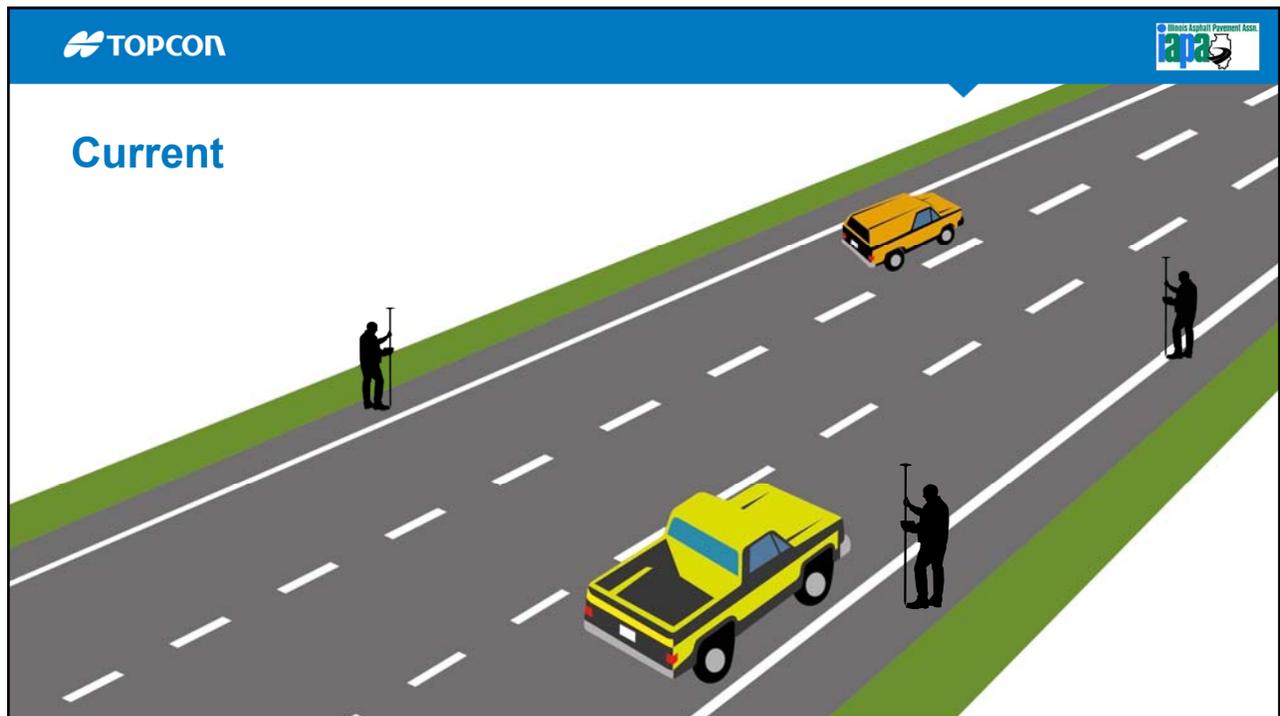
15



16



17



18



19



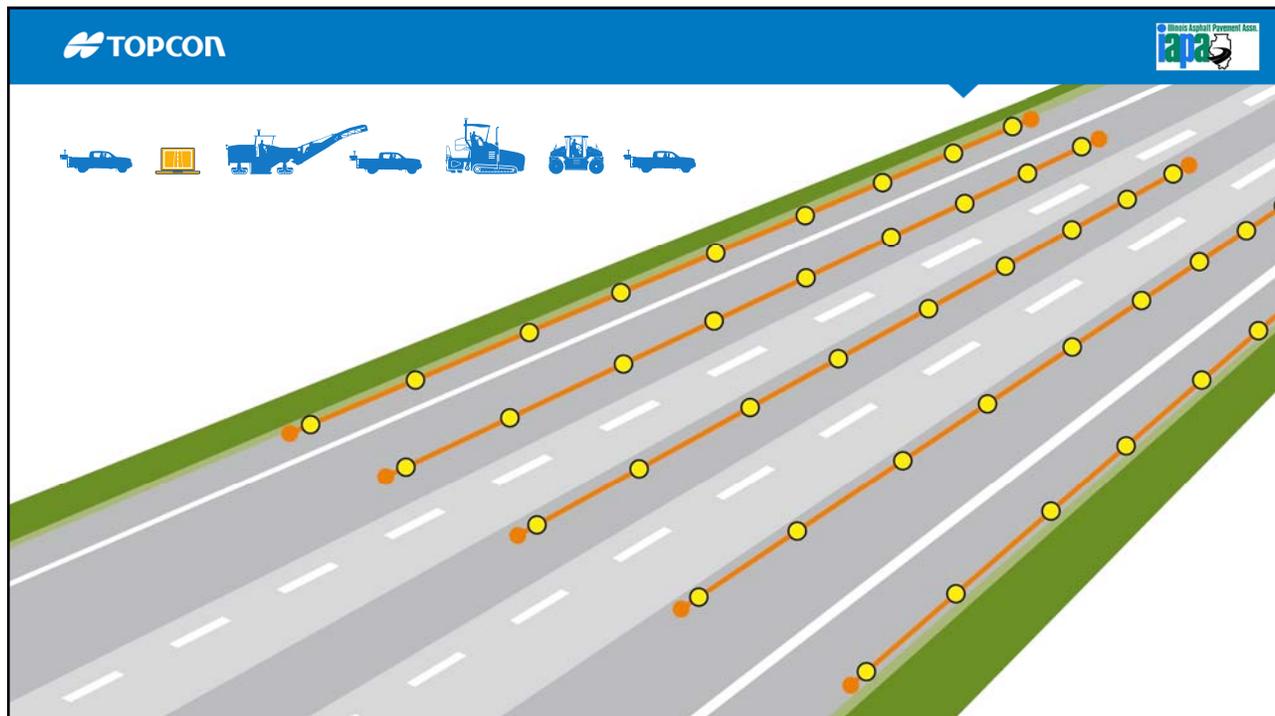
20

- LIDAR scanner
- GNSS receiver
- IMU
- Wheel encoder



## RD-M1 Road Scanner

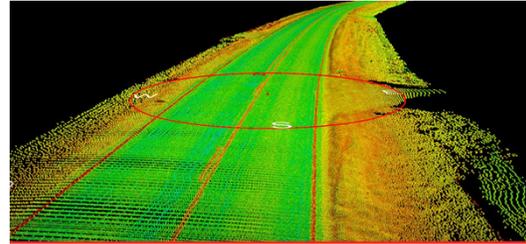
21



22

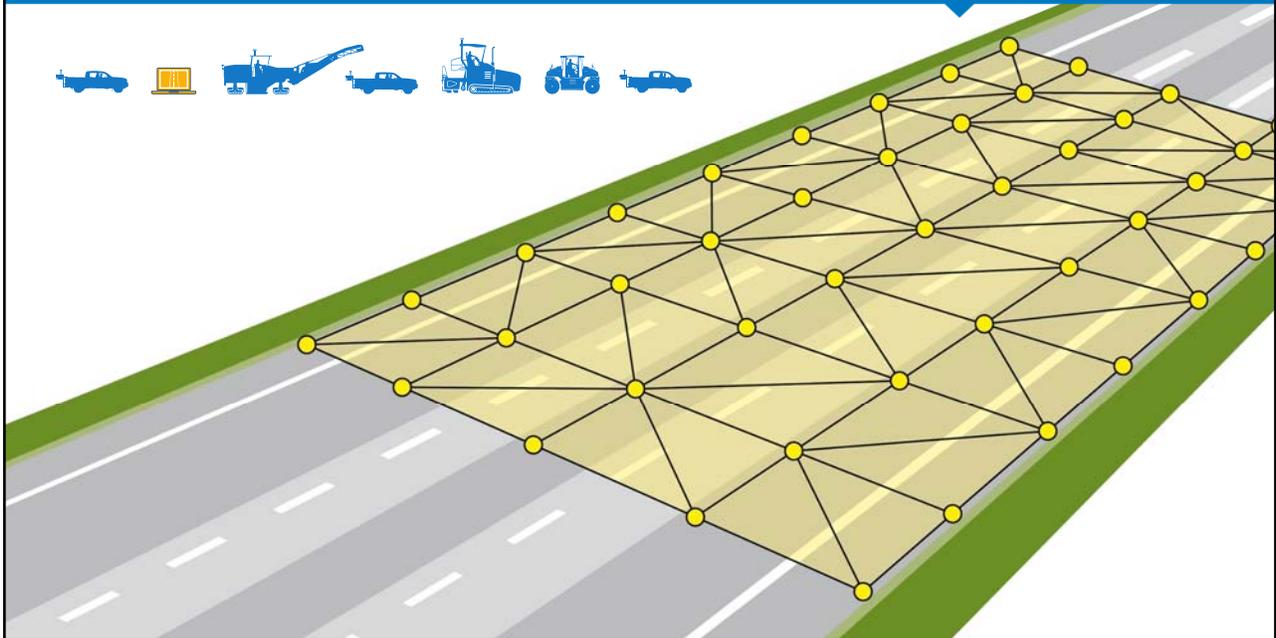
## Immersive Point Cloud Software

- Simple way to combine mass data sets
- Advanced matching and ground control functionality
- Quick surface creation
- Extensive project analysis



## MAGNET Collage

23



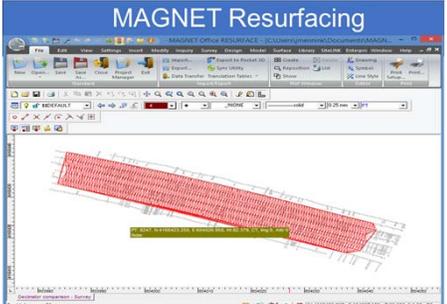
24

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## Project Software

- Easy input of project parameters
- Variable depth entry
- Smoothing longitudinal profile
- Cross slope correction
- Material management



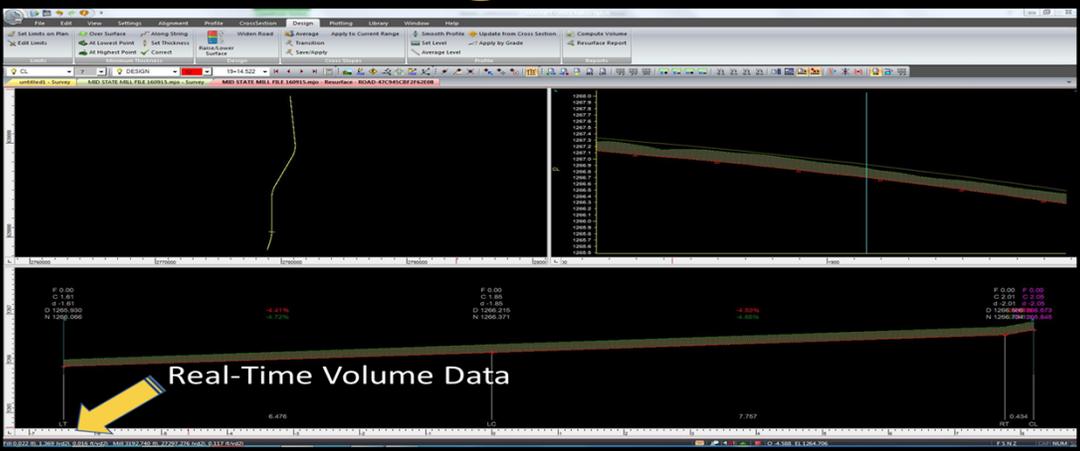
# MAGNET Construction

25

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## Design surface



# MAGNET Construction

26




## Reports

- Cross Section report
- Profile Report
- Resurface Report
- Slope Report
- VC Report

### Resurface Report

(Station: 0+000.000 - 3+250.000)

Station (yd)	0+000.000	0+250.000	0+500.000	0+750.000	1+000.000	1+250.000	1+500.000	1+750.000	2+000.000	2+250.000	2+500.000	2+750.000	3+000.000	3+250.000
area (yd <sup>2</sup> )	83.05	111.55	111.55	111.55	111.55	111.55	111.55	111.55	111.55	111.55	111.55	111.55	111.55	111.55
volume (yd <sup>3</sup> )	4.41	4.41	4.41	4.41	4.41	4.41	4.41	4.41	4.41	4.41	4.41	4.41	4.41	4.41
weight (tons)	7.34	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81
shape (1/3rd)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Station (yd)	LEP - LT	LT - LC	LC - CL	CL - RC	RC - RT	RT - REP	Station (yd)
0+000.000	-2.77	-3.69	-3.17	3.13	3.04	4.47	0+000.000
0+250.000	-4.04	-2.99	-3.23	2.47	3.74	5.07	0+250.000
0+500.000	-3.79	-3.20	-3.54	3.13	4.15	4.36	0+500.000
0+750.000	-3.41	-3.69	-3.83	3.17	3.98	5.26	0+750.000
1+000.000	-2.13	-3.61	-4.37	3.50	4.01	3.96	1+000.000
1+250.000	-2.56	-3.64	-4.32	3.58	4.57	3.03	1+250.000
1+500.000	-2.61	-3.16	-4.26	4.00	4.44	4.02	1+500.000
1+750.000	-2.04	-3.27	-4.23	4.21	4.56	3.00	1+750.000
2+000.000	-3.25	-3.53	-4.41	4.16	4.43	3.71	2+000.000
2+250.000	-3.12	-3.21	-4.41	4.33	4.46	3.50	2+250.000
2+500.000	-2.88	-3.24	-3.94	4.14	4.40	4.15	2+500.000
2+750.000	-2.79	-3.03	-3.75	3.24	3.84	4.41	2+750.000
3+000.000	-2.92	-3.08	-3.45	2.61	2.99	2.52	3+000.000
3+250.000	-5.07	-2.63	-3.07	2.09	2.41	2.50	3+250.000

MAGNET Construction

27

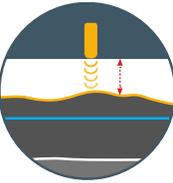


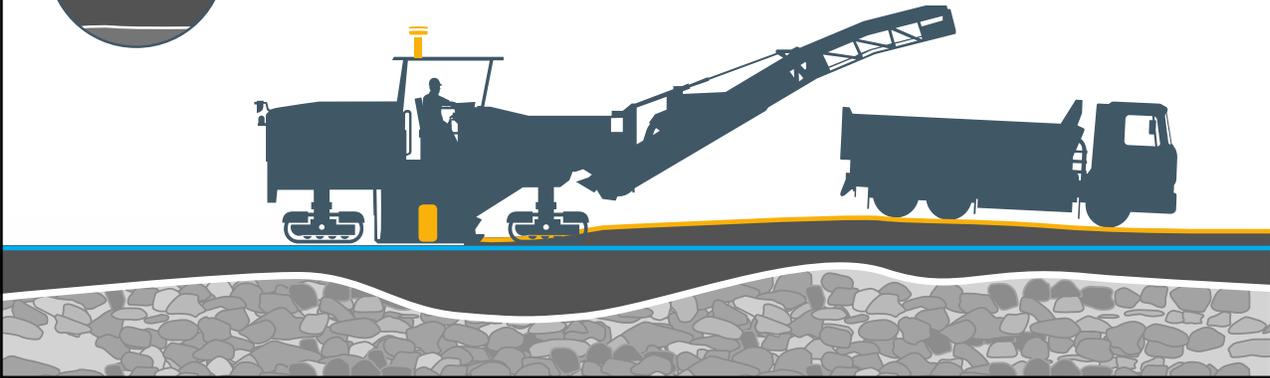










28



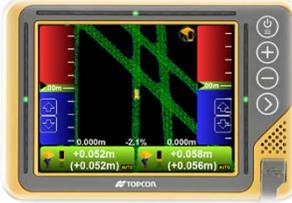
## SmoothRide Milling

29

### RT. 83 Wisconsin

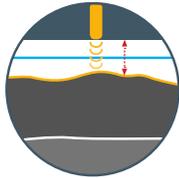
- Resurfacing Project
- IRI from +200 down to 30





30

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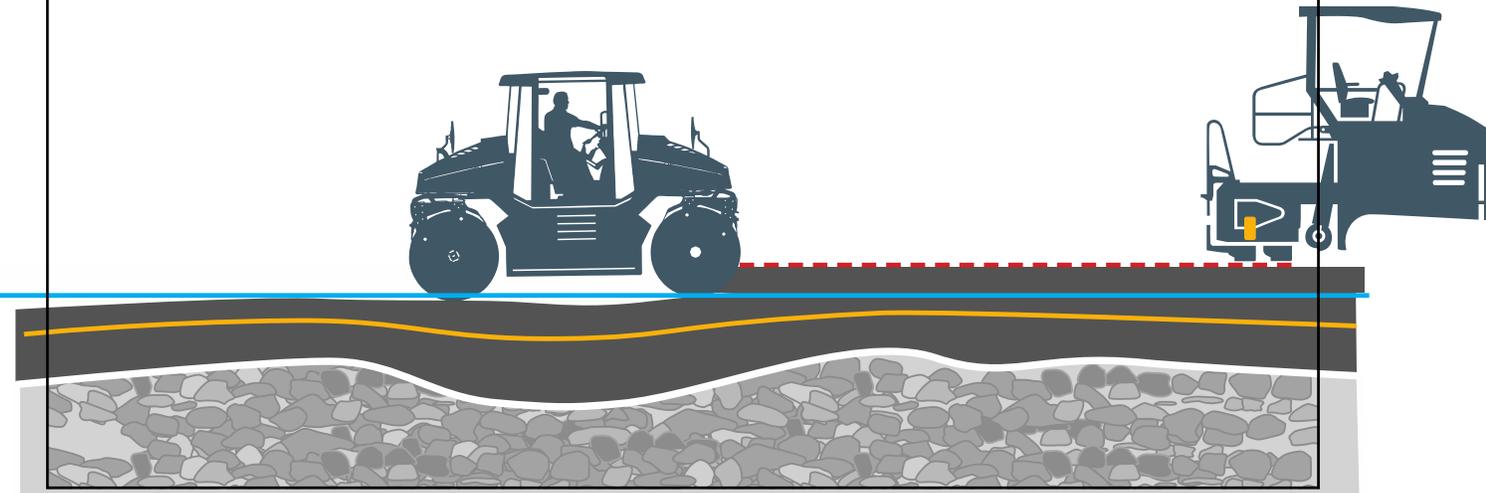
31



**SmoothRide** Paving

32

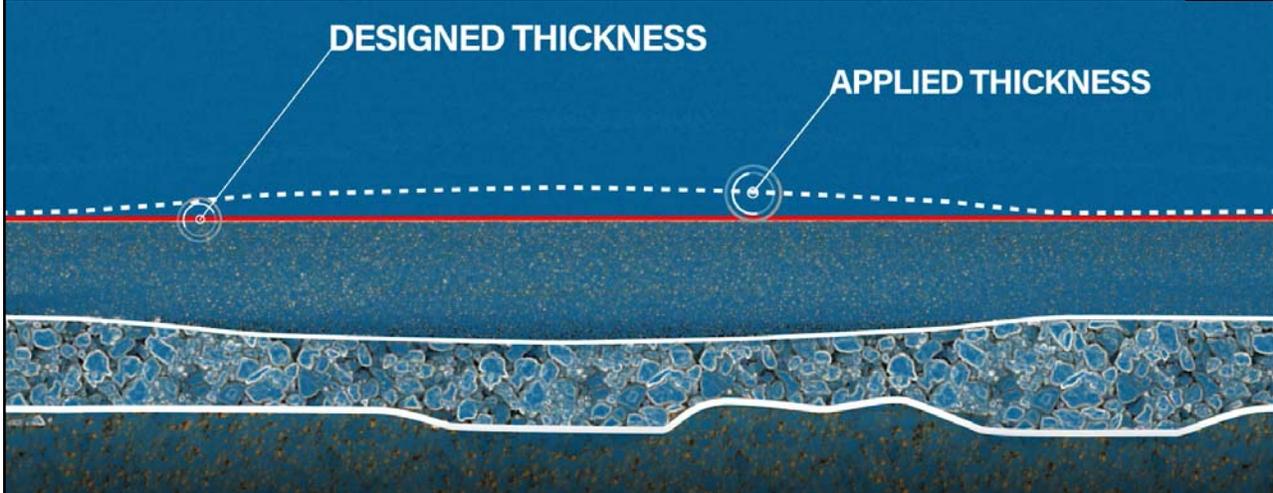
# Current



33

DESIGNED THICKNESS

APPLIED THICKNESS



34

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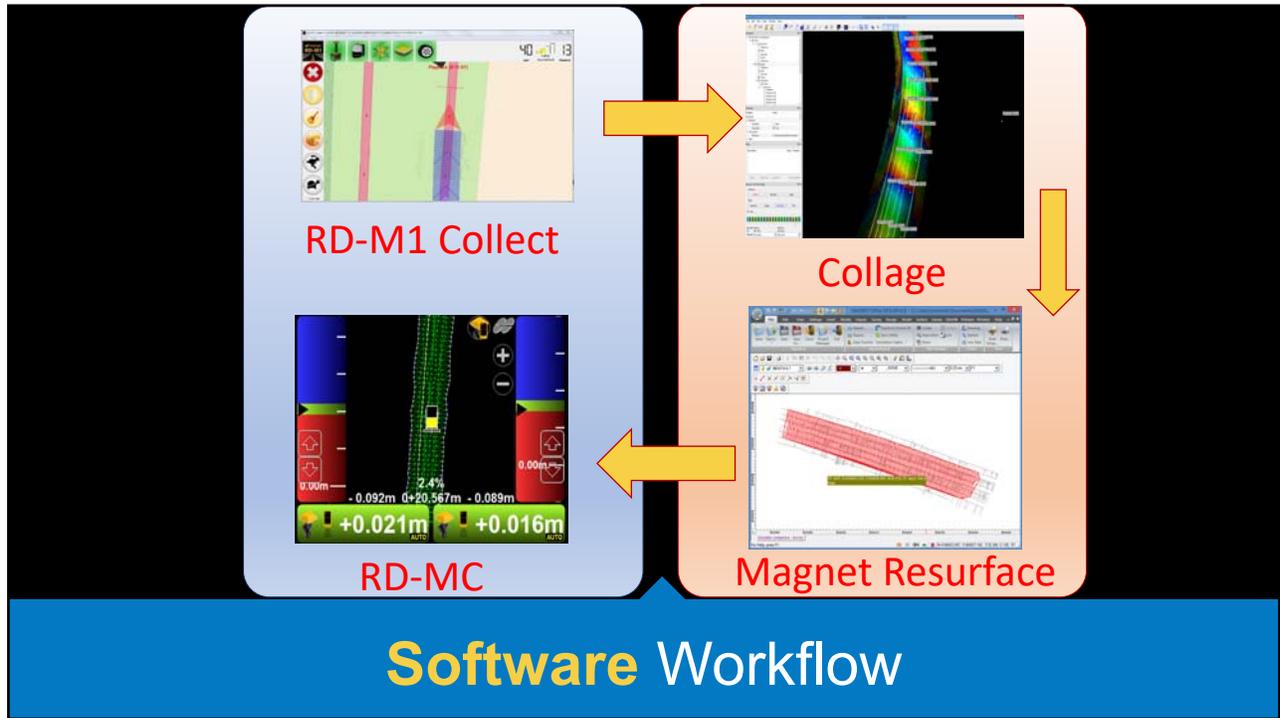


35

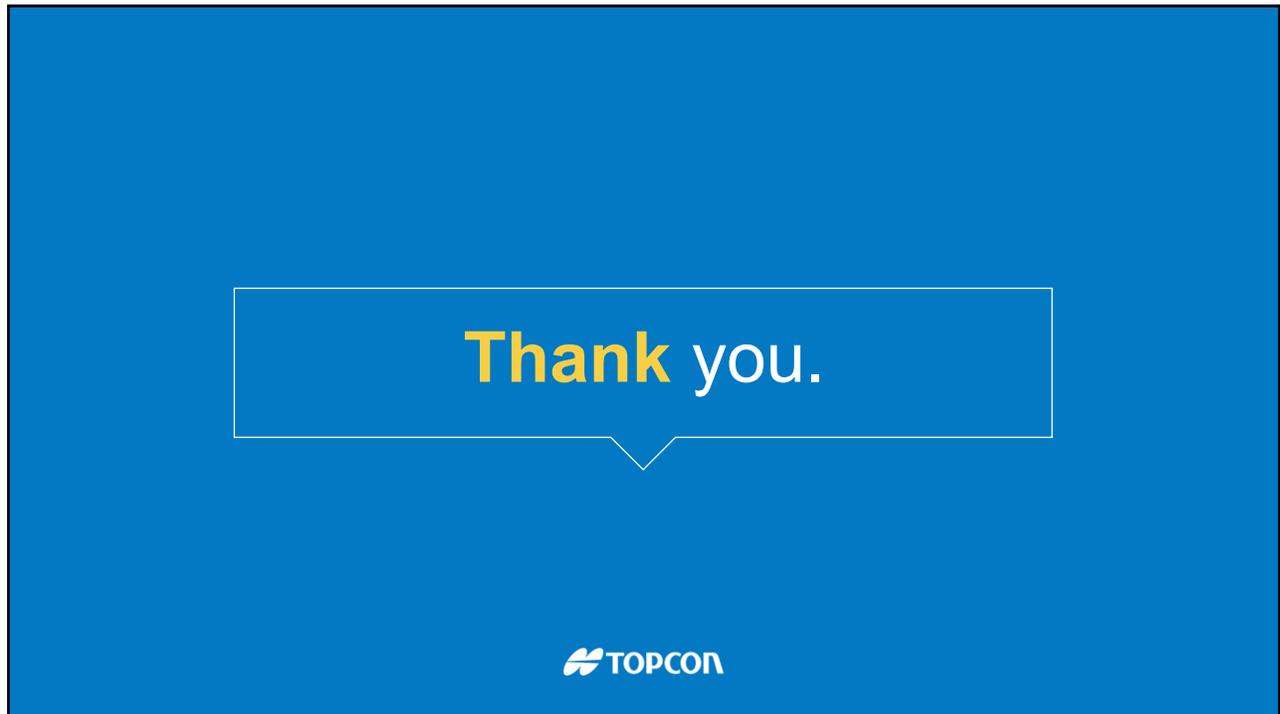
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36



37



38