A WIRTGEN GROUP COMPANY

VÖGELE

PAPA ANNUAL CONFERENCE 2019

INTELLIGENT MACHINE CONTROLS

Presented by Jim Holland

Paver Controls – Past & Present

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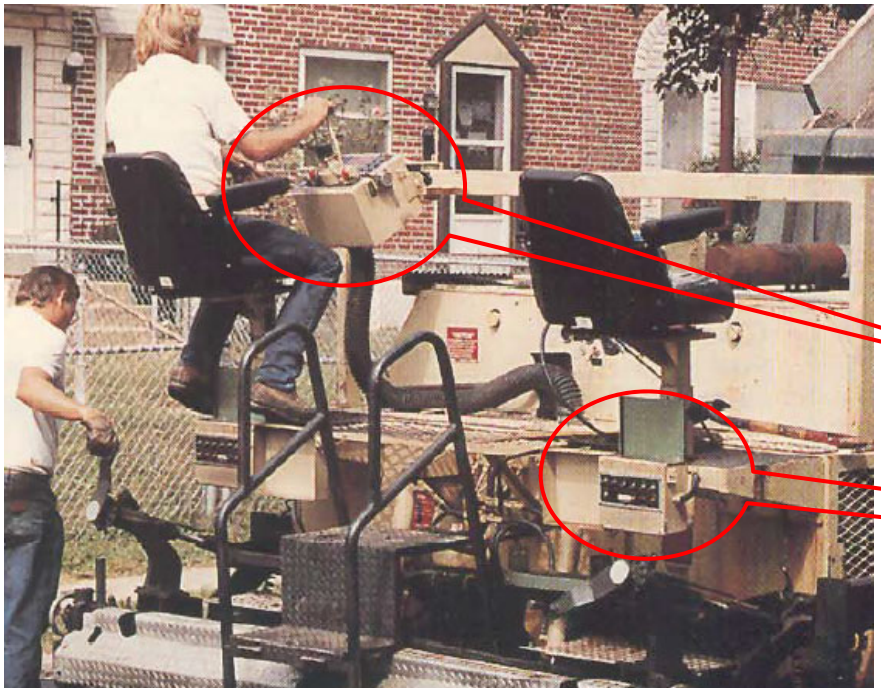
Present: Intelligent Machine Control

Past: Electric over Hydraulic



Review of the Principle of the Free Floating Screed

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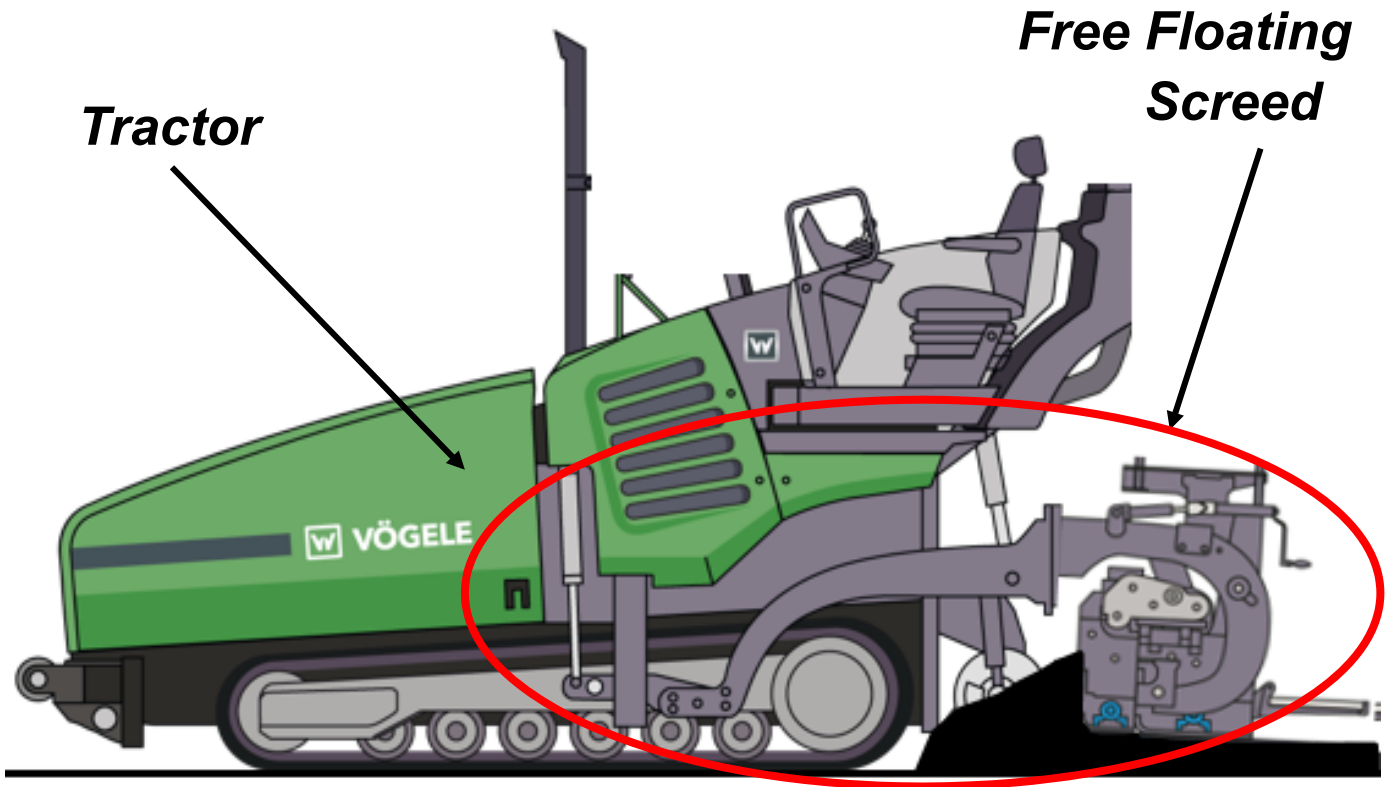
The Paver consist of 2 Independent Pieces of Equipment

1. ***The Tractor***
2. ***The screed***
   - ***Float on the Asphalt like a water Skier***



Review of the Principle of the Free Floating Screed

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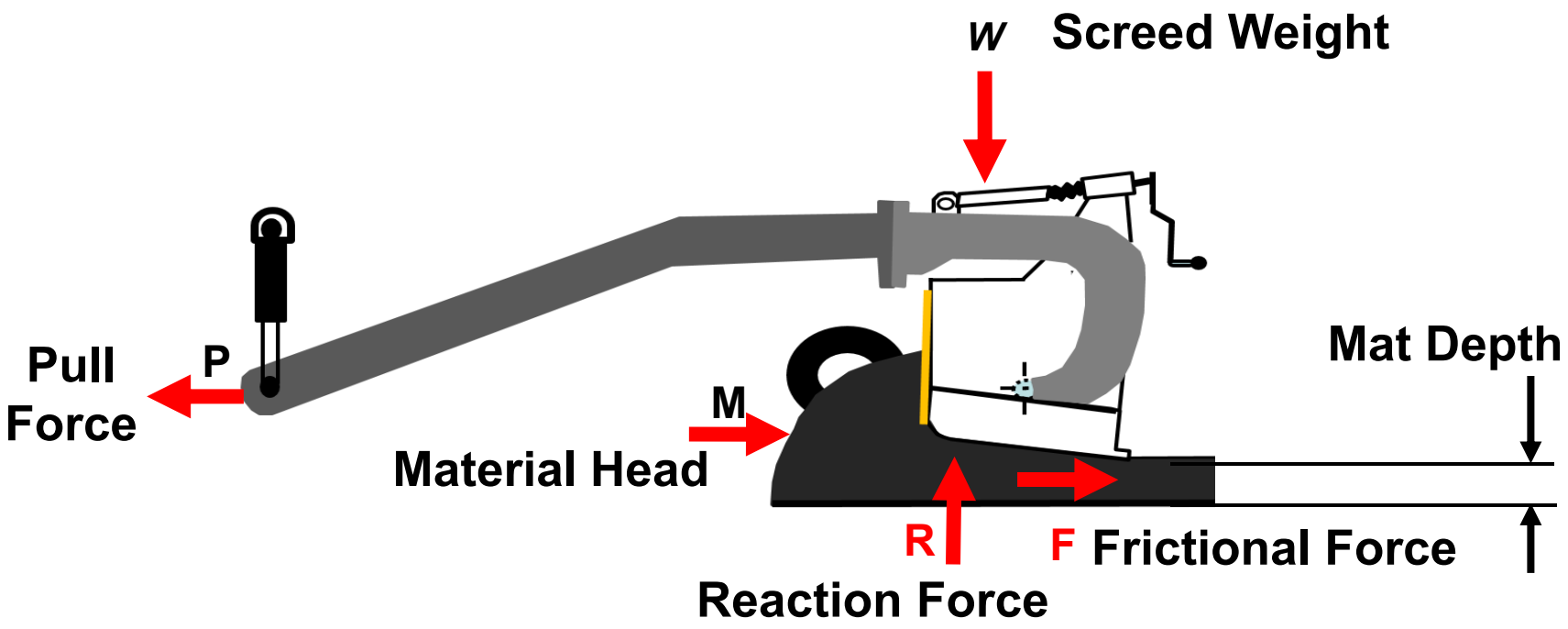
The screed is held to grade by 5 Forces



Features to Manage Pull Force (P)

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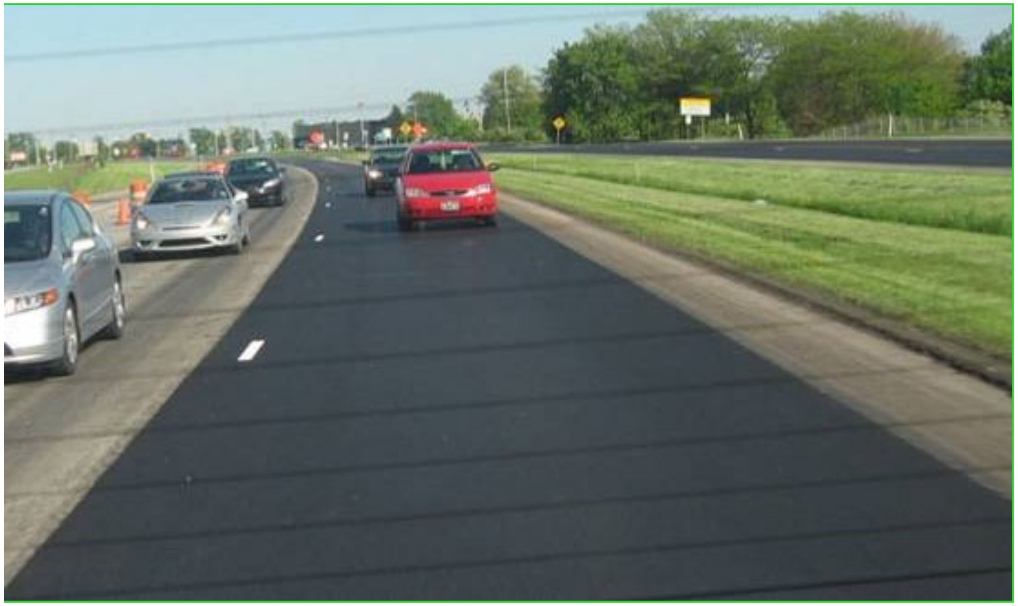
Intelligent Machine Control

- *Precise Steering*
- *Auto Screed Hold & Freeze*

Trim Steer



Automatic Screed Hold & Freeze

Features to Manage Material Head (M)

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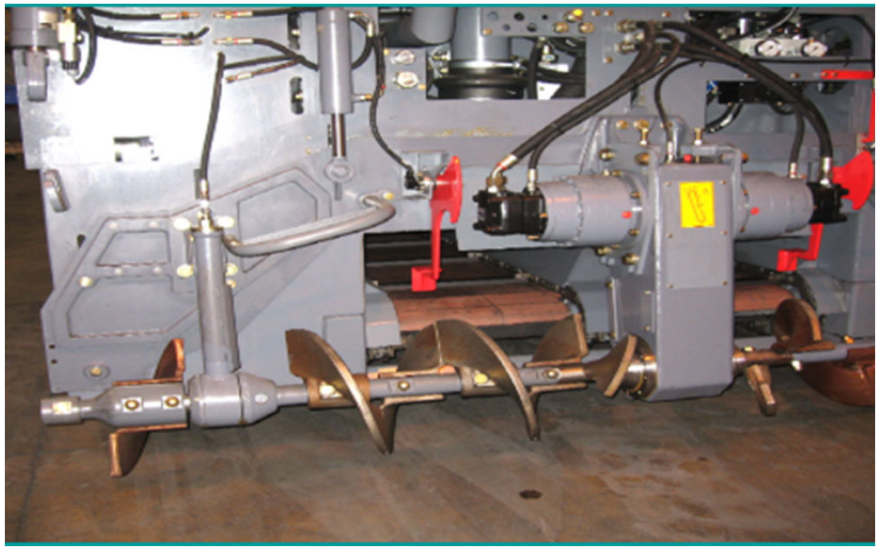
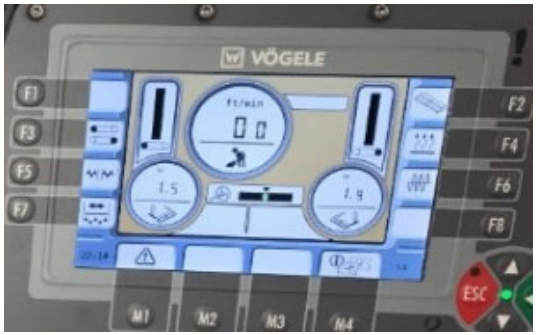
Independent Feeder Control & Digital Display:

- *4 Sensors Controlling each Auger & Conveyor*
- *Digital Display to monitor Material Delivery*





Screed Weight (W) by Design

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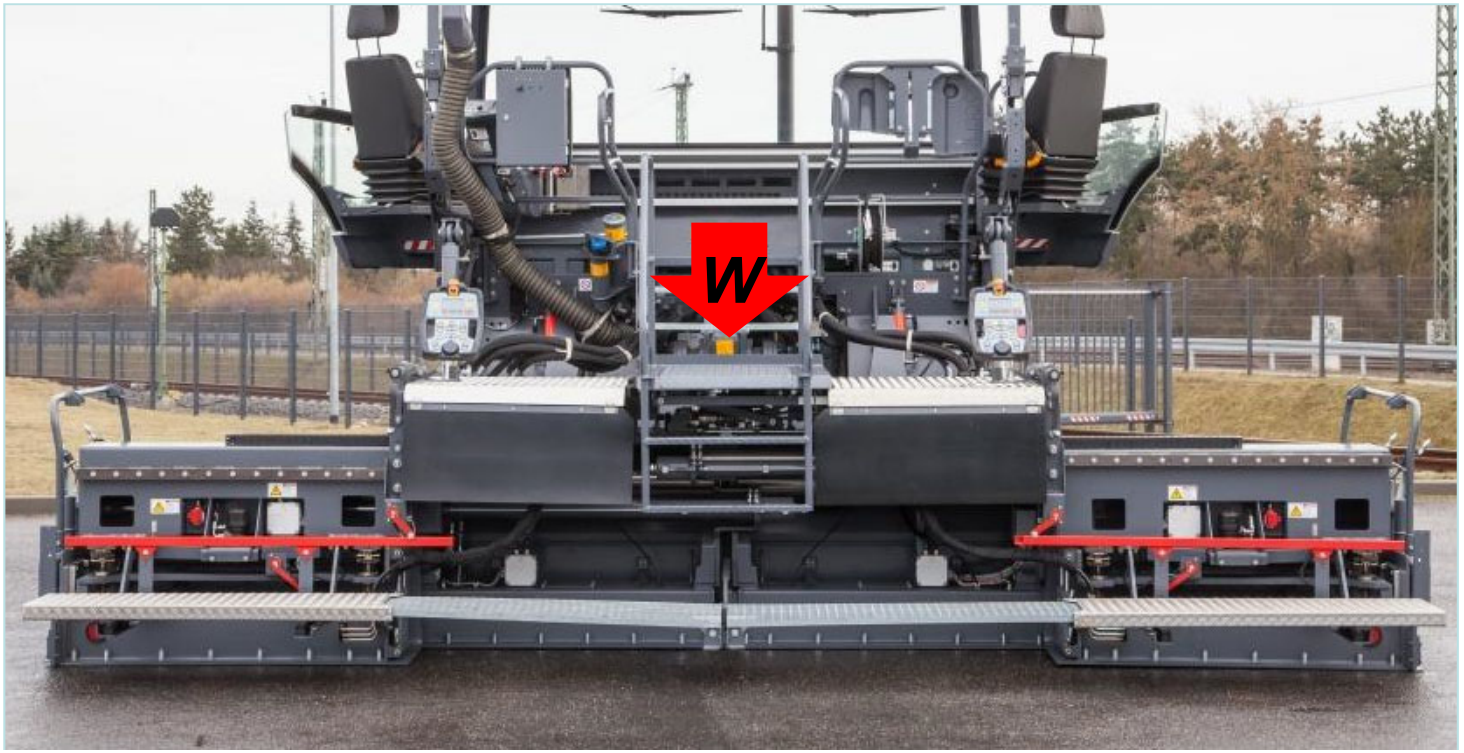
Todays Design is Usually Heavier & more Rigid

- ***Improved Stability and hold adjustments…….Ideal for Stiffer Mixes***
- ***Also withstand Small changes to the other 4 Forces***
  - ***Maximize Smoothness & Density***



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Issues Impacting R & F

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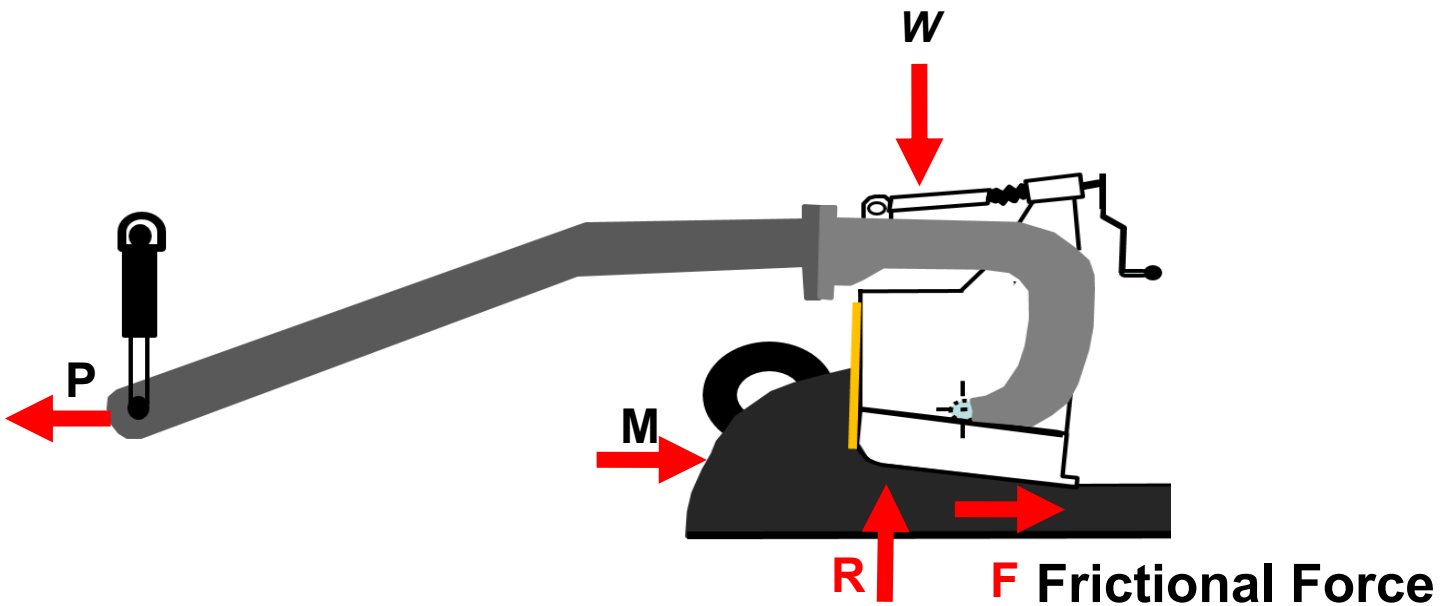
Aggregate Frictional Resistance - Influenced by:

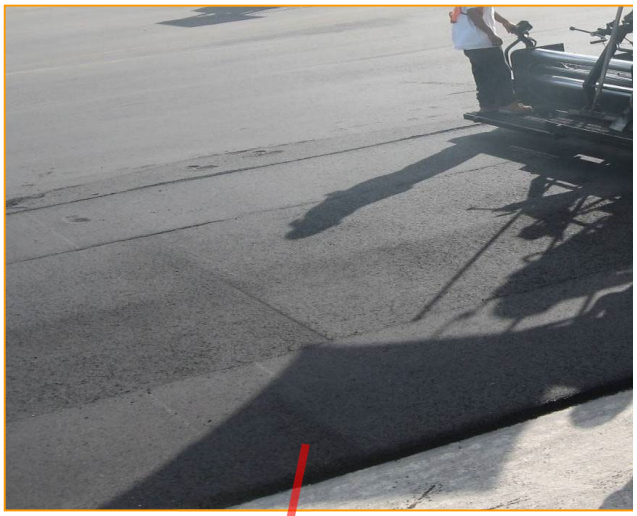
- *Gradation / aggregate shape*
- *Asphalt type / content*
- *Temperature*

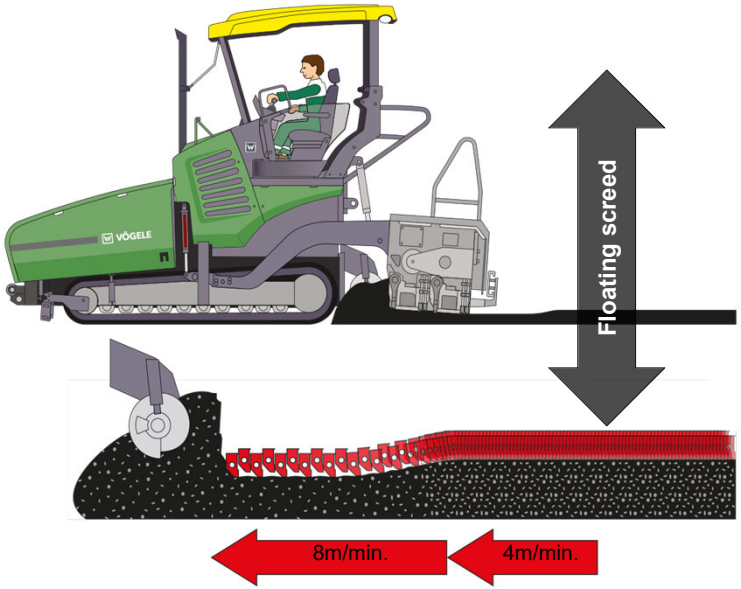
- *All of which changes with Segregation*

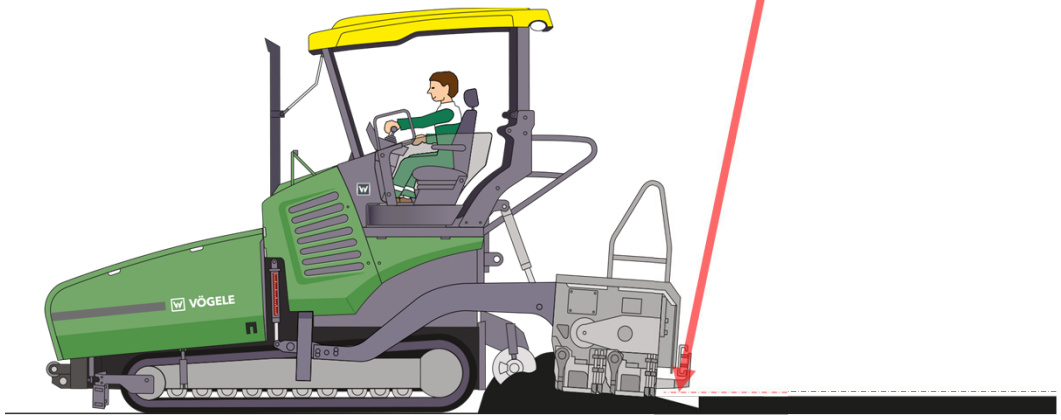


Maintain Consistency of the Paving Material

- *Temperature Varies with Mix Consistency*
  - *Ideal Tool to Monitor Consistency*



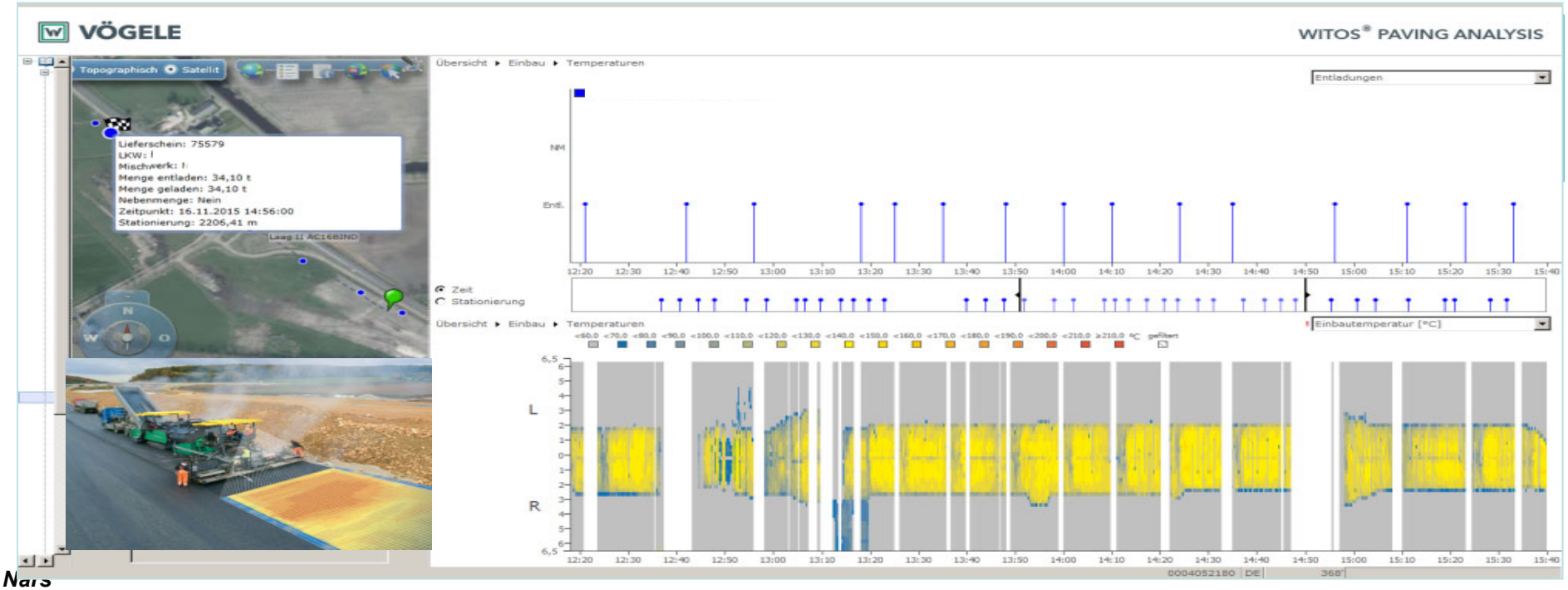




OEM Objectives:

Provide a System to Manage Material Consistency

- *Pavement Surface Temperature differential*
- *Stop Time*
- *Trucking*
- *Analysis & Reports*



FHWA / Pool Fund States Objectives - ITC (Intelligent Construction Technologies)

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Documentation of the Paving Process….on same Coordinates

1. PMTP – Paver Mounted Thermal Profile (RoadScan)

2. Intelligent Compaction

3. Ground Penetrating Radar GPR / Density check

4. IRI – Smoothness

5. 3D Milling & Paving

Paver Mounted Thermal Profiler

Veta Software for Analysis

Intelligent Compaction

Future Imports: 3D, GPR, Smoothness

EU Objectives: Contractors / ITC

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Vögele Solution WITOS Paving - 5 Modules to Manage the Entire Paving Process

Vögele WITOS Paving – 5 Modules:

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1. Planning & Control Module

- *Detailed Representation of the Project in Real Time*
- *Easy Machine Scheduling*
- *Easy exchange of Data with the mixing Plant*

2. Mixing Module

- *Manage Material Delivery*
- *Just In Time material Delivery*

3. Transportation Module

- *Monitoring of Trucks from Plant to Job Site*
- *Electronic Ticketing*

WITOS Paving – Job Site Module #4:

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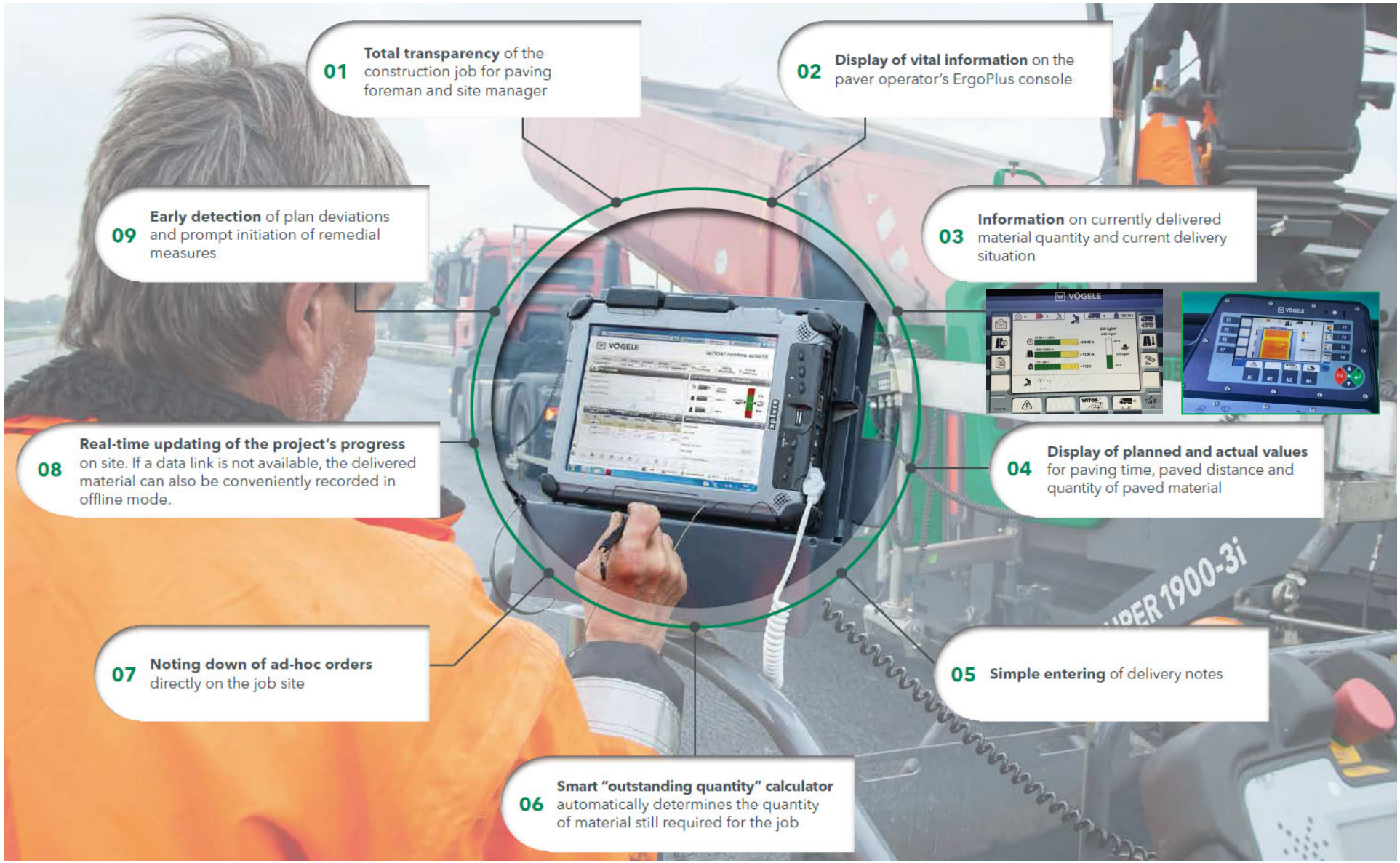
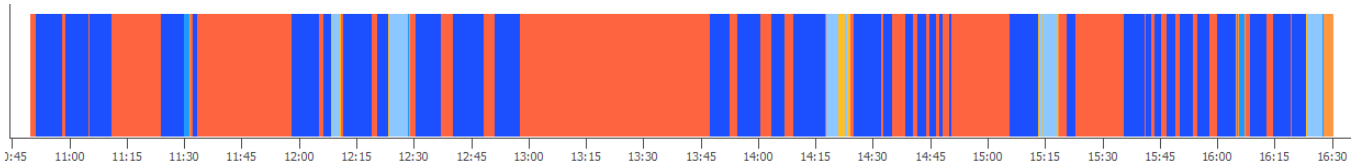
Several Functions including Paver Mounted Thermal Camera



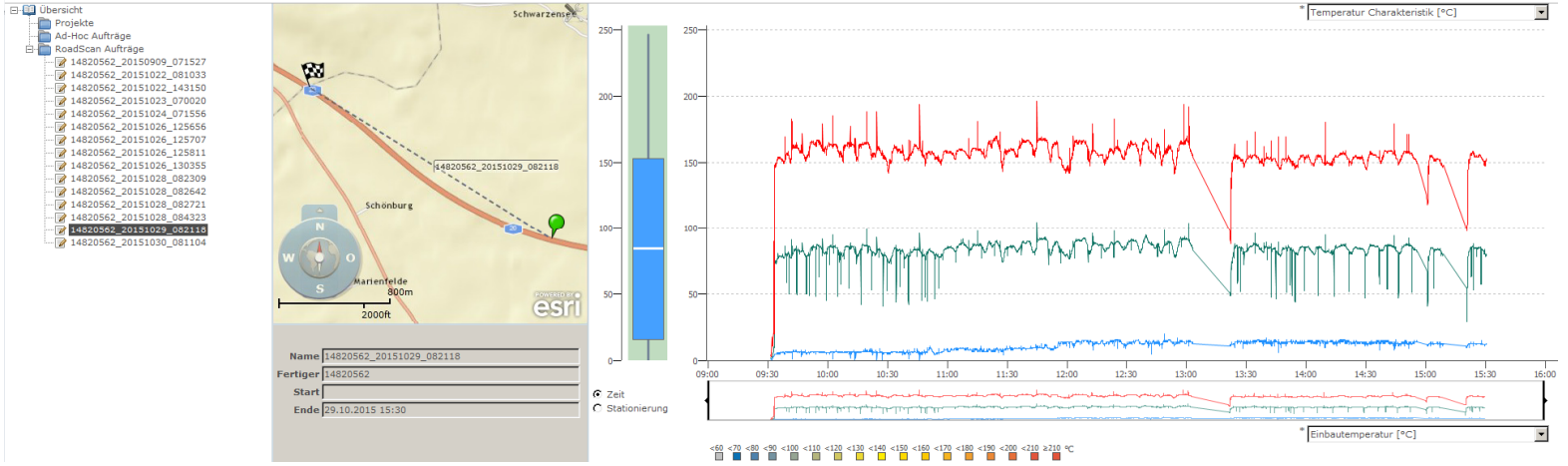
Pavement Surface Temperature analyzed with RoadScan Analysis



Materials | Transport | Jobsite | Compaction | Costs

Idle Paving

Operating mode	Paving	LL Paving	Transport/ Transpose	Eng. idle	Total	Planned
Hours		02:39 hh:mm	00:32 hh:mm	00:00 hh:mm	05:42 hh:mm	03:23 hh:mm
Machine costs/h						
Machine costs	0.00 €	0.00 €	0.00 €	0.00 €	0.00 €	0.00 €
Staff costs/h	0.00 €/h					
Staff costs	0.00 €	0.00 €	0.00 €	0.00 €	0.00 €	0.00 €
Costs/h	0.00 €/h					
Costs	0.00 €	0.00 €	0.00 €	0.00 €	0.00 €	0.00 €



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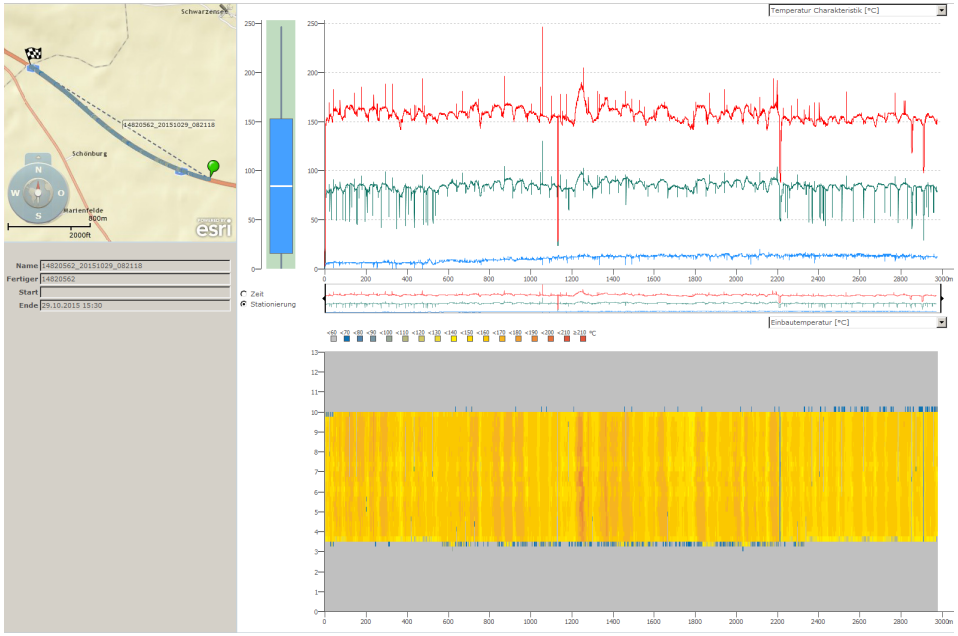
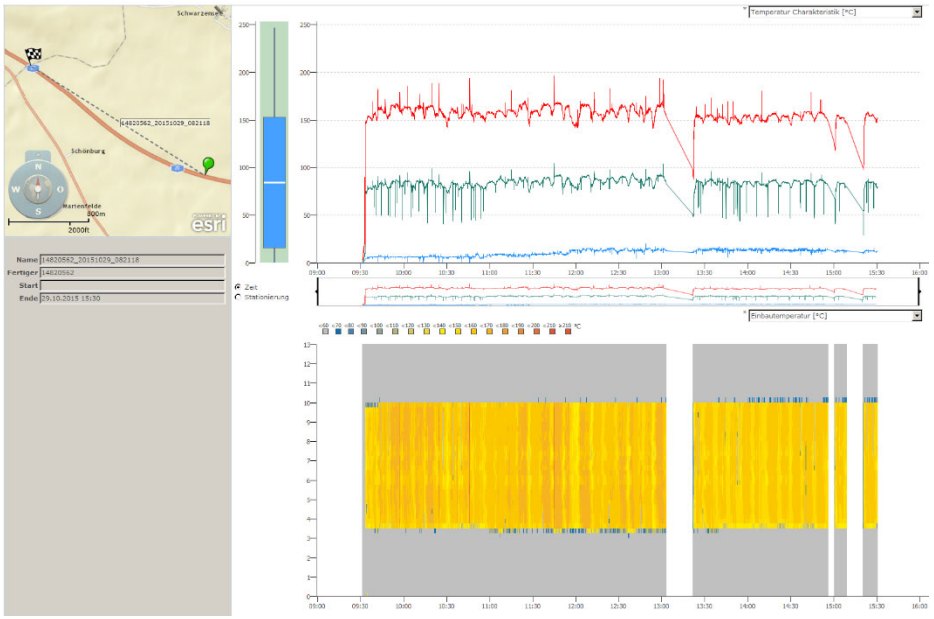
RoadScan Analysis:

Could look at the Data 2 ways

- ***Position and Time***



Position



Time

RoadScan Analysis:

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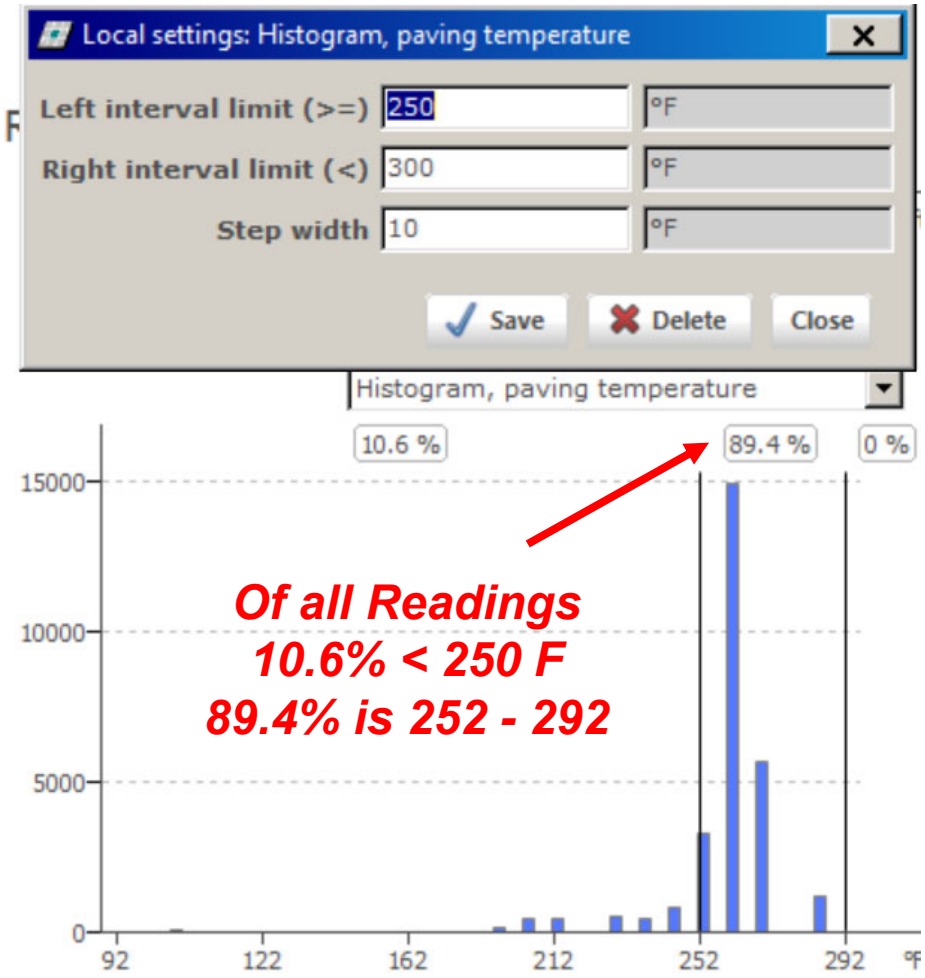
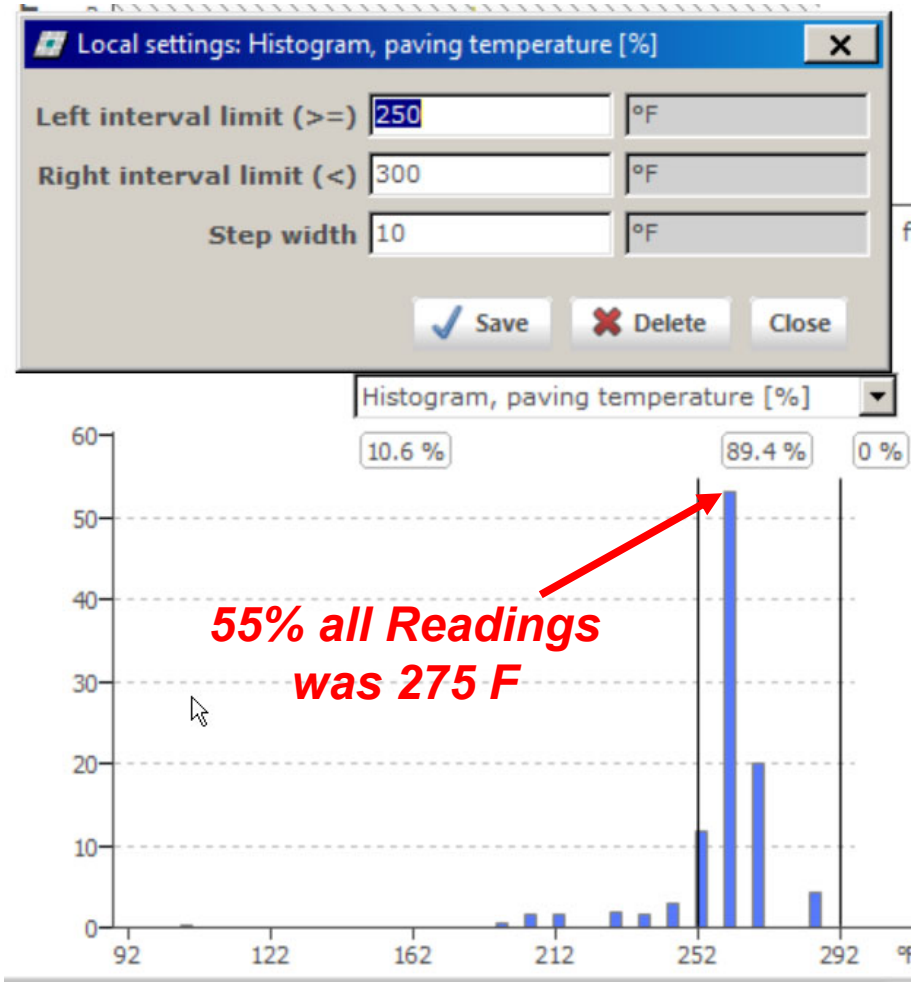
Could analyze the all Tempetrature Measurements in 2 ways

- ***Paving Temp Range***
- ***% of all Temp measured placed in a Temp Range***





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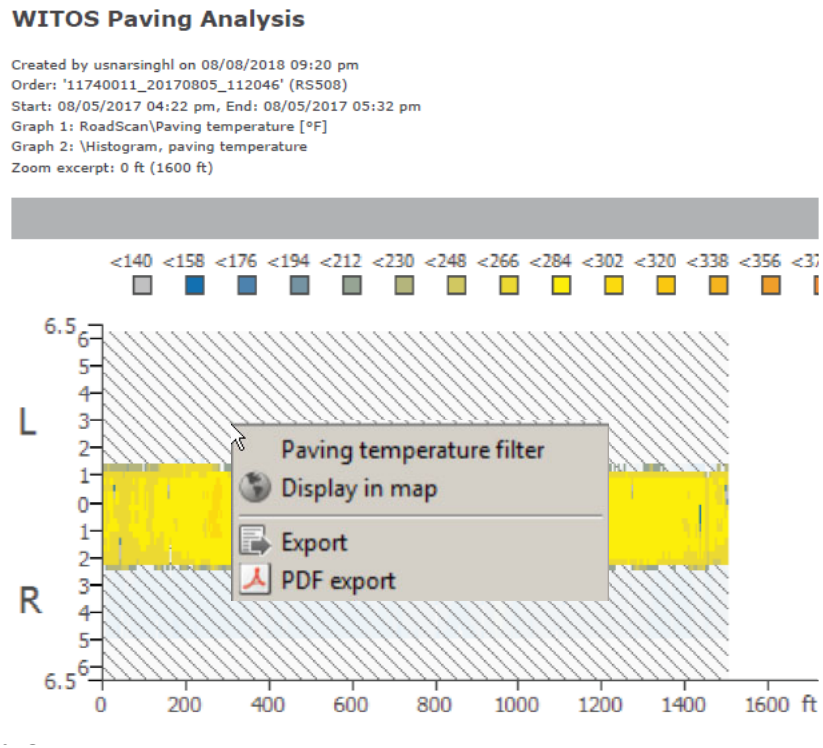
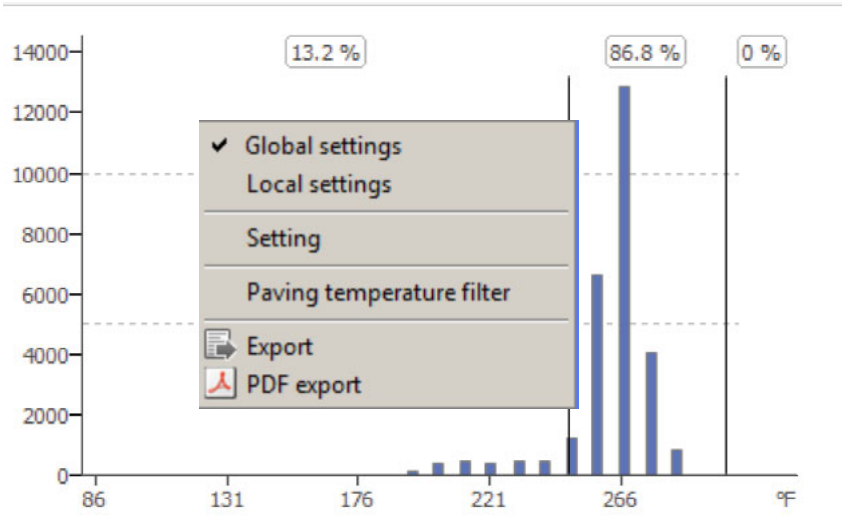
Data Export

- ***Data could be export on Spread Sheets or PDF Format***
- ***Also Export to VETA to meet Individual State Requirements***





FHWA / State Requirement – AASHTO PP80-17:

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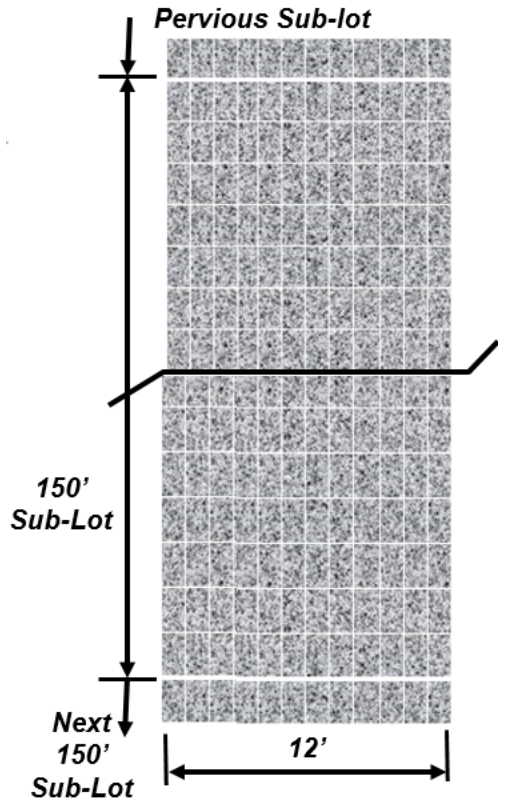
Analysis done in 150’ Sub-lot

- *Individual States drives their own Analysis Specifications*
- *VETA Software Ideal to meet Individual States specifications*
  - *OEM would prefer VETA for all Intelligent Construction Technology*
    - *Intelligent Compaction*
    - *Paver Mounted Thermal Profiler*
    - *Ground Penetrating Radar*
    - *3D Paving and Milling*
    - *Smoothness (IRI)*



Limitations of Current AASHTO Analysis:

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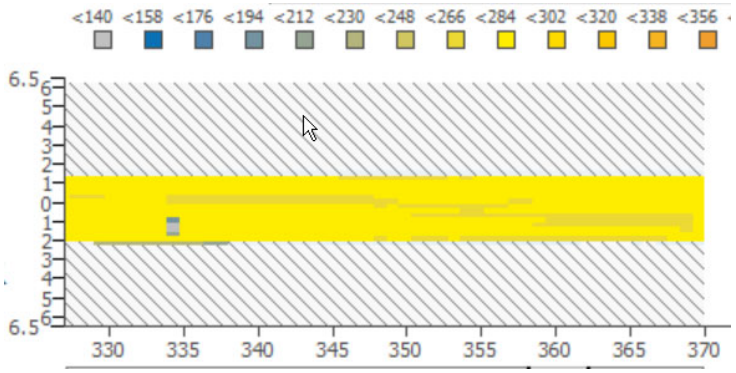
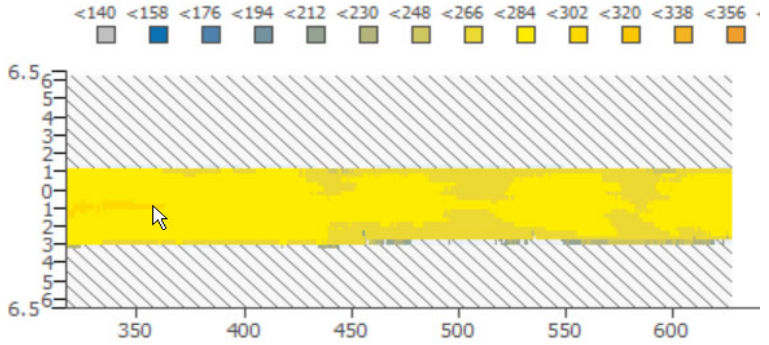
Thermal Streaks not detected by current AASHTO PP 80-17 Analysis



Range	Category
≤13.9°C [25°F]	Good
>13.9°C [25°F] to ≤27.8°C [50 °F]	Moderate
>27.8°C [50 °F]	Severe



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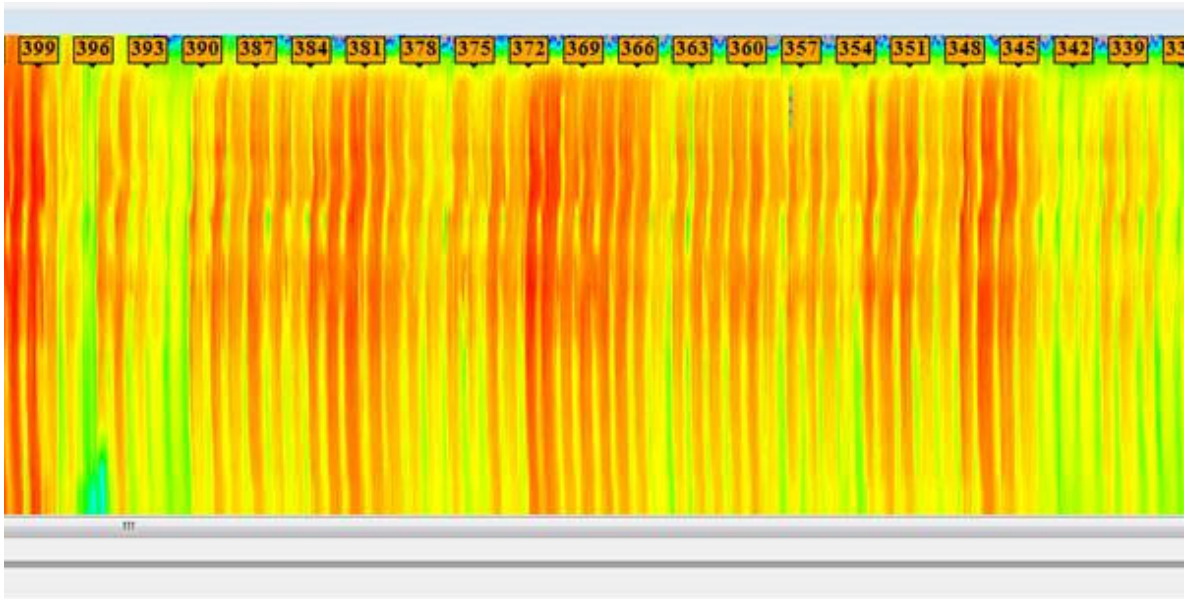
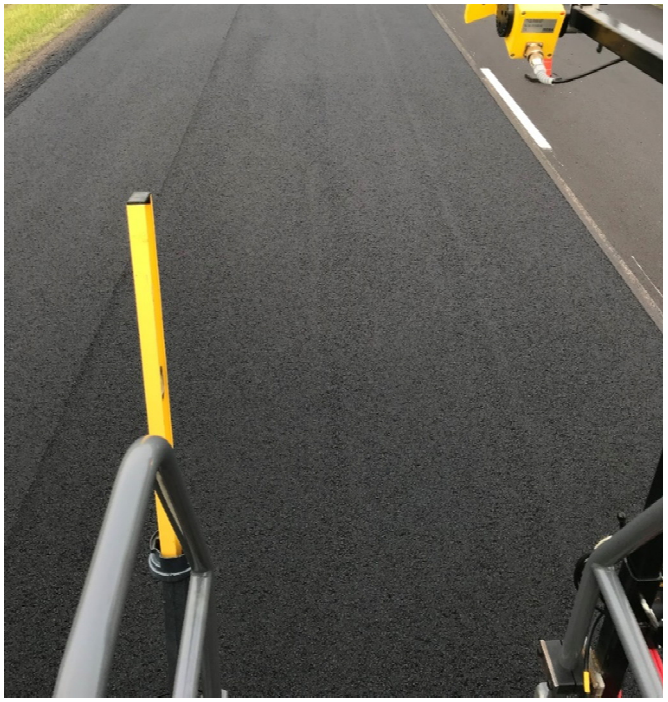
Limitations of Current AASHTO Analysis:

Visual Streaks but Pass AASHTO Requirements

- ***Not > 25 Deg F***





Thermal Profile Results Summary

Number of Profiles	Moderate 25.0°F < differential <= 50.0°F		Severe differential > 50.0°F	
90	Number	Percent	Number	Percent
	57	63	5	6

Vögele Paver Mounted Thermal Camera – RoadScan

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Thermal Camera Specification

- ***Scan grid: 10“ x 10“ (40 readings at the Same Time over 10 m Wide)***

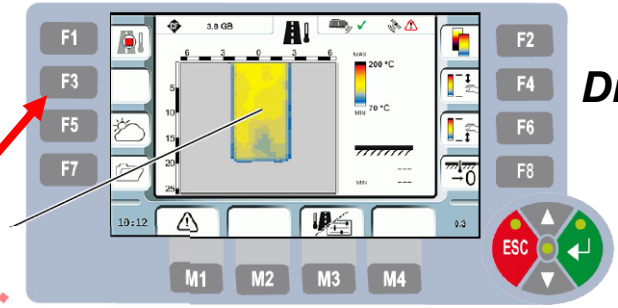
RoadScan Components:

Ground temperature measurement

Odometer

Weather station (optional)

ThermoScan & GPS Receiver



Thermal Profile Displayed on Tractor consone

Data transfer via special USB to Computer then to Veta

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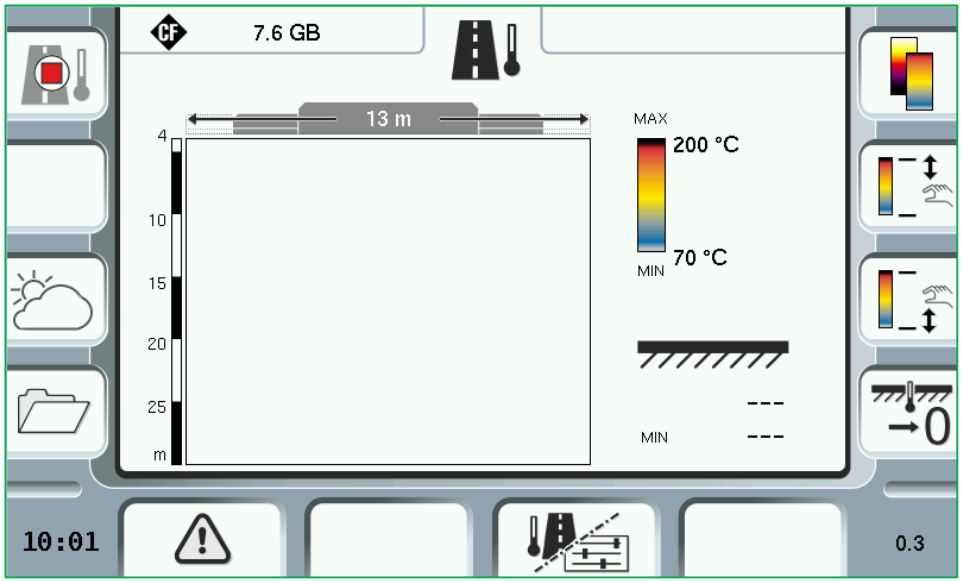
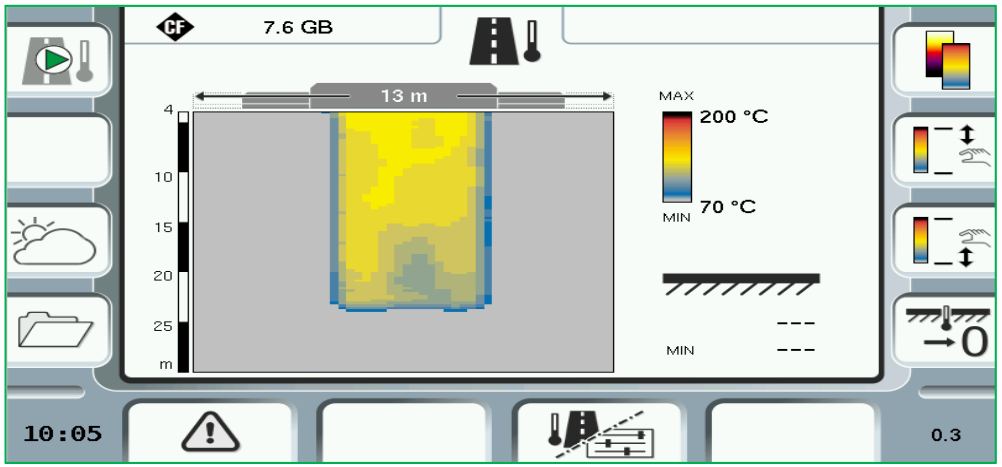
Recording start and Stop on the paver





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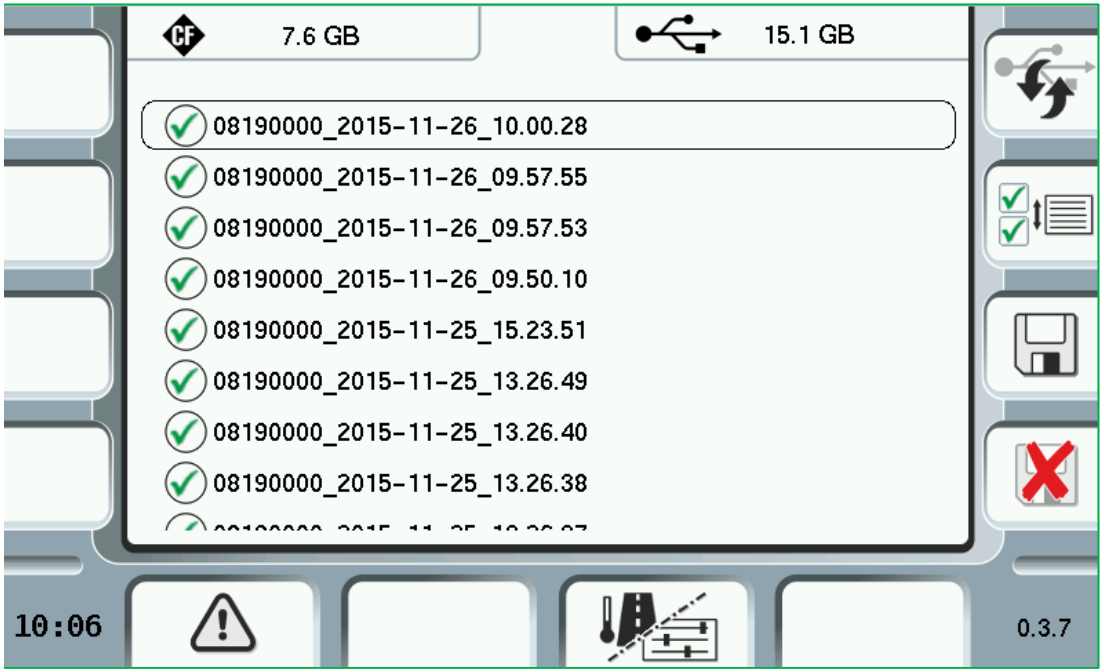
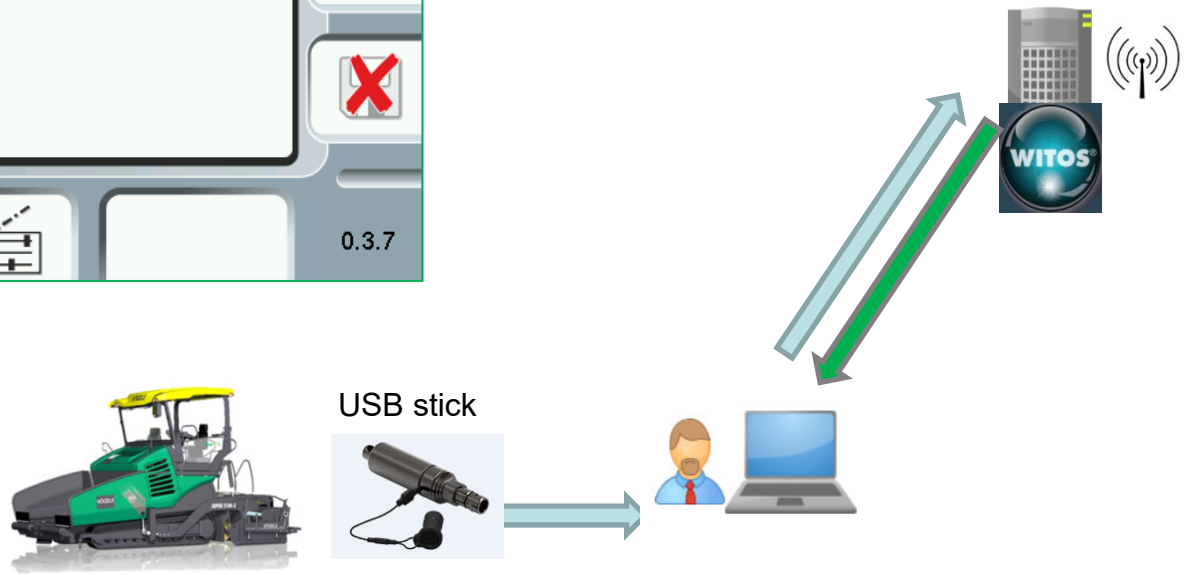
Data are copied to a USB stick

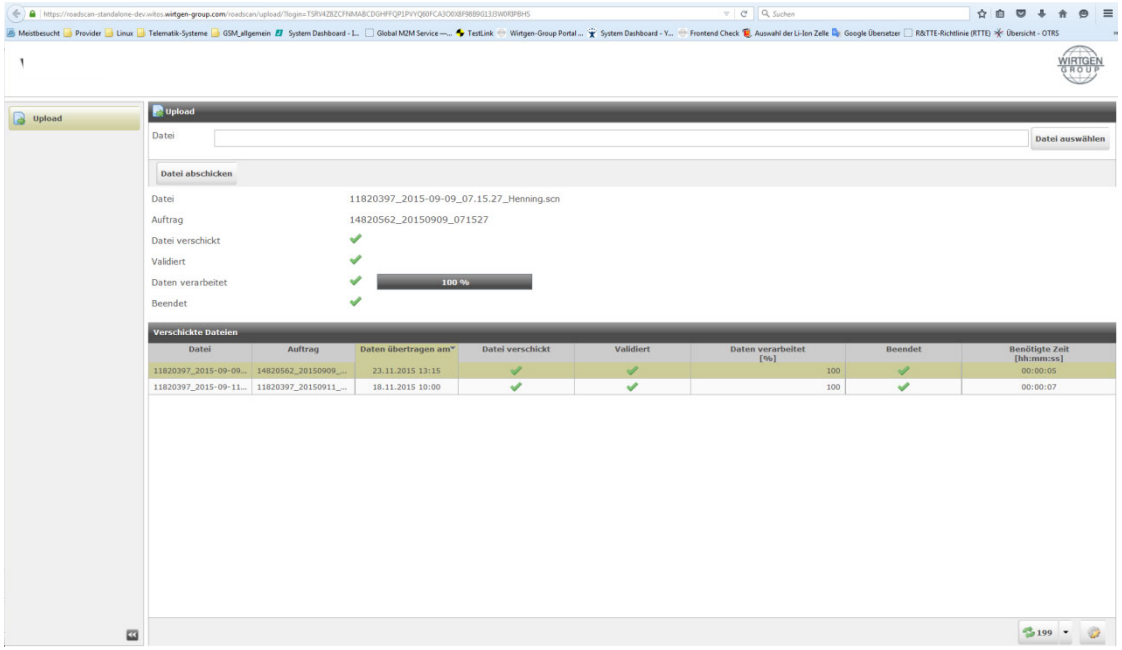
- Data is uploaded to Wirtgen server using RoadScan Upload tool





RoadScan Operation

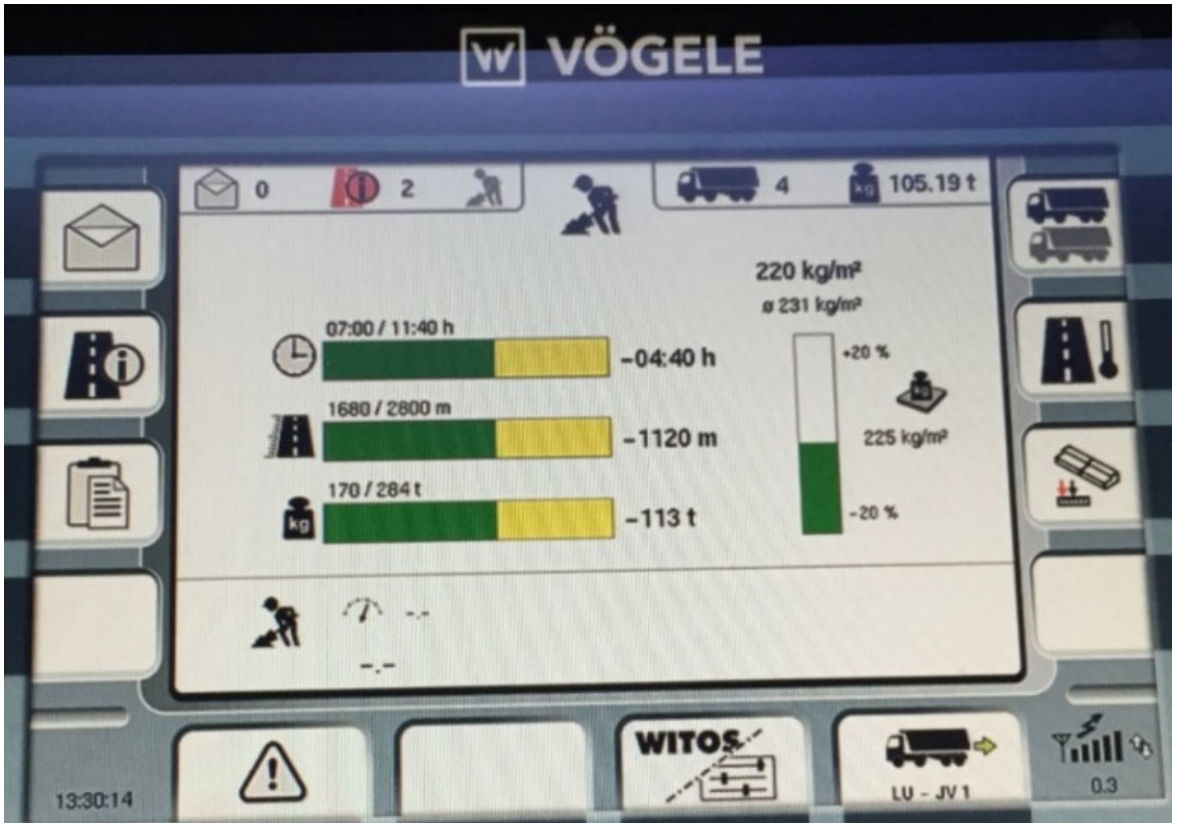
Data uploaded to Wirtgen server using RoadScan Upload tool



WITOS Trucking Module:

Trucking & Messaging Information – Used in Europe:

- *Number of trucks / Tonnage on the road*
- *Tons Laid / Tons to be laid*
- *Messages from the Plant*



Paving Crew Responsibility

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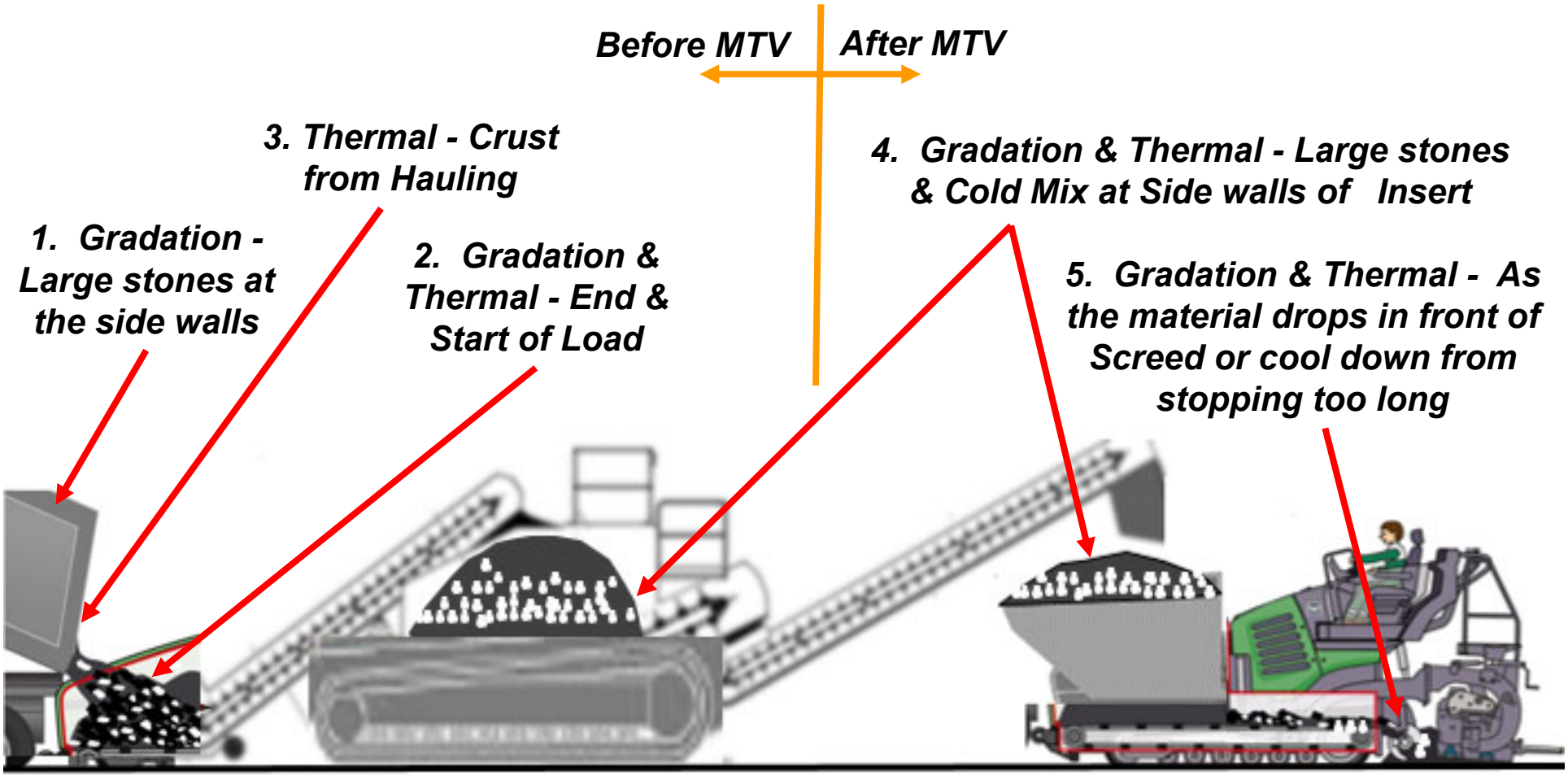
Manage the 5 Forces

- *3 of the 5 Forces Using Control Features*
- *2 of the 5 Forces by managing Segregation at 5 typical locations*



QUESTIONS

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For More Info On Paving

https://tinyurl.com/paving-academy-FIU