WIRTGEN GROUP

VÖGELE

INNOVATIONS IN HMA PAVING - RECENT ADVANCEMENTS

L. Nars, Application & Technology Specialist

Old Controls VS Current Controls

Principles of the Free Floating Screed

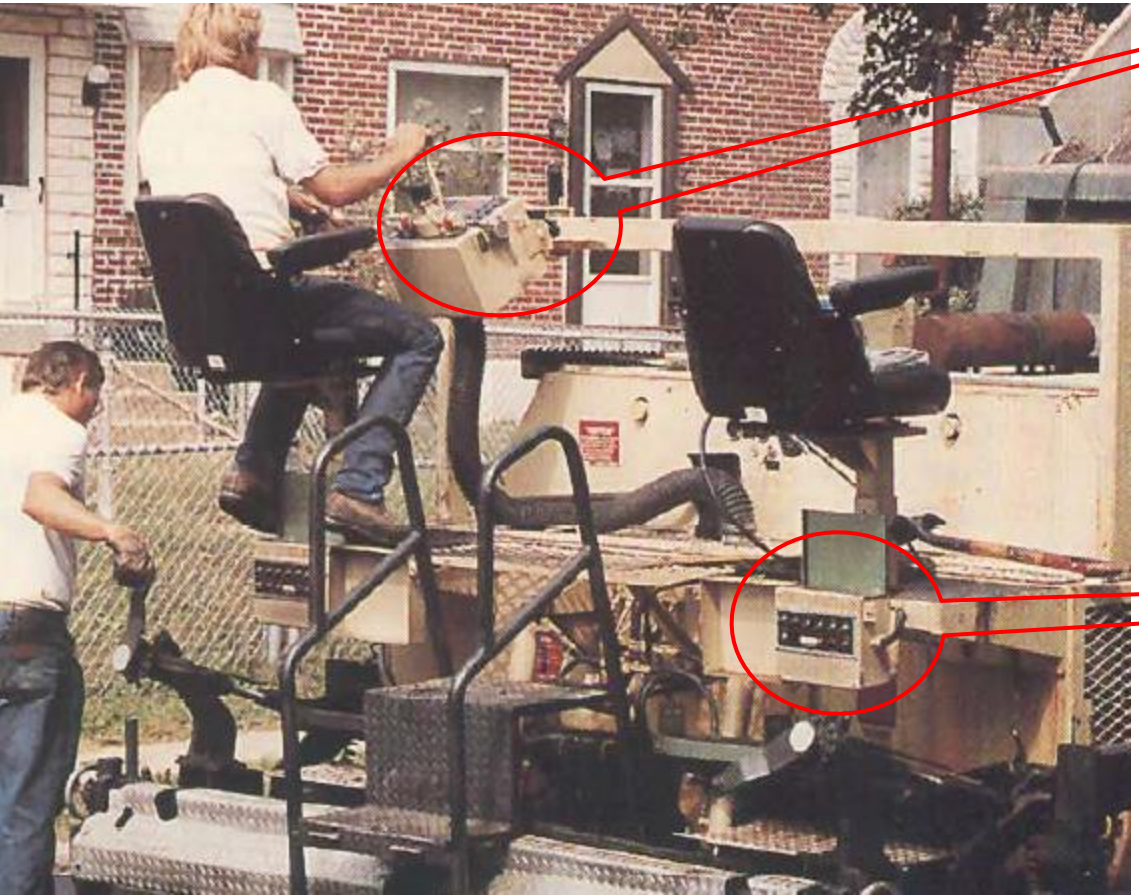
FHWA & States Use of Intelligent Construction Technology

Vögele Intelligent Construction Technologies

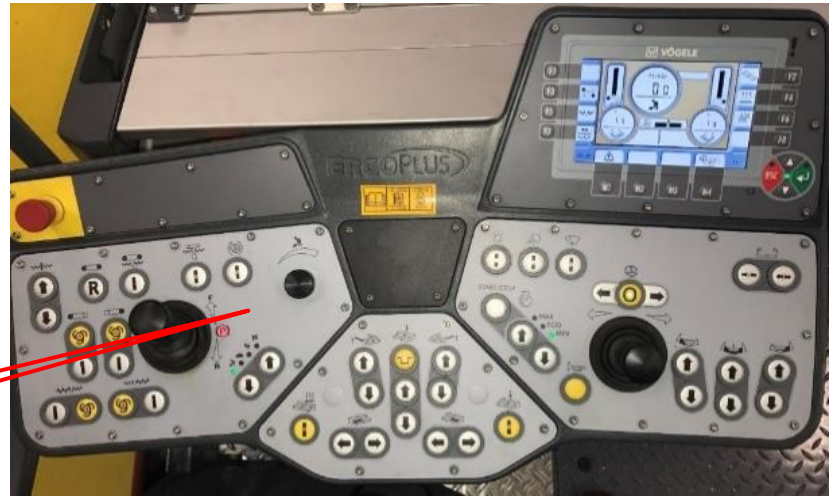
Paver Controls – Past & Present

From Mechanical Levers to Intelligent Controls

Past Early 90's



Present



What Is Paving???

VÖGELE

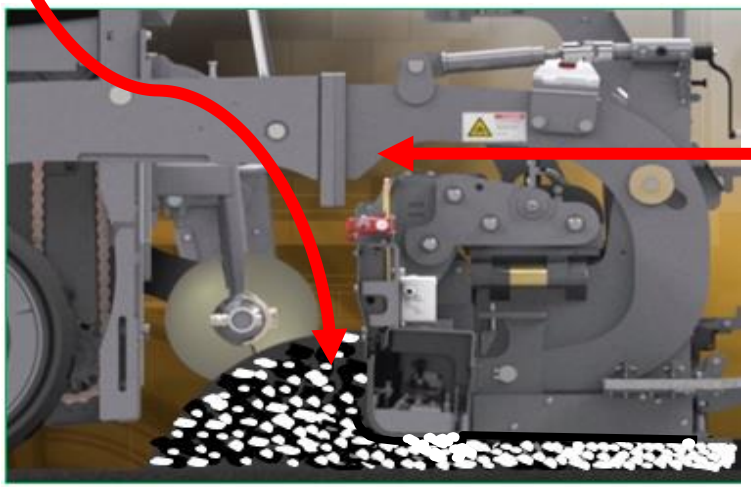
Laying a Hot Mixture of Aggregate, Sand, Asphalt Cement & Air Voids

- ***To a specific Depth & Width & Removing Air Voids***
- ***Asphalt Cement act as Lubricant and …… a Glue at Lower Temperature***

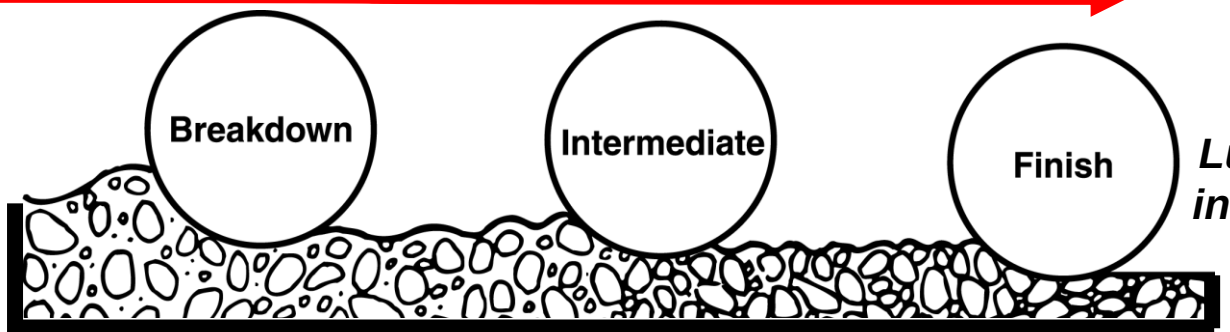
Temp. at Delivery

Temp. at Loading

Temp. Laydown



Asphalt Should act as Lubricant



Temp. for Asphalt to Remain a Lubricant. Turn into a Glue after

Principle of the Free Floating Screed

VÖGELE

The screed Floats on the Asphalt like a Water Skier

- ***Pavement Depth …… Held by 5 Forces ….. Not a Mechanical or Hydraulic Lock***

Principle of the Free Floating Screed

Controlling the Pull Force P

- Precise Steering with Trim Steer

Controlling the Pull Force P

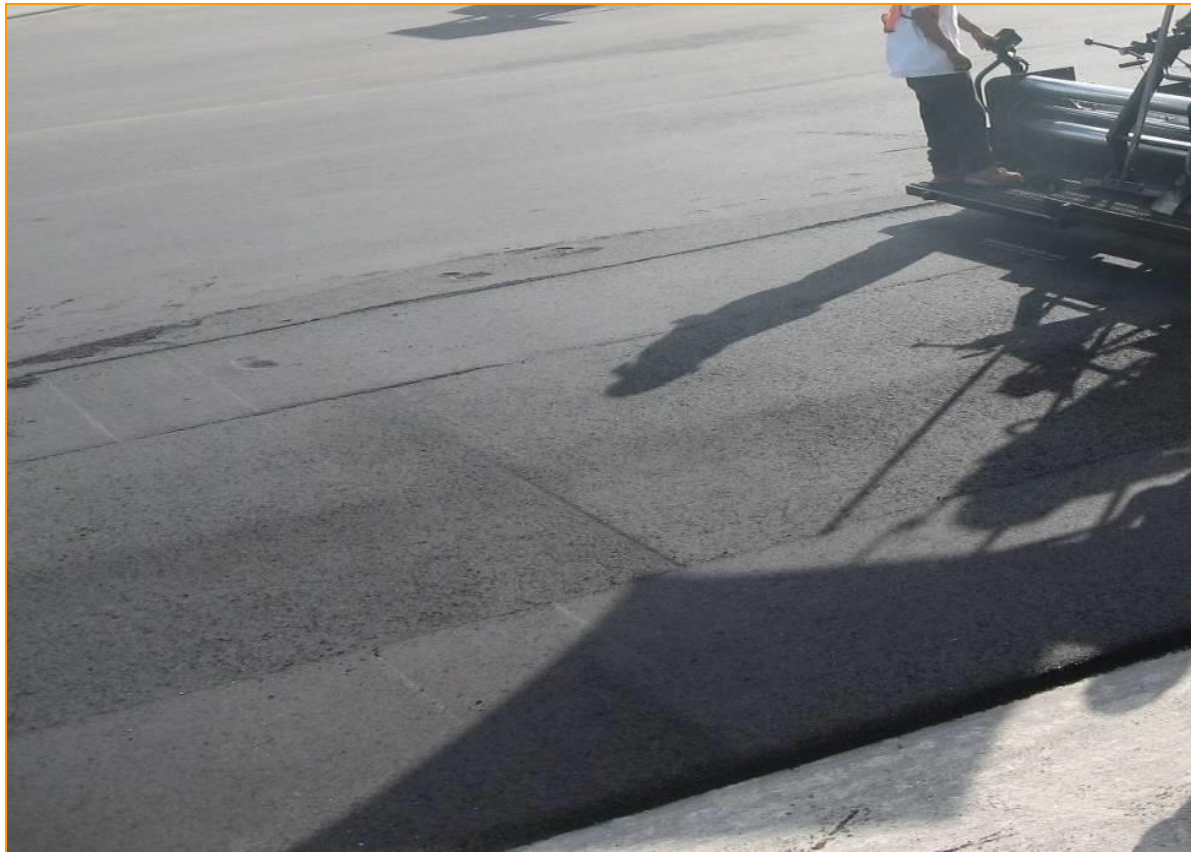
- 3D Controls of all 3 Dimensions
- Easy to realign Crown / Slope etc.

3D Paving

Principles of the Free Floating Screed

Issues Affecting Force # 1 - Pull Forces (P):

- Stopping cause Settling & Humps
  - Use Screed Hold & Freeze when Available to Reduce Settling & Humps
  - Operators - Disengage Neutral Lock and Start Moving Instantly

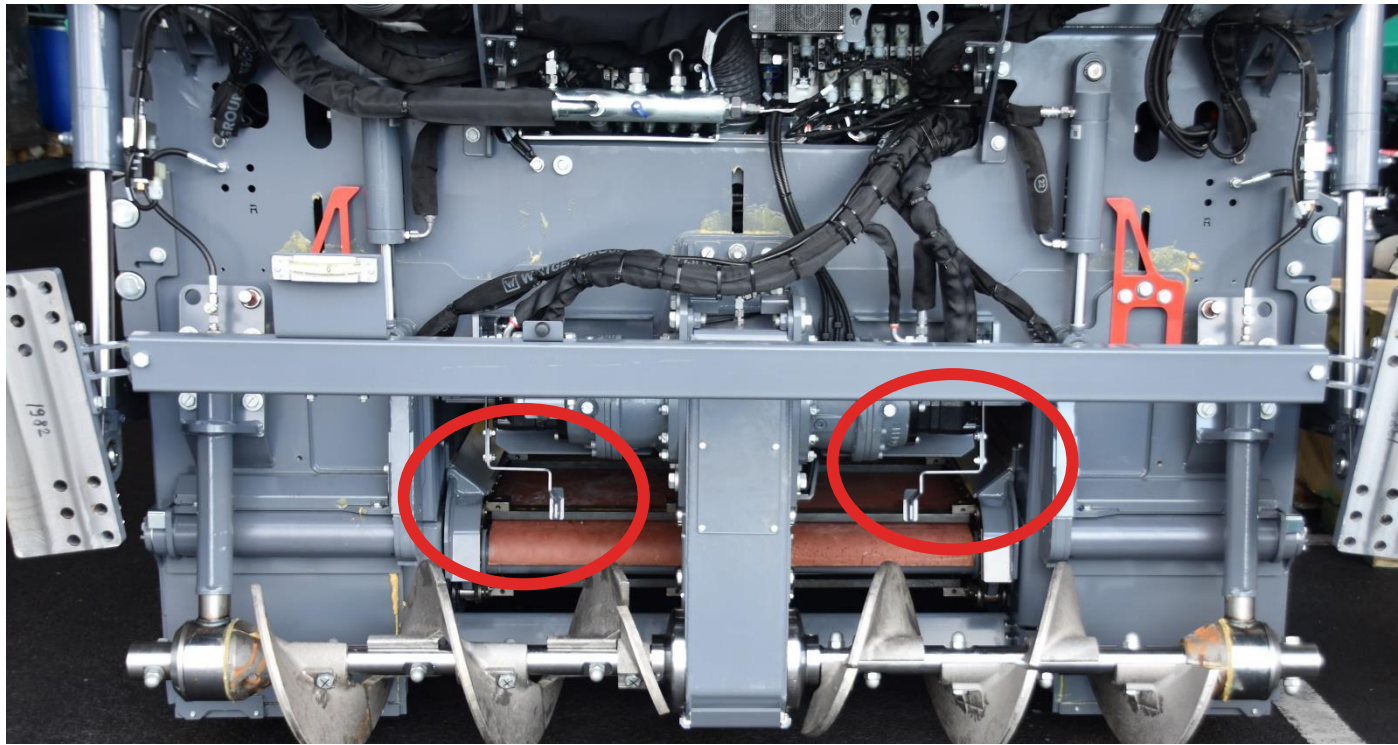


Principles of the Free Floating Screed

Controlling the Head of Material (M):

- Use Auger Sensor to Set material Height at Endgate
- Conveyor sensors to Regulate material delivery
  - Providing Precise delivery of material being Laid

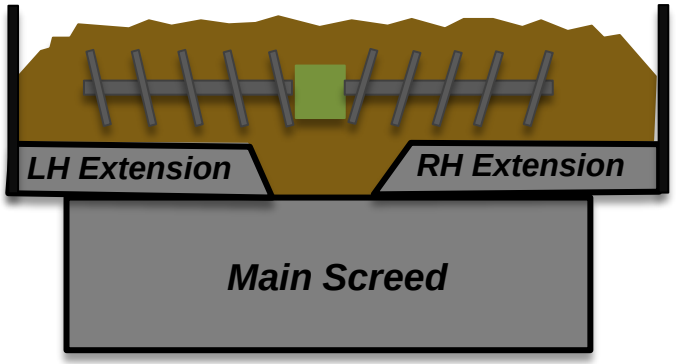
Wide Paving
VF Airport



Principles of the Free Floating Screed

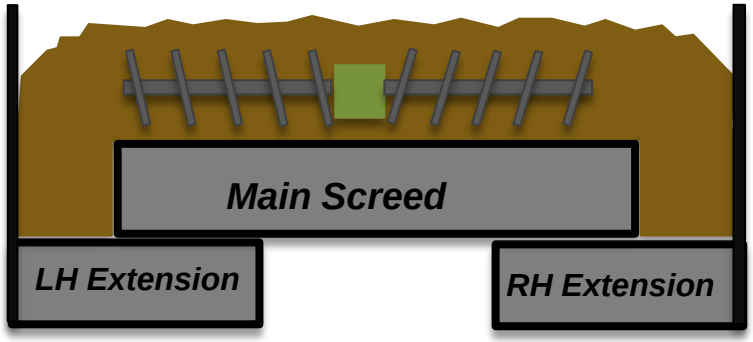
Weight of the Screed (W) - Constant

- Several Types of Floating Screeds - All Places 0 Slump Material
- Application Determines Screed Type



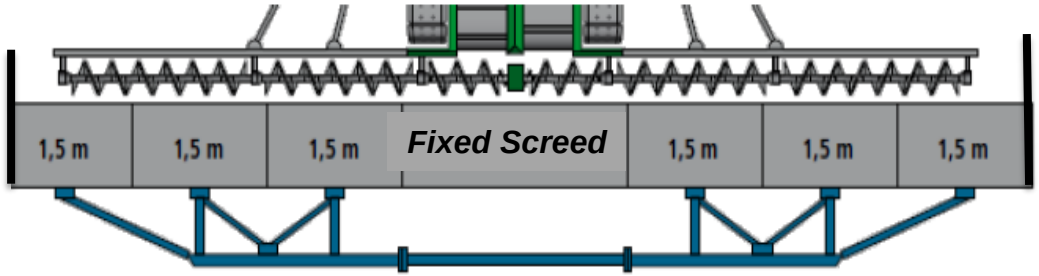
Unequal Width Front Mount Vibratory Screed

78 to 89% Density

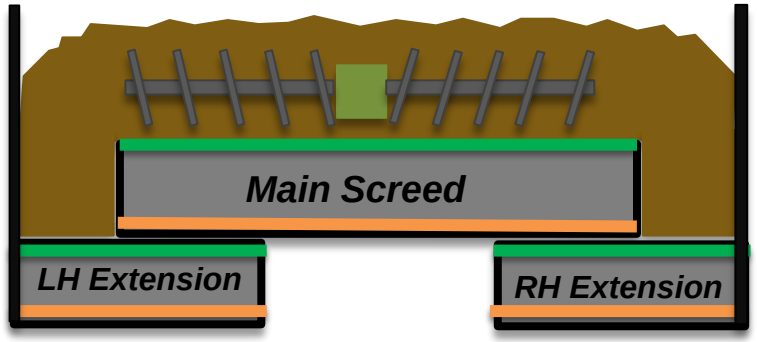


Rear Mounted Extensions Vibratory Screeds

90 to 98% Density



Fixed Screed - Compaction & High Compaction – Max 60' Wide (Hydraulic Extensions Optional)



Rear Mounted Extensions Compaction & High Compaction Screeds – Max 33' Wide

Principles of the Free Floating Screed

VÖGELE

Inline

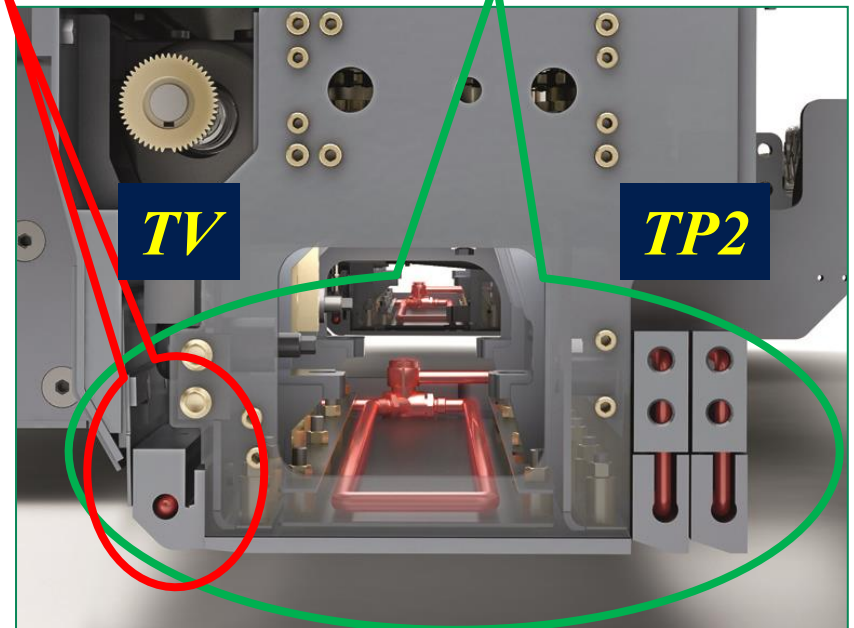
Compaction & High Compaction Screeds:

1. Vibratory – No Reciprocating Devices
2. Compaction Screed: Vibration & 1 Tamper Bar (TV)
3. High Compaction Screed: 1 Tamper Bar and 2 Pressure Bars (TP2)

Vibratory Screed: 0 – 6”

Compaction Screed: 0 – 8”

High Compaction Screed: 0 – 12”



Principles of the Free Floating Screed

Weight of the Screed (W)

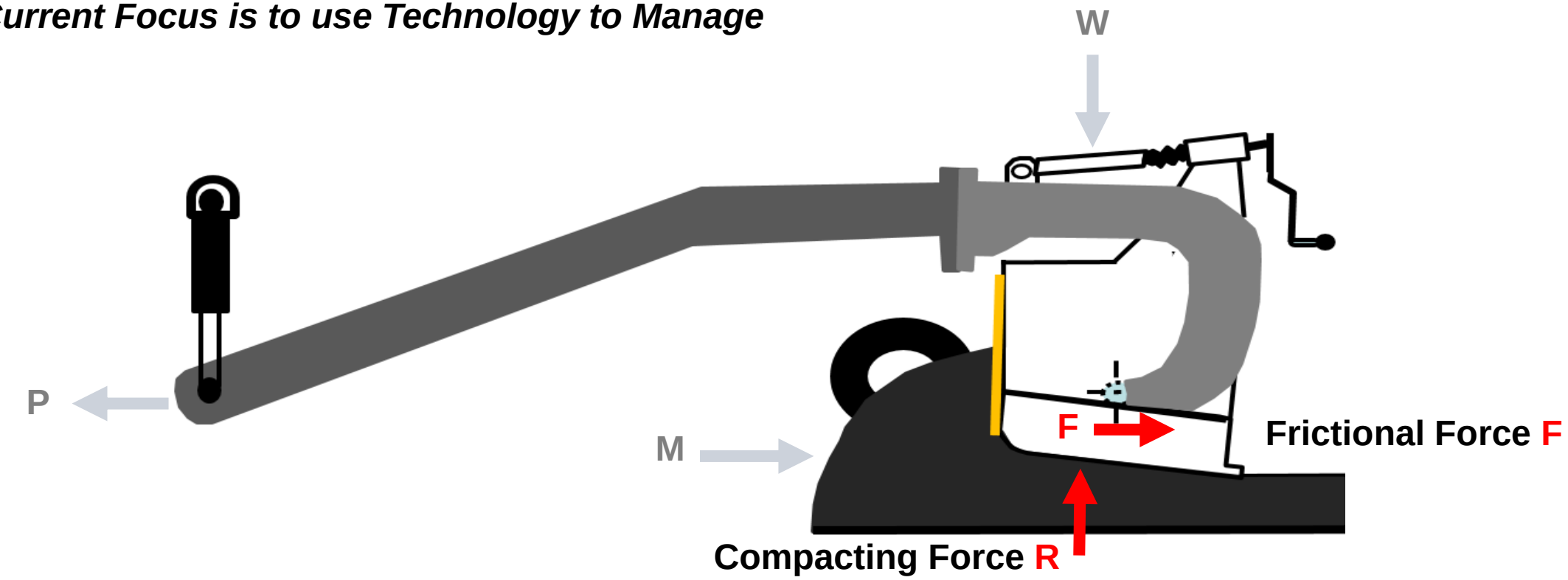
- Versatility is important to Most today
- Heavier Screeds generally more Rigid – Can Pave Wider
  - More Stable for Mainline Paving / Stiffer Mixes

VF
Airport

Principles of the Free Floating Screed

Controlling R & F

- Changes with the Mix Internal Frictional Resistance
  - Which Changes with alteration of any of the following:
    - Gradation……..Asphalt Cement……..Temperature
- All of which changes with Segregation & Impact Density
- Current Focus is to use Technology to Manage

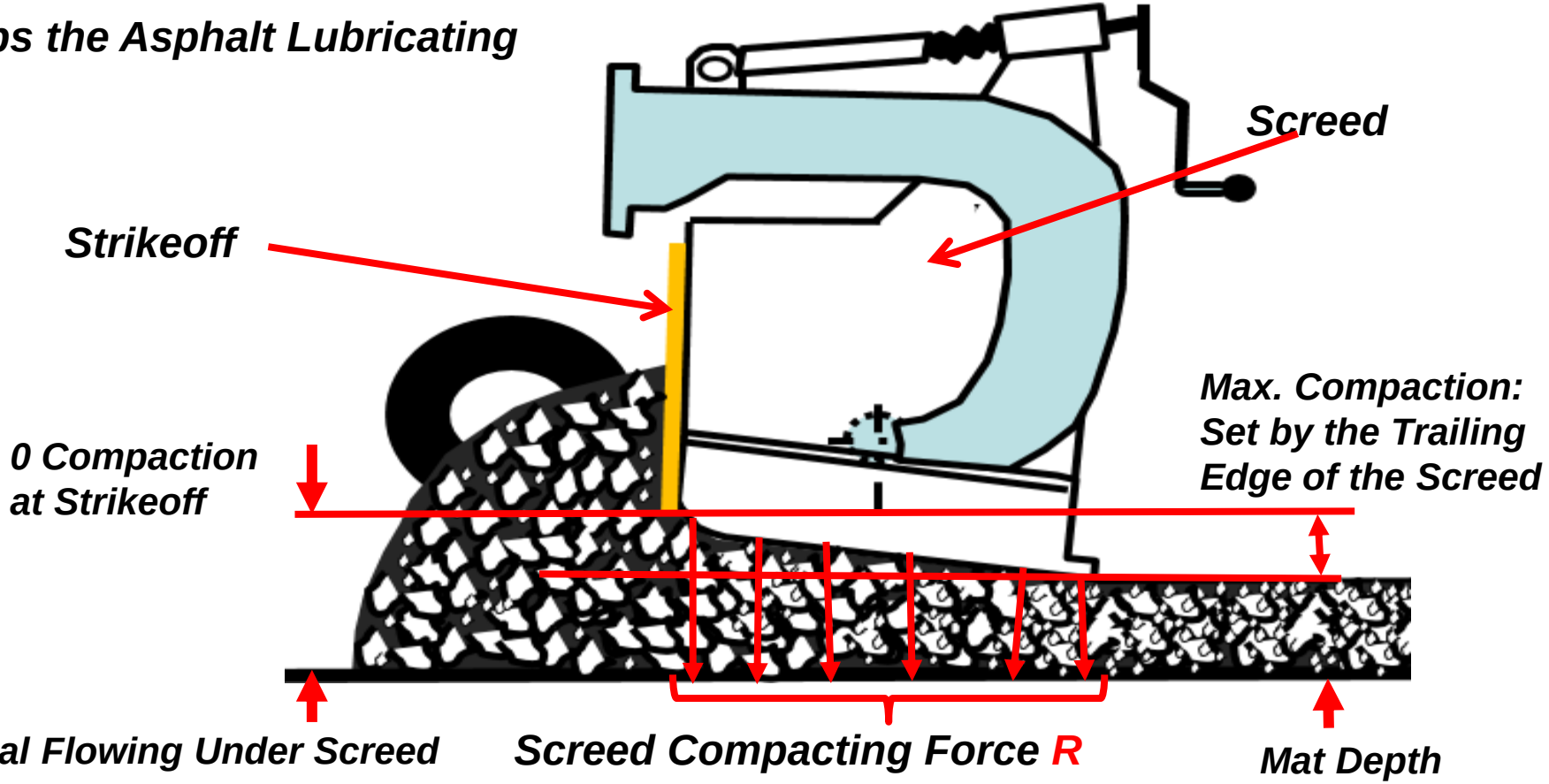


Principles of the Free Floating Screed

VÖGELE

Segregation - Large Stones Separate from the Fines during handling

- Asphalt & Fines acts as Lubricant & Bearings
- Allows Larger Aggregate to move during Compaction
  - Heat & Asphalt embedded in the Fines
  - Temperature keeps the Asphalt Lubricating



Principles of the Free Floating Screed

Impact of Gradation Segregation

- Thermal Segregation a Symptom of Gradation Segregation
- Roughness from Screed Reaction to Segregation

New Pavement

Low Density

- Low Fines
- Low Asphalt
- Low Temperature

Raveling - Premature Failure

Principles of the Free Floating Screed

Impact of Gradation Segregation

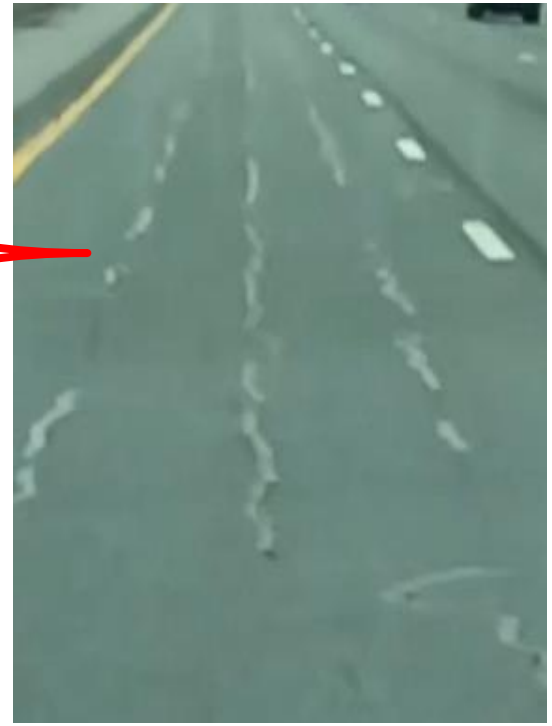
- Thermal Segregation a Symptom of Gradation Segregation
- Not enough Segregation to Affect Screed Performance

New Pavement

Low Density

- Low Fines
- Low Asphalt
- Low Temperature

Premature Crack



Intelligent Machine Control

Hot Topics &Transportation Research Board (TRB)

	Flexible Pavement		
Tuesday, January 10 10:15 AM – 12:00 AM ET	3099 – Asphalt Pavement Construction and Density – Segregation, and Optimized Cold Milling Operations	Poster Session	AKC60
Tuesday, January 10 1:30 PM – 3:15 PM ET	3121 – Innovations in Asphalt Thermal Segregation Detection and In-Place Recycling	Lectern Session	AKC60
Wednesday, January 11 9:00 AM - 10:45 AM ET	4009 - Quality Assurance and Balanced Mix Design	Lectern Session	AKC30, AKC60, AKM10, AKM30, AKM40
Thursday, January 12 9:00 AM - 12:00 AM ET	5003 – Permit Vehicle Weigh-In-Motion Data Fusion to Improve Freight Knowledge	Workshop	ACP70, ACP15, ACS60, ACS30, AKB20, AKB40, AKC50, AKC60, ATO15, ATO60
Thursday, January 12 9:00 AM - 12:00 PM ET	5006 - Implementing Dielectric Profiling System and Paver Mounted Thermal Profiler for Real-Time Quality Control	Workshop	AKC30 AKC60 AKM10 AKT10

FHWA SHRP2 – Strategic Highway Research Program 2

SHRP2 R06C Goal

Advance solutions to measure and quantify non-uniformity of asphalt mixture construction

Paver Mounted Thermal Profiler (PMTP)

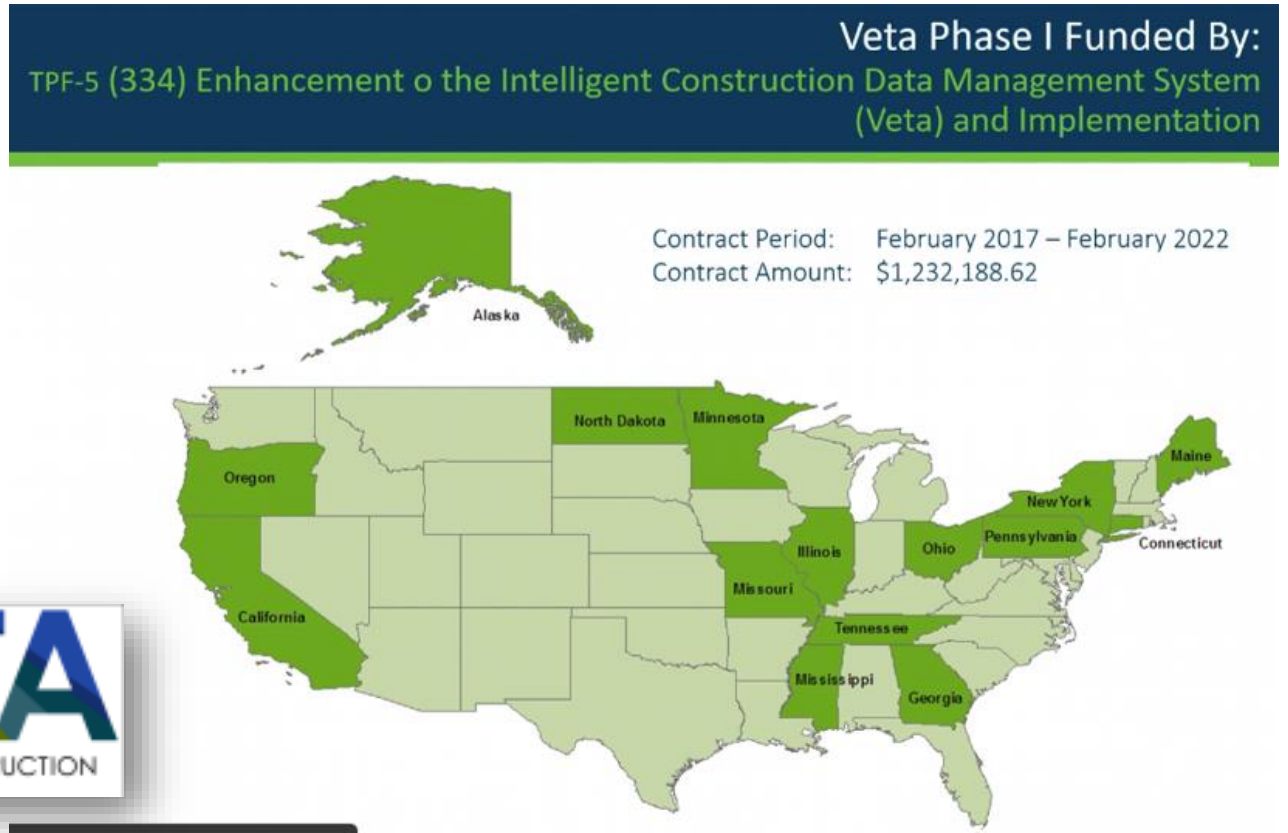
Ground Penetrating Radar (GPR) Dielectric Profiling System

GSSI PaveScan Rolling Density Meter (RDM)

Data Source - FHWA

Intelligent Construction Technologies

1. *PMTP – Paver Mounted Thermal Profiler*
2. *Intelligent Compaction*
3. *Dielectric Profile System (DPS), GPR Technology for Density check*
4. *Material Delivery Management System – Tentative Release Date 2025*
5. *3D Milling & Paving*
6. *IRI – Smoothness*



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IRI Superimposed on PMTP Lat & Long

- Relationship of Segregation & Smoothness

Intelligent Construction Technologies (MDMS)

VÖGELE

In Veta

Funded & Under Contract

Funding Approved

Unfunded Needs

Virtual Roadway (BIM)

Download Veta Software:
https://www.intelligentconstruction.com

Intelligent Construction Technologies - MDMS

VÖGELE

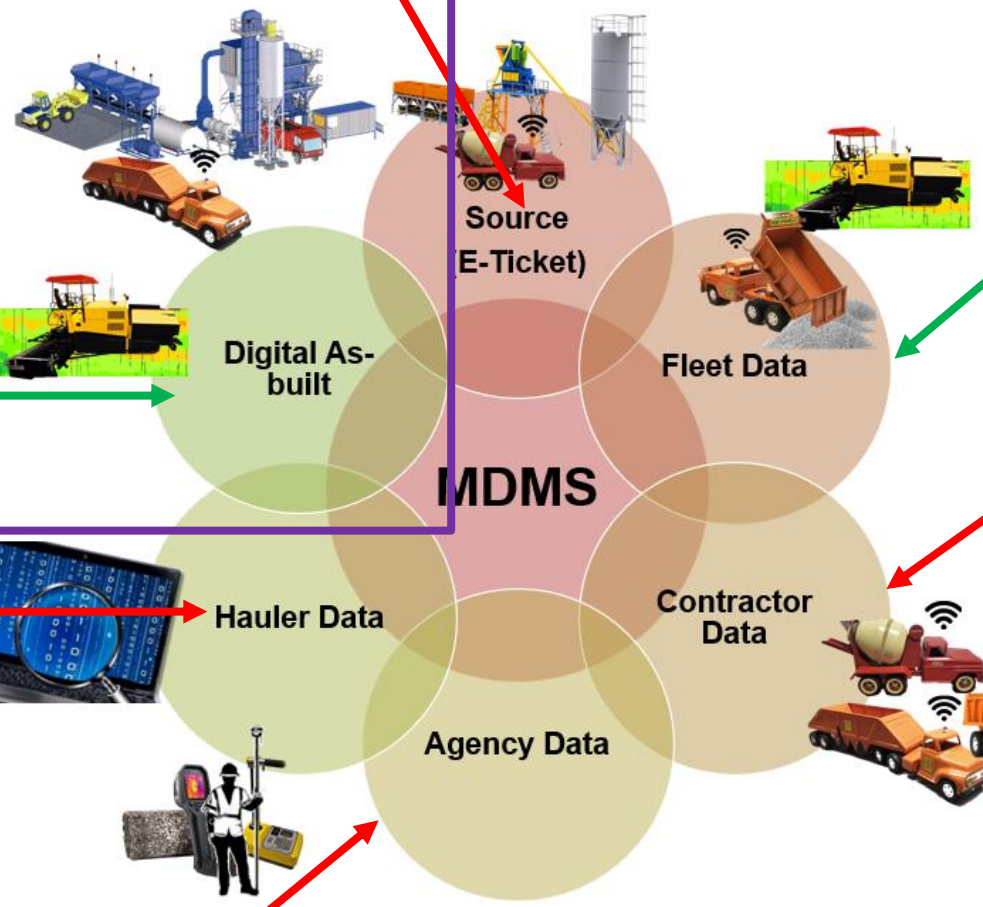
Digital "As Built" – 1 of 6 Modules

TicketNum
LoadNum
TruckID
TrailerID
VoidedTicket
LoadDateTime [a]
GrossWt
NetWt
TruckTareWt [b]
DailyRunningTotalByMixDesignWt [c]
ContractTotalByMixDesignWt [c]

DateTime
Lat
Long
spatial-ref-authority
spatial-ref-id
MixDesignBulkDensity
AsBuiltPavingDist
AsBuiltPavingWidth
AsBuiltAreaPaved
DesignUncompact Dpth
AsBuiltUncompt Dpt
DesignYield
AsBuiltYield
YieldVarQTY
YieldVarPC
PaverStopDur
PaverSpeed

Long Description
Agency Sample Identification
Agency Matl Temperature at Field
Agency Air Temperature
Agency Split Load 1 Weight
Agency Split Load 1 Pay Item
Agency Split Load 1 Location Note
Agency Split Load 2 Weight
Agency Split Load 2 Pay Item
Agency Split Load 2 Location Note
Agency Split Load 3 Weight
Agency Split Load 3 Pay Item
Agency Split Load 3 Location Note
Agency Wasted Material Weight
Agency Load Acceptance and Rejection
Agency Partial Rejected Load Weight
Agency Dump Station Number
Agency Field Notes
Agency Inspector Identification
Agency date and time

Contractor Job Number
Hauler Company Name
Broker Name
DOT Number
Truck Identification
Truck Driver Classification
Overweight Permit Number
Maximum Gross Weight
Driver Name
Shift Start Date and Time
Shift End Date and Time



Reference Field No.	Long Description
33	Dump Equipment Identification
34	Dump Geofence Name
35	Dump Date and Time
36	Dump Latitude
37	Dump Longitude

Reference Field No.	Long Description
82	Contractor Sample Identification
84	Contractor Material Temperature at Field
85	Contractor Air Temperature
86	Contractor Split Load 1 Weight
87	Contractor Split Load 1 Pay Item
88	Contractor Split Load 1 Location Note
89	Contractor Split Load 2 Weight
90	Contractor Split Load 2 Pay Item
91	Contractor Split Load 2 Location Note
92	Contractor Split Load 3 Weight
93	Contractor Split Load 3 Pay Item
94	Contractor Split Load 3 Location Note
95	Contractor Wasted Material Weight
96	Contractor Load Acceptance and Rejection
97	Contractor Partial Rejected Load Weight
98	Contractor Dump Station Number
99	Contractor Field Notes
100	Agency Staff Identification
101	Contractor date and time

Circle Chart - Courtesy Rebecca Embacher, MnDOT

Intelligent Construction Technologies – e-Ticketing – US Direction

VÖGELE

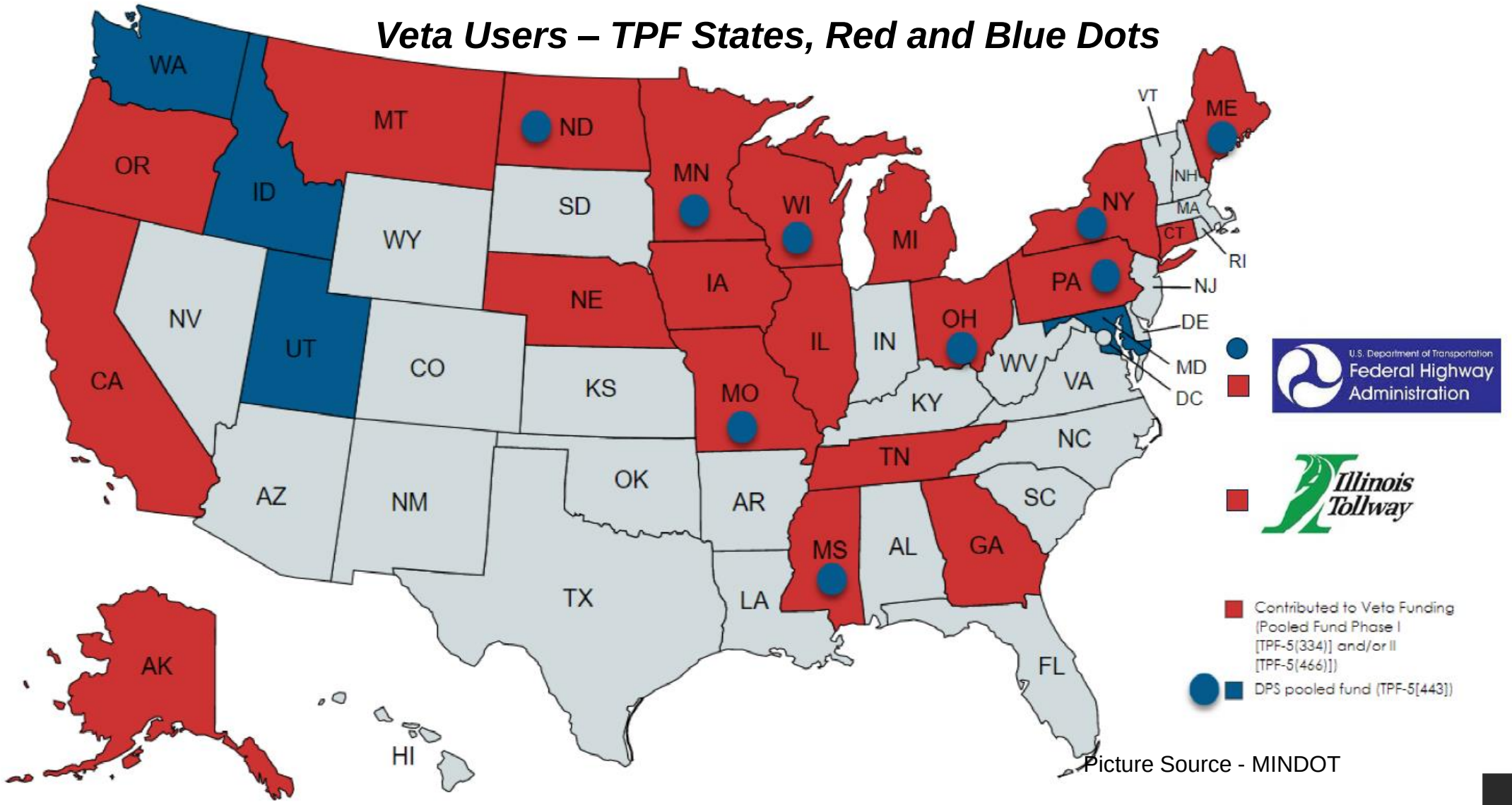
FHWA e Ticketing Implementation Goals

Picture Source - FHWA

Intelligent Construction Technologies – Veta Users

VÖGELE

Veta Users – TPF States, Red and Blue Dots



Picture Source - MINDOT

States that have contributed/contributing to Veta funding

Intelligent Construction Technologies – Who can Deliver

VÖGELE

3 Groups of Companies

- ***Each Group with different Core Competency***
- ***Equipment Manufacturers design to US State Specifications***
  - ***Providing Data with their Analysis***
- ***Other SW Companies will Provide the Analysis***

E-Ticketing Solution Providers	Positioning Service Providers	Equipment OEM's
HaulHub	Topcon	John Deere Wirtgen
Fleet Watcher	Trimble	CAT
XBE	MOBA	Bomag
Command Alkon	??	Astec
??	??	??

Intelligent Construction Technologies – 2024 Convention

VÖGELE

ISIS 2024 Convention

- ***Sept. 10-12 in Orlando***

Intelligent Construction Technologies – MOBA & Topcon PMTP System

MOBA & Topcon PMTP System

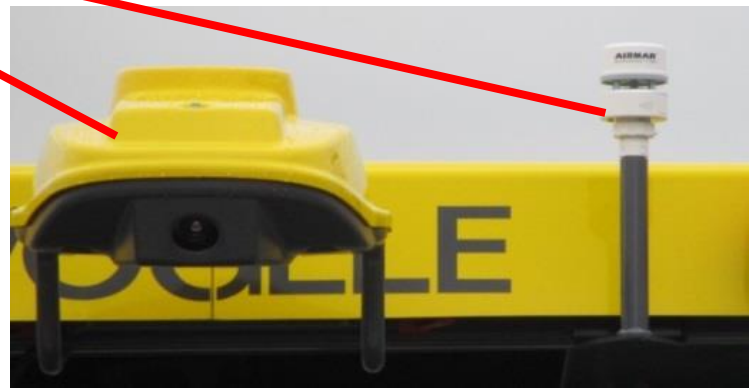
- Hang on Installation

Intelligent Construction Technologies – Vögele PMTP

Ground temperature measurement

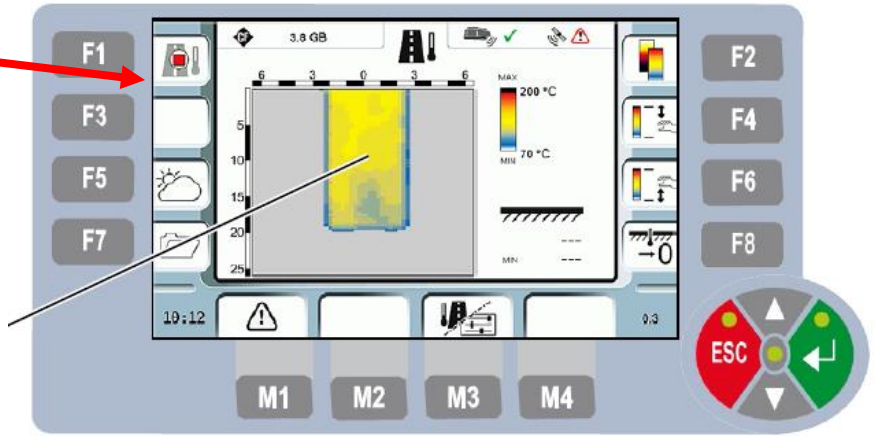
Integrated Odometer for Paver Distance

Weather station (optional)



ThermoScan & GPS Receiver

Operator Monitor Thermal Profile on console



Analysis done with Veta Software

Intelligent Construction Technologies – Vögele PMTP

VÖGELE

Integrated into the Paver Systems

- *All connections part of Paver Electrical System*
- *Speed sensor part of Vögele ErgoPlus Operating System*
  - *Speed Sensors RPM have Inaccuracies ……based on Slippage*

Intelligent Construction Technologies – Vögele PMTP

File Name – Automatically Ctreated:

- ***Machine S/N, Date and Time***

Data:

- ***Geoposition***
- ***Temperature, at Back of Screed***
- ***Odometer value per measurement***
- ***weather and Ground data (optional)***

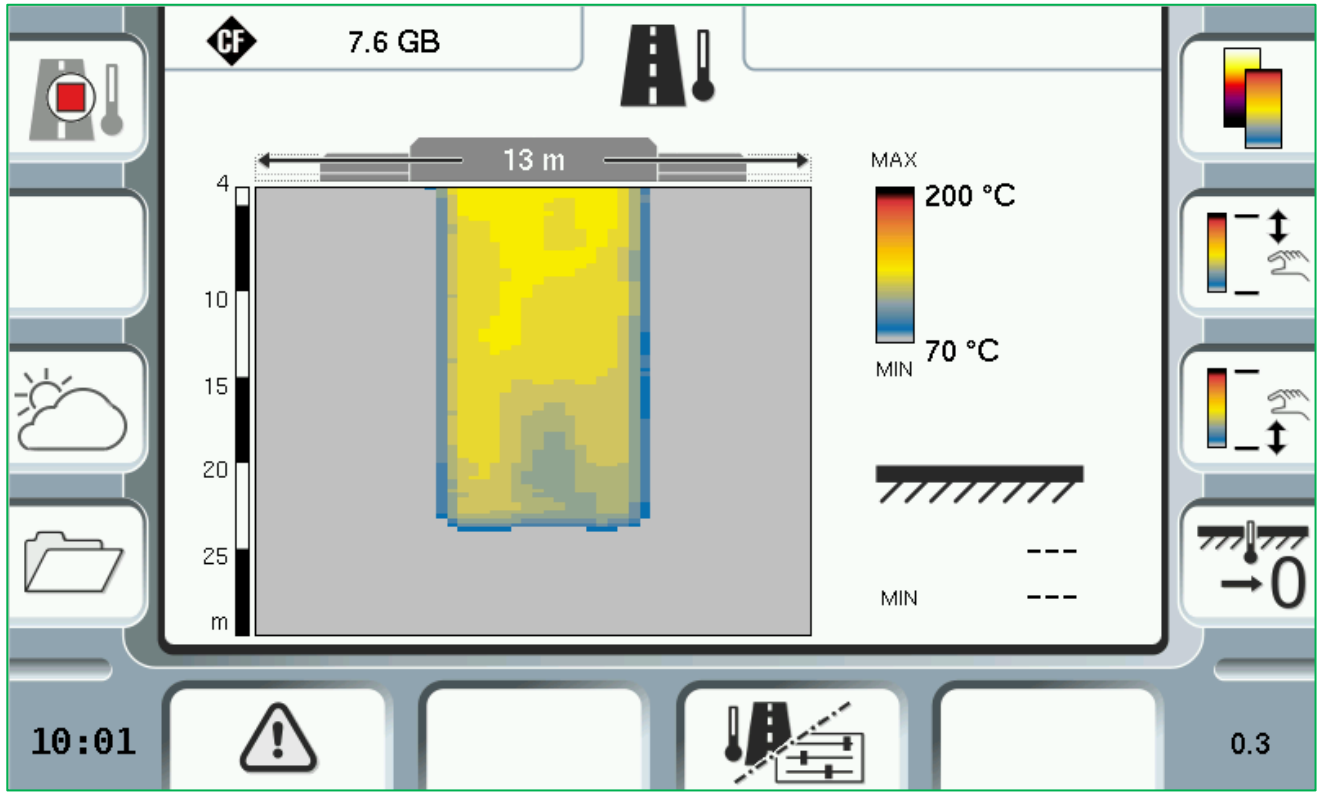
Dispaly: on Tractor Control

- ***On Tractor Control - Operator Monitors***

Operation:

- ***Tractor Operator Turns On / Off***
- ***Site Manager Download on USB***
- ***Upload to WITOS Paving / Export to Veta***

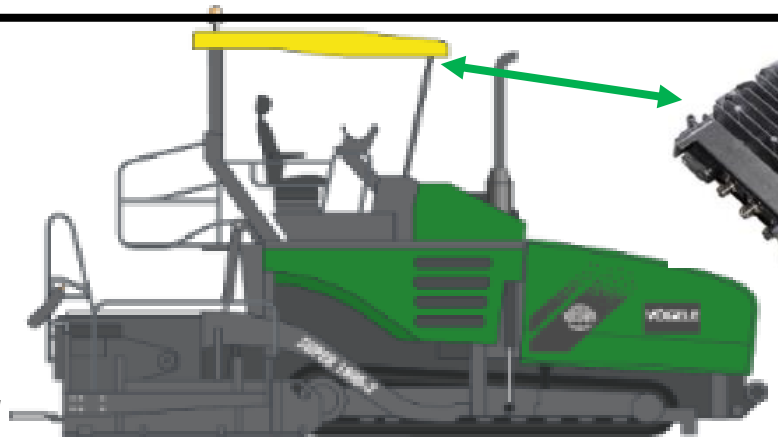
Start / Stop



Intelligent Construction Technologies – Vögele PMTP / Additional Features

Vogele PMTP with Direct Download of Data

- *TCU on Paver - builds WIFI network arround paver & Communicate with Wirtgen Server*
- *Smart Phone With Android App Communicate with TCU*
- *WITOS Server Generates E Mail with Data Link and Report*



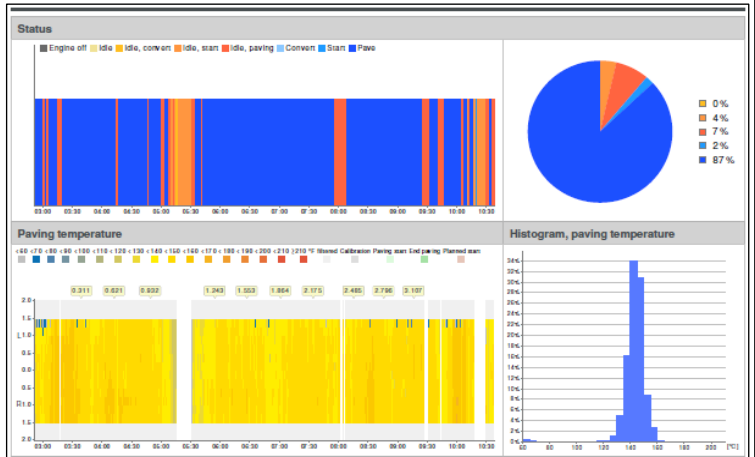
Smart Devise In Foreman Vehicle Shows T, L, W & Speed

TCU for Direct Download of Data

Data Link e mail to Veta Users

WITOS Server

Report e Mail to Users



250‘ Wi-Fi Range

250‘ Wi-Fi Range

Smart Devise Breakdown Roller Cab

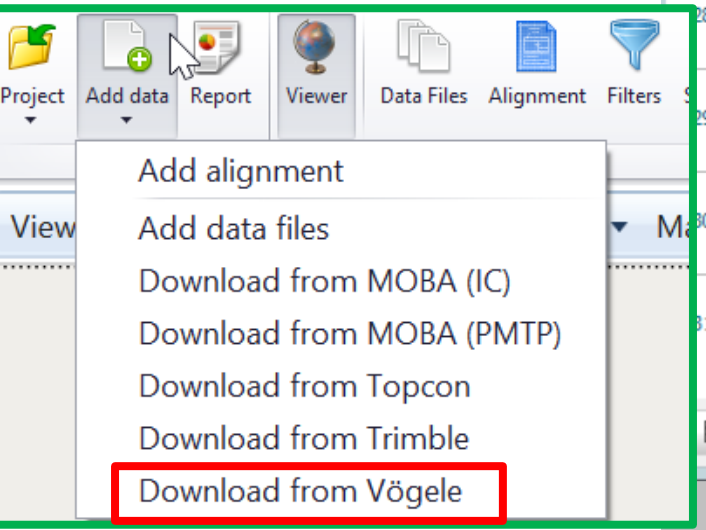
Intelligent Construction Technologies – Vögele PMTP / Additional Features

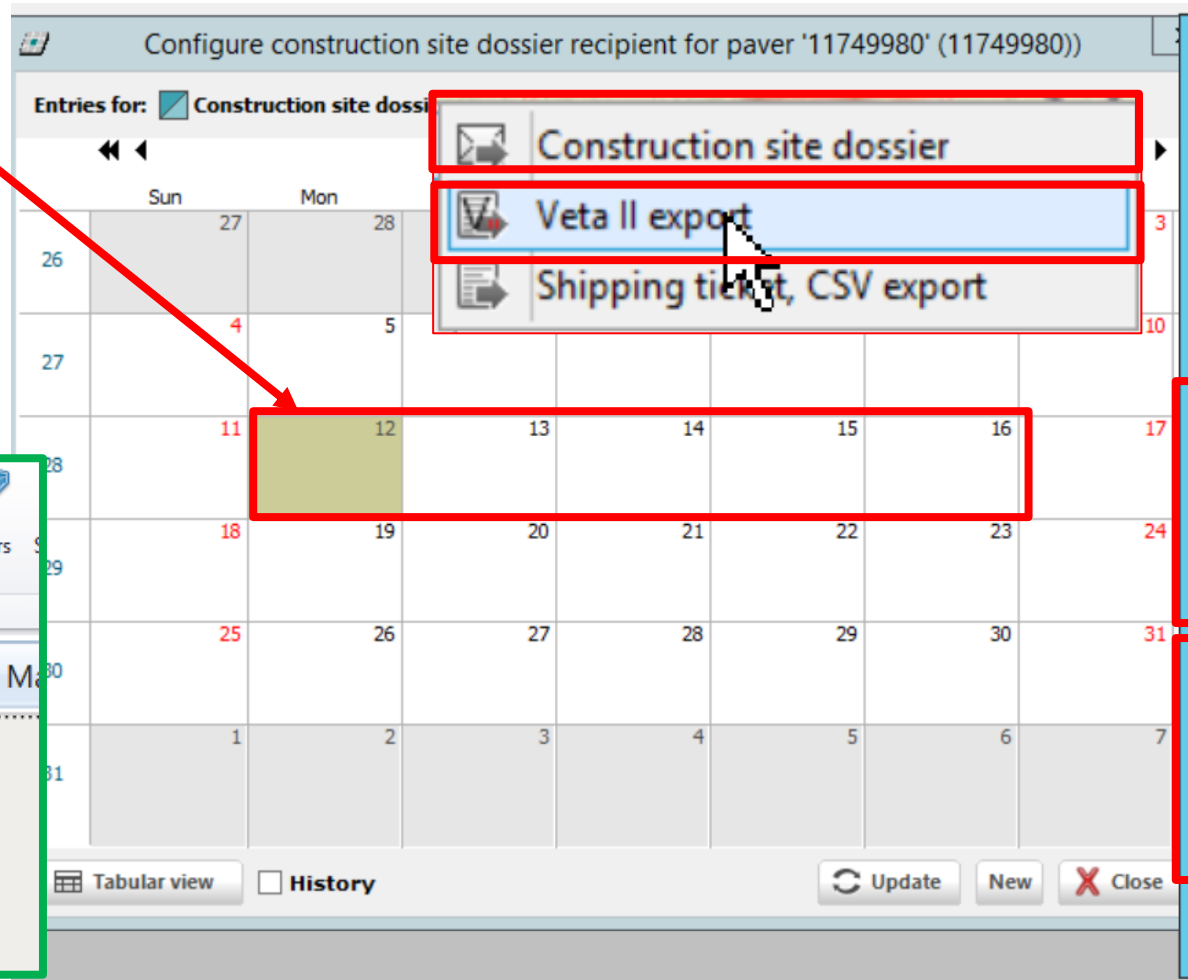
Direct Download Using a TCU

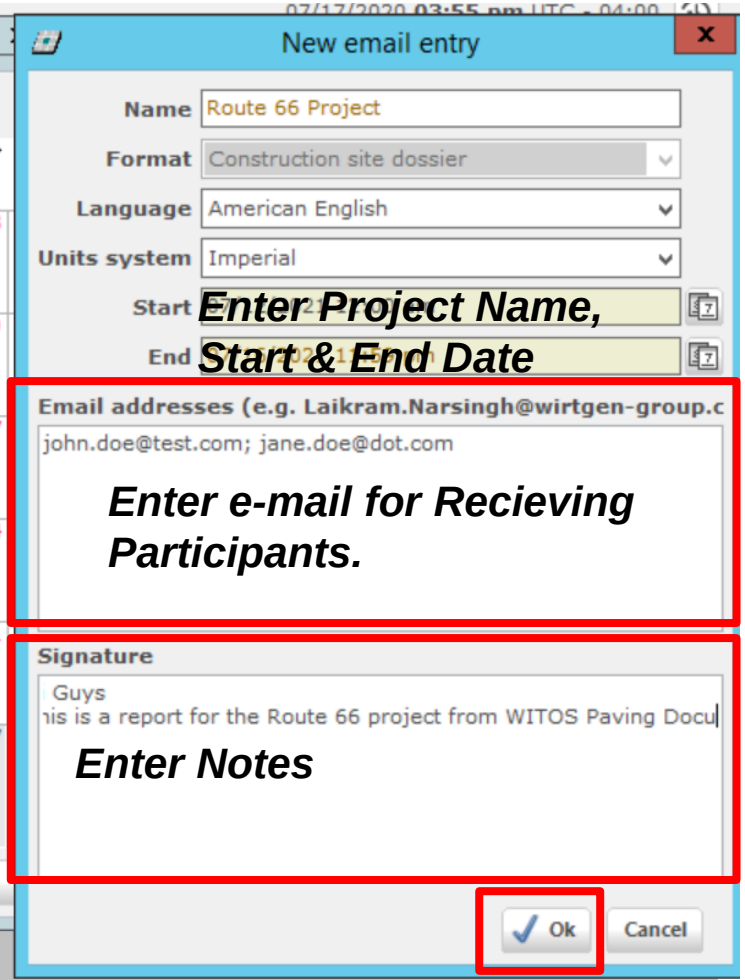
- Click on Veta II Export to Set up Job details & Who gets the Data

Selet Project start and End Date

Select Download Box from Veta







Intelligent Construction Technologies – Vögele PMTP / Additional Features

Complete – Automatically Email report & Data to all on List

VÖGELE

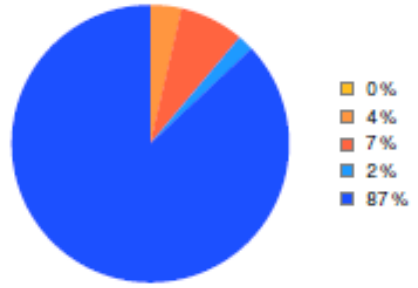
WITOS® PAVING

Construction project: ---

Daily lot: 11749980_20200820_195228 (11749980_20200820_195228)

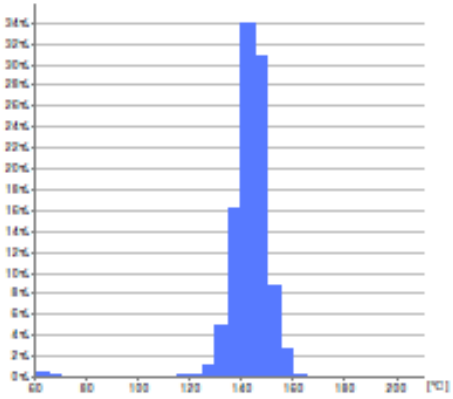
Pavers: 11749980 (11749980)

Status



Paving temperature

Histogram, paving temperature



Ship. tickets

Waiting time

Intelligent Construction Technologies – Vögele PMTP / Additional Features

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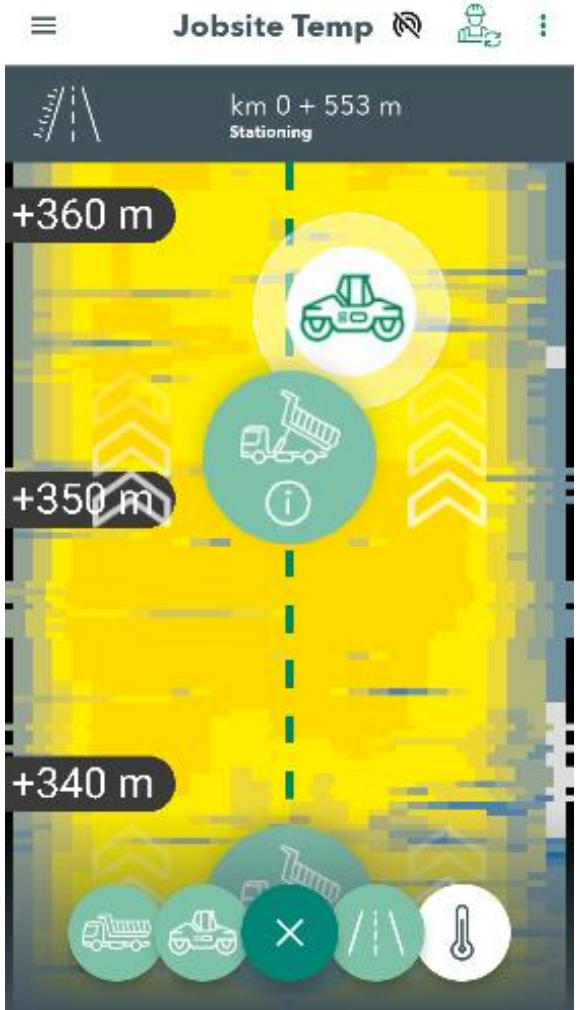
Thermal Profile if available ……Display in Roller Cab – 250' Radius

- ***Breakdown Roller Operator See Thermal Profile on a Tablet***
  - ***Roll accordingly***



Intelligent Construction Technologies – Vögele PMTP / Additional Features

Screed Width Sensor

- Precise Paving Width Data
- Easy Filtering of Cold Edges when using PMTP Systems

Intelligent Construction Technologies – Vögele PMTP / Additional Features

Screed Width Sensor

- **Precise Thermal Profile**

Intelligent Construction Technologies – Vögele PMTP / Additional Features

Paving Equipment Future – Combining MDMS Data with IC Data

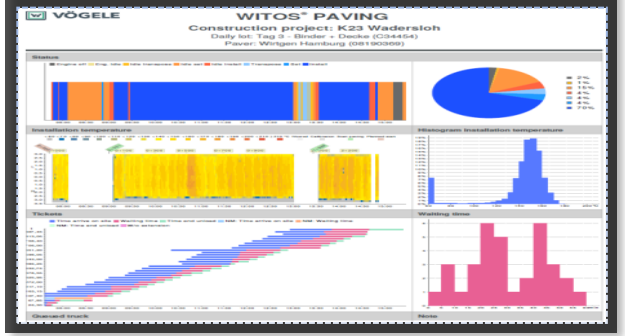
Electronic Data - Truck Load & Paving Process

Precise Measurement of Pavement Length

Precision Paving Width & Depth - Future

Real Time Tonnage / Yield on Smart Devise & Paver

Instant Reports – Fleet & Paving Process



Feedback to Breakdown Roller Operator

Vögele Dash 5 Generation

Paving Equipment Future – Integrated Data Collecting Systems

WIRTGEN GROUP

VÖGELE

QUESTION

INNOVATIVE SOLUTIONS

Our passion.

Nars: Cell 717 729 8484

laikram.narsingh@wirtgen-group.com