

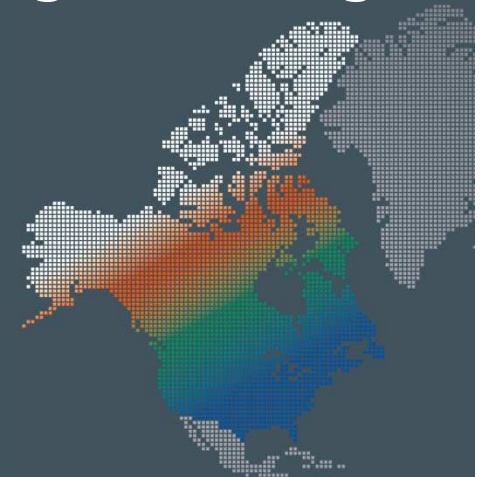
CLOSE TO OUR CUSTOMERS



Virginia Pavement Research and Innovations Symposium

Intelligent Construction Technologies – Paving & Rolling

Laikram Narsingh (Nars)
Commercial Support & Development Manager



Agenda



The Paving Process

- Principles of the Free Floating Screed
- Placement Related Pavement Failures & Root Cause
- Why MTV??

Intelligent Machine Controls / Construction Technologies

- 3D Paving
- Paver Mounted Thermal Profile (PMTP)
- Intelligent Compaction

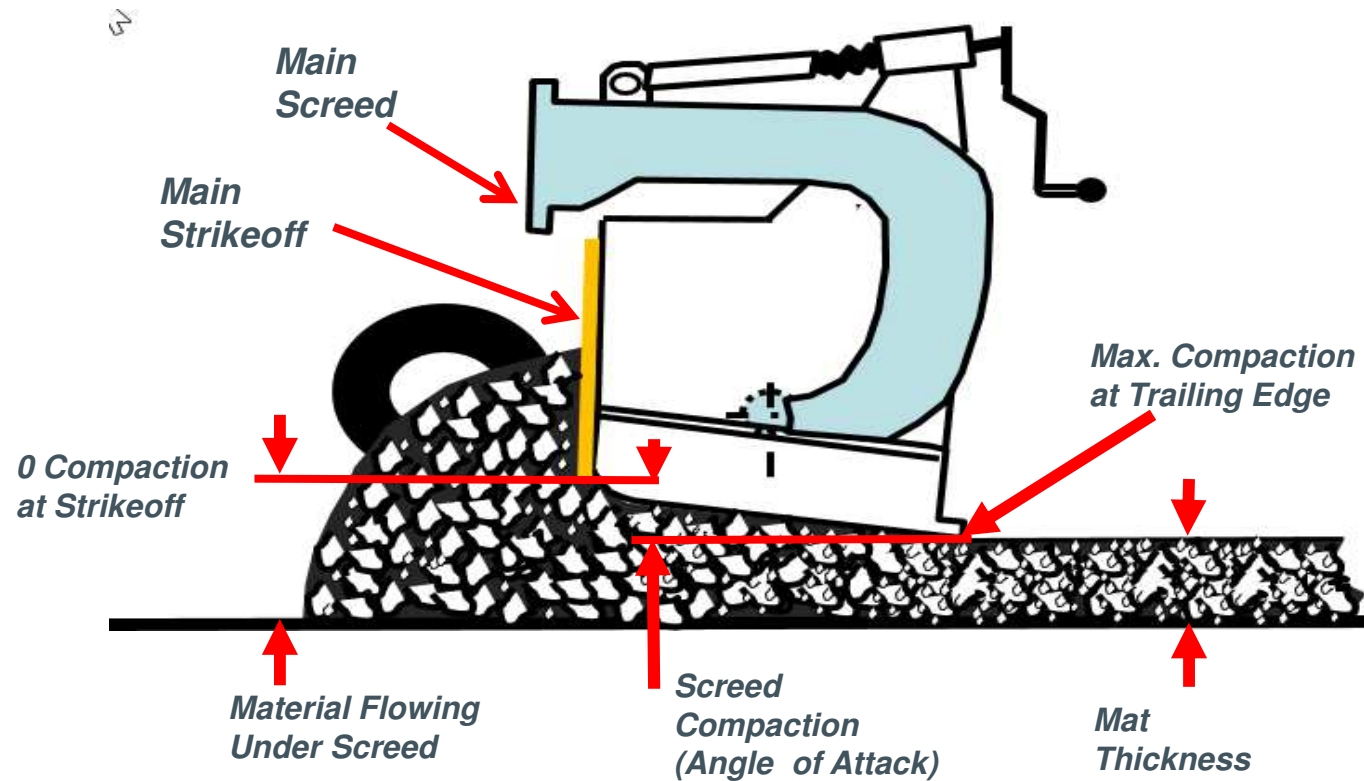
Material Management at Placement

- Remixing at Placement – Why & Where??



Principles of the Free Floating Screed

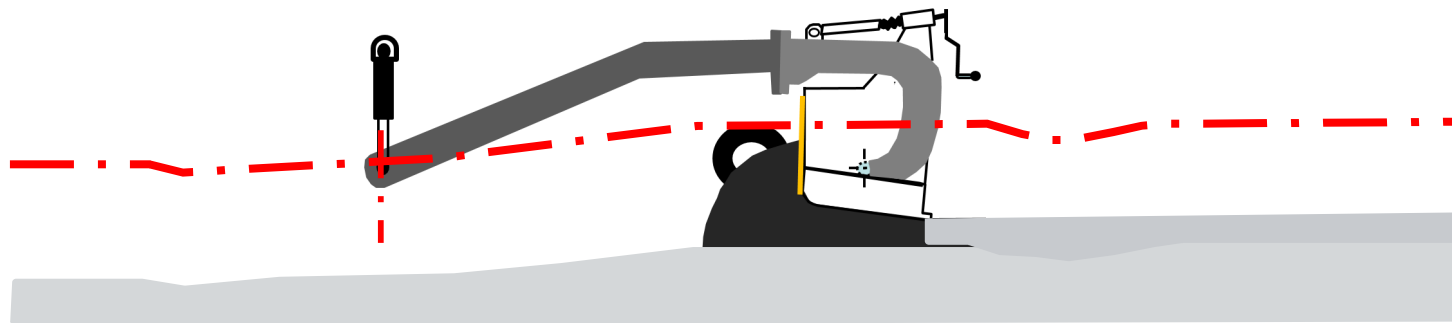
Vibratory Screed Compaction:



Principles of the Free Floating Screed



Free Floating Screed Averaging the Sub-grade



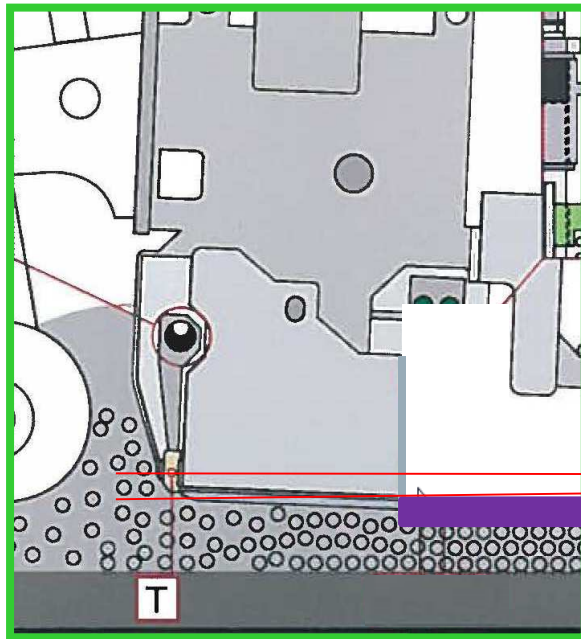
Sub-Grade



Principles of the Free Floating Screed

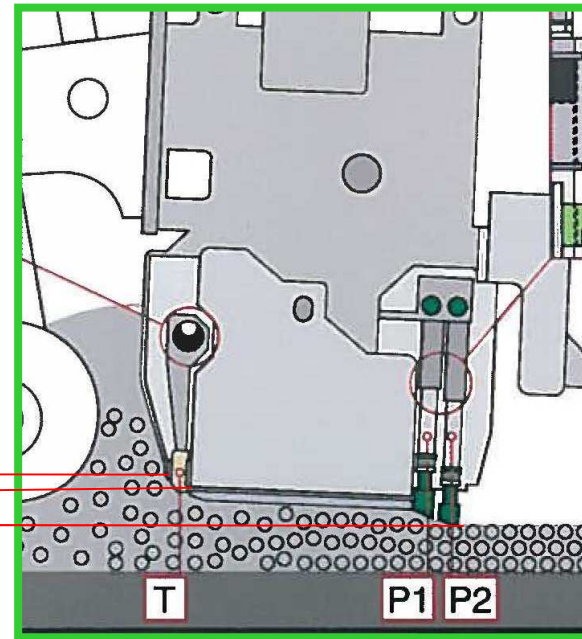
Compaction & High Compaction Screed:

Compaction Screed - Single Tamper Bar



Compaction From Tamper bar

High Compaction - Tamper Bar & 2 Pressure Bars

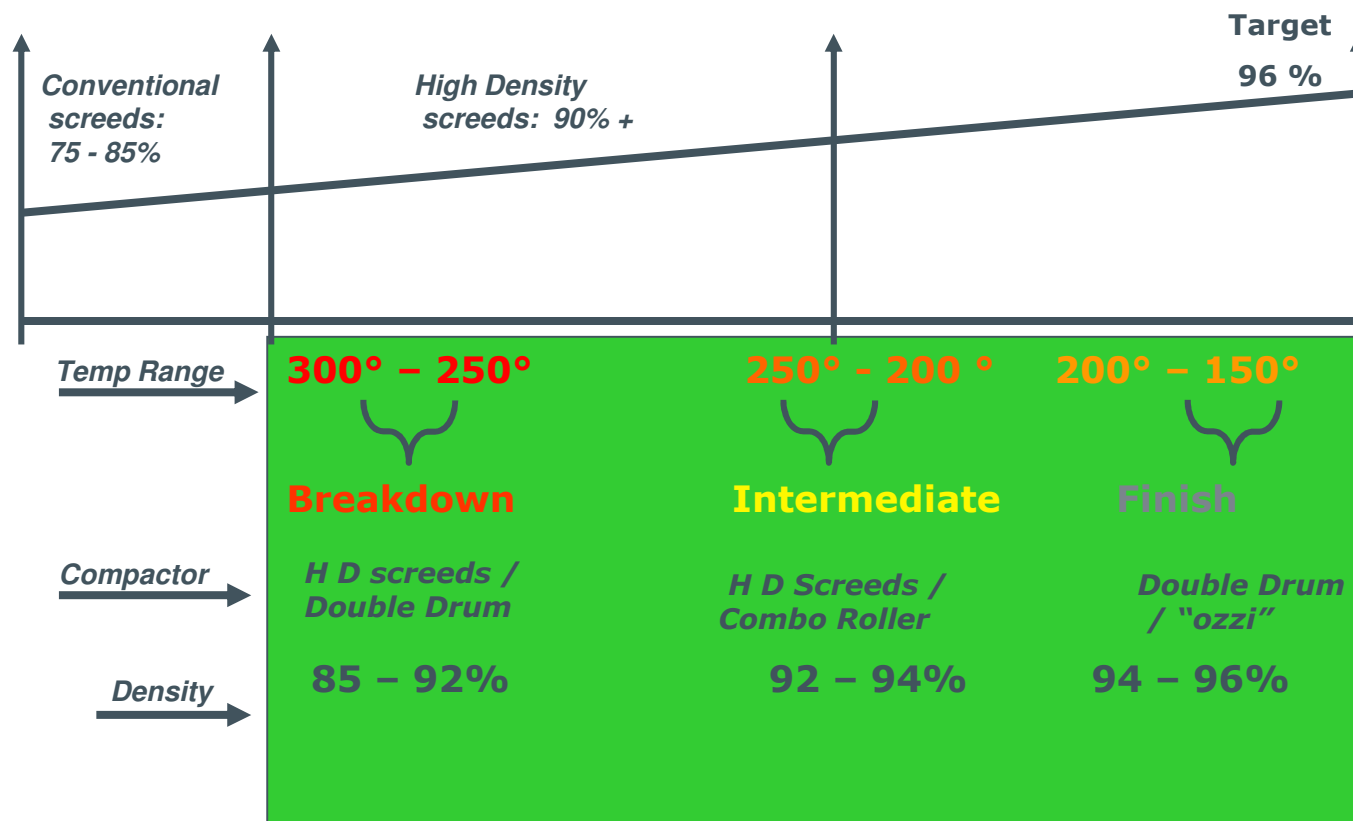


Compaction from Pressure



Principles of the Free Floating Screed

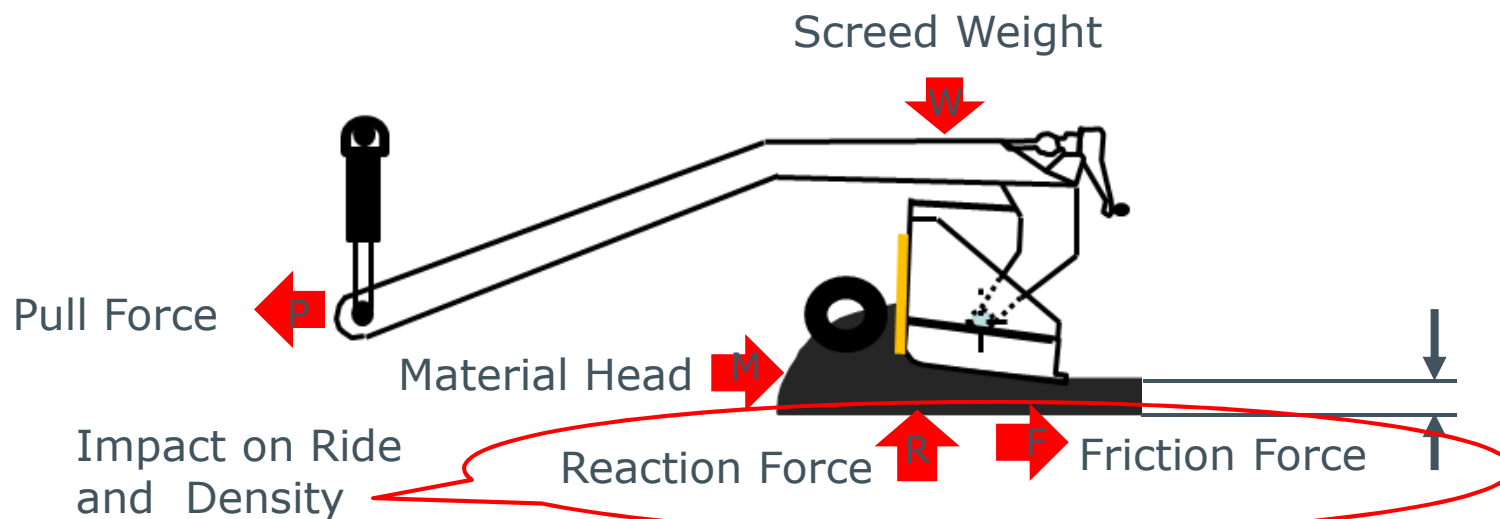
Screed Densities, Temperature Ranges & Rolling Zones:



Principles of the Free Floating Screed

Smoothness & Density Influenced by 5 Forces In Balance

- Consistency is critical for Best Performance
 - Temperature Monitoring to manage Material Consistency
 - 3 D Machine Controls to Reduce Human Interactions



Material Transfer for Maintaining Consistency



Use of MTV for Non Contact Continuous Paving

- Exchange truck without Stopping / Avoid Truck bumping Paver
- Provide Adequate Surge for Truck Exchange
- Reduce Gradation Segregation.... Hence Reduce Thermal Segregation
 - By Providing Adequate Remixing



Typical Pavement Blemish – Placement Related



Type Pavement Blemish:

- Resulting in Cracks and Raveling

1. Longitudinal Streaks:

- Gradation Segregation Streaks
- After MTV, All Tractor Induced



2. Open Texture / Voids:

- Gradation Segregation
- Before & After MTV



Temperature Differential in Blemish areas



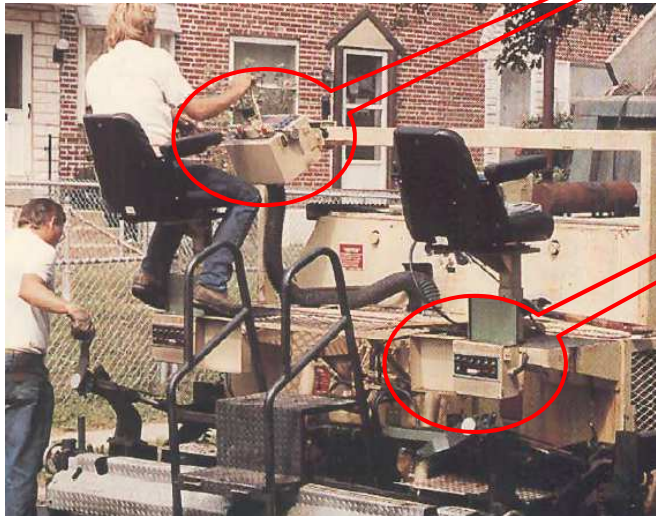
Paver Controls – Past & Present



Present: Intelligent Machine Control



Past: Electric over Hydraulic



Intelligent Machine Controls – IMC



Tier III Engines Emission Drove Intelligent Machine Control

- CANBUS used to Manage Engine and other machine Functions
- Followed by Intelligent Construction Technologies
- Some OEM limit to Only Engine controls

Intelligent Tractor Control:



Intelligent Screed Control:



Intelligent Roller Control:



The Federal Highway Administration (FHWA) Accelerated Innovation Deployment (AID) Demonstration grant program, which is administered through the FHWA Center for Accelerating Innovation (CAI), provides incentive funding and other resources for eligible entities to offset the risk of trying an innovation and to accelerate the implementation and adoption of that innovation in highway transportation.

AASHTO Designation: PP 80-14¹

Table X3.1—Temperature Differential Categories

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

X4. MONETARY ADJUSTMENT

X4.1. *Good*—If more than 50 percent of the day's segments fall in this category, an X percent bonus of the day's core density payment will be added.

X4.2. *Moderate*—If more than 50 percent of the day's segments fall in this category, take corrective action to eliminate.

X4.3. *Severe*—If more than 25 percent of the segments fall in this category, the engineer will suspend operations and the contractor will take immediate corrective action. All incentive payment for density cores is eliminated for that day's paving.

Note X2—When determining which category the day's paving belongs in, start from severe and work backwards until one is satisfied.



Paving Process Data plotted on same Coordinates

1. Intelligent Compaction

- Manage the rolling Process

2. 3D Milling & Paving

3. PMTP – Paver Mounted Thermal Profile

- Document Pavement Temperature at back of screed

4. Ground Penetrating Radar GPR / Density check

5. IRI – Smoothness

How does Each State analyze Data from Multiple OEM & Systems?????



Common link to several OEM Systems for Data management

1. Intelligent Compaction – All Current Vendors



2. Paver Mounted Thermal Profile System All Current Vendors



4 & 5. Future Imports: GPR & Smoothness



3. 3D Milling & Paving Major Vendors - 3

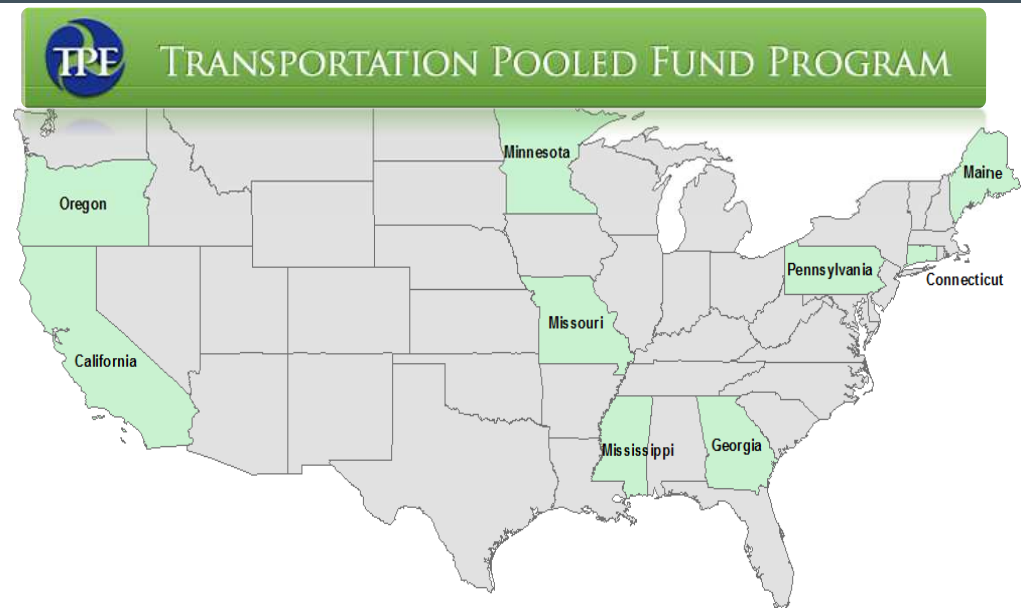


Pooled Fund – States Participation in ICT



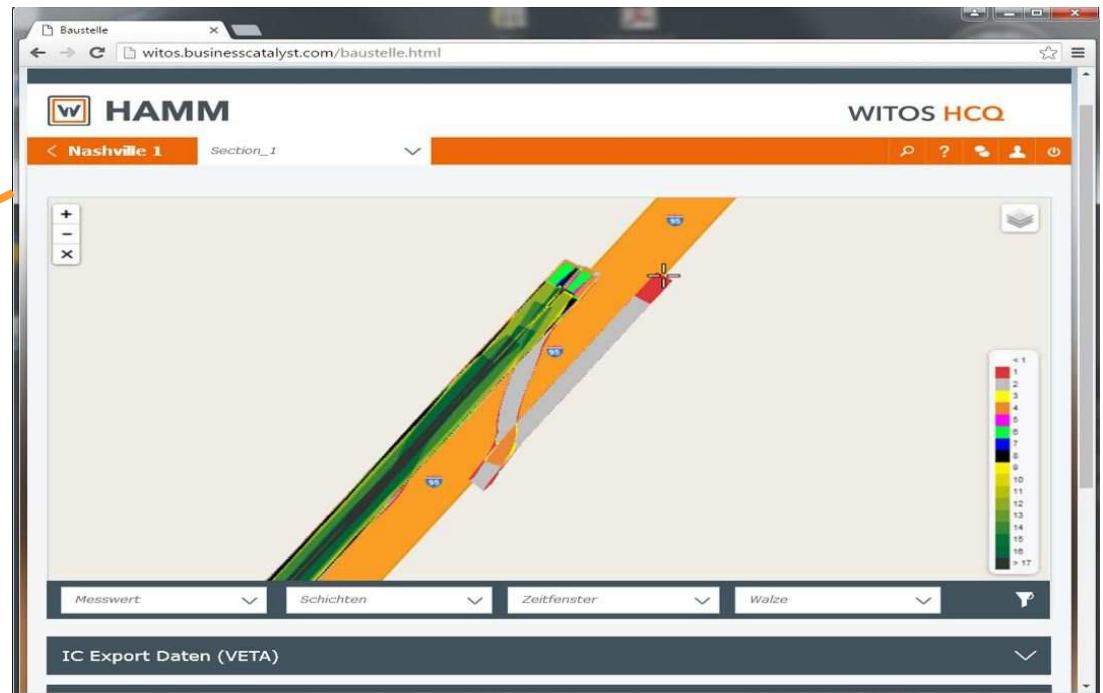
12 States to Date;

- ☐ Alaska (non-voting member)
- ☐ Arkansas
- ☐ Alabama
- ☐ California
- ☐ Georgia
- ☐ Maine
- ☐ Minnesota
- ☐ Mississippi
- ☐ Missouri
- ☐ New York
- ☐ Oregon
- ☐ Pennsylvania

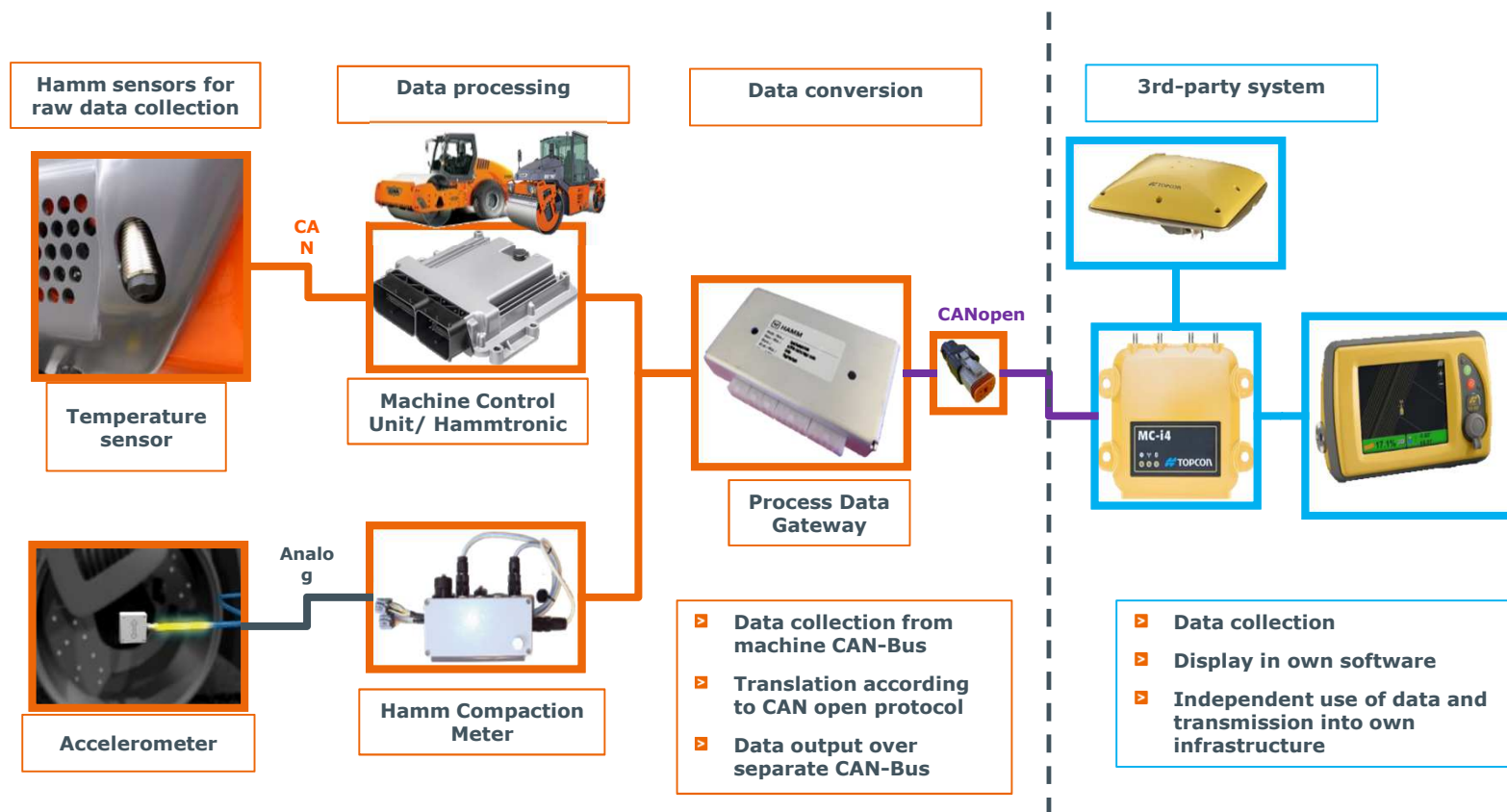


Hamm Compaction Quality (HCQ) – Live Monitor

- Real-time monitoring of work in progress
- Display of
 - drum positions
 - Pass count
 - Temperature
 - HMT



Hamm Compaction Quality (HCQ) – Key Components



Intelligent Construction Technologies – 3D Paving WIRTGEN GROUP

Optional Niveltronic 3D Machine control

- 3D OEM Positioning Instruments + Use 3D Job Files
 - Eliminate Expensive Surveying & Erecting of string lines
 - Improve Safety

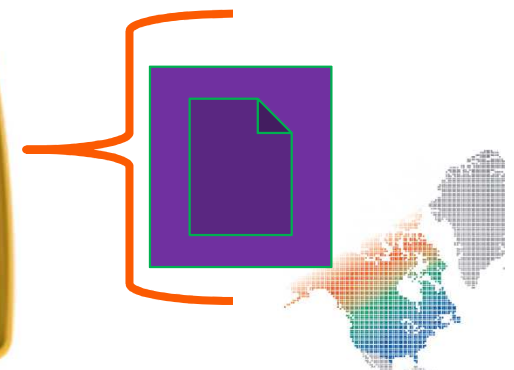
Vögele Machine control



Topcon, Trimble or Leica Positioning Instruments



3D Job Files



Two Types of 3D Job Files:

1. Design Files
2. 3D Model build from Scanned Surfaced
 - Topcon SmoothRide System
 - Trimble System Similar to Topcon
- Both Interface with Vögele Optional Niveltronic+ 3D



Vögele Optional Navitronic Machine Control on S2100-3

- 1D – Controlling Depth LH & or RH
- 2D - Controlling Depth & Width
- 3D - Controlling Depth, Width & Steering

Interface with Topcon, Leica or Trimble 3D Positioning Systems

- a. Topcon – MM GPS System
- b. Leica – PaveSmart, Total Stations
- c. Trimble – PCS900, Total Station



Intellegent Construction Technologies – PMTP



Vogele Paver Mounted Thermal Camera - RoadScan

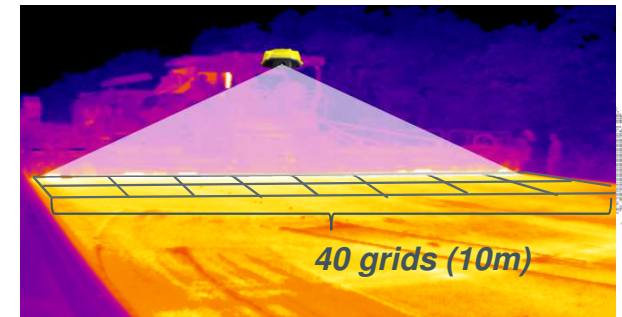
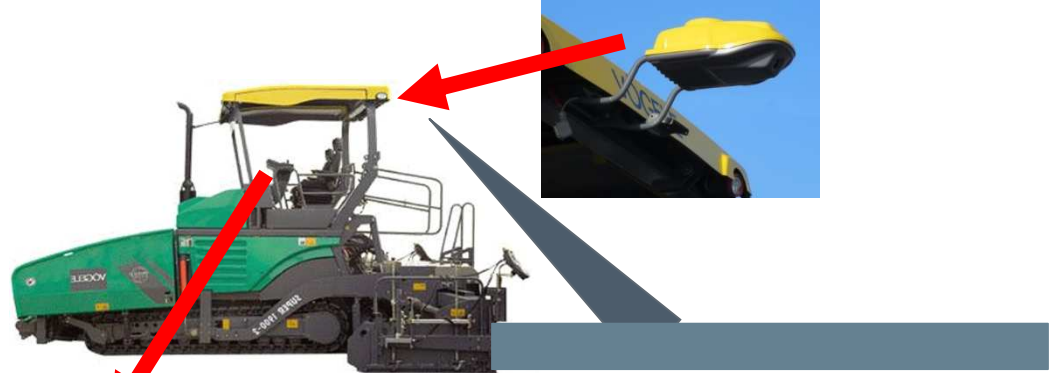
Part of 5 Modules to Optimize, document & Analyze the Entire Paving Process

1 Control 2 Materials 3 Transport 4 Job Site 5 Analysis



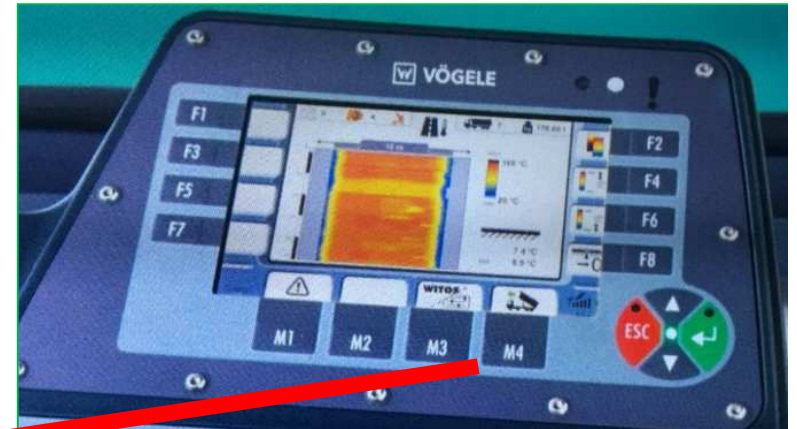
Integrated Display & Thermal Camera

- Display on the Tractor Control
- Analysis through WITOS Paving
- Optional Weather Station

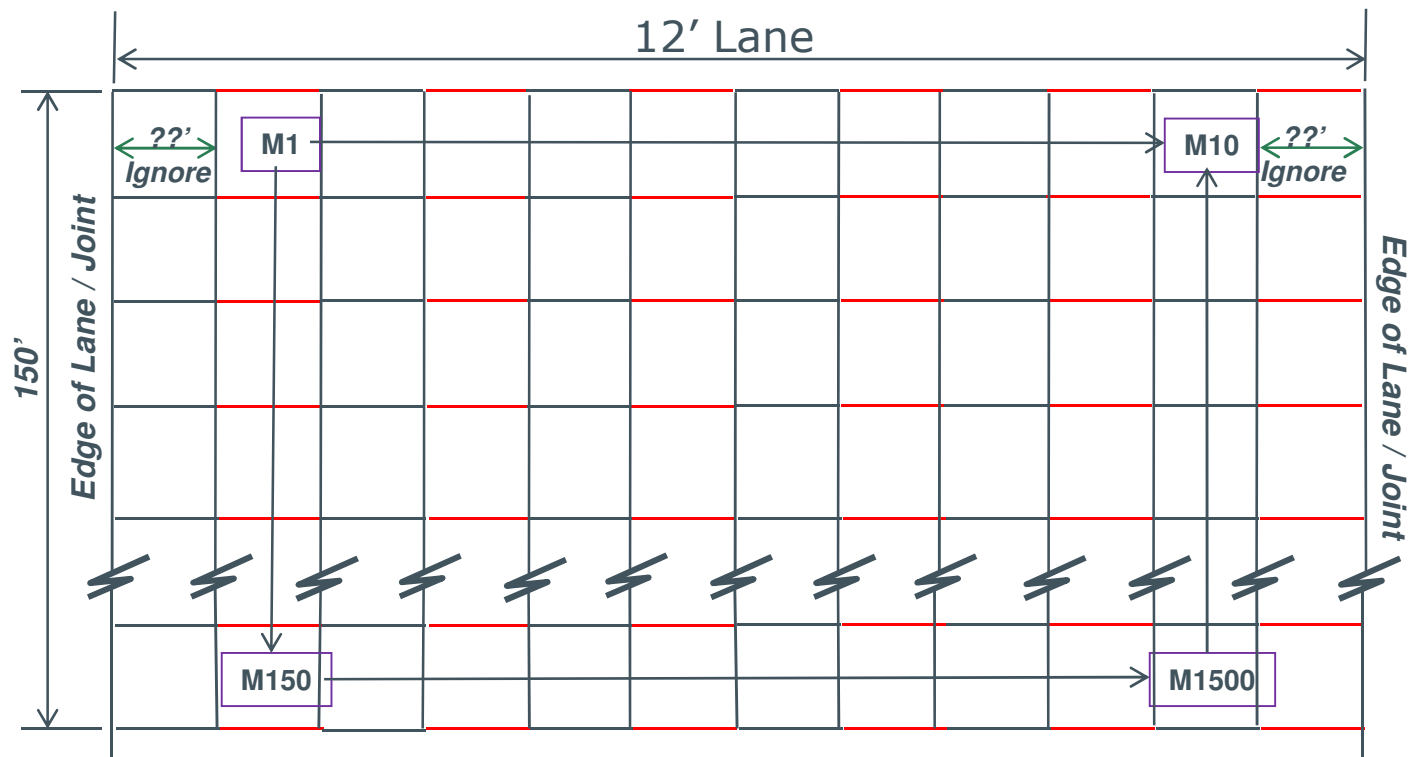


Trucking and Messaging Info available for Europe

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



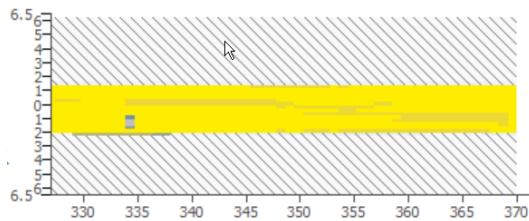
- 150' Long measured every Ft. Traverse & Longitudinal



Thermal Image will show Temperature Differential.. confirms the Visual

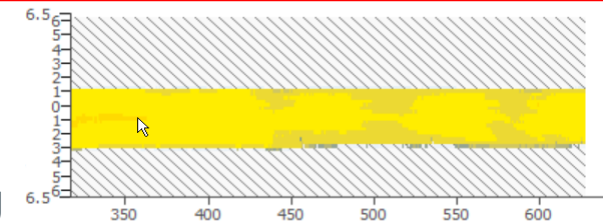
- Thermal Streaks not identified by Analysis

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



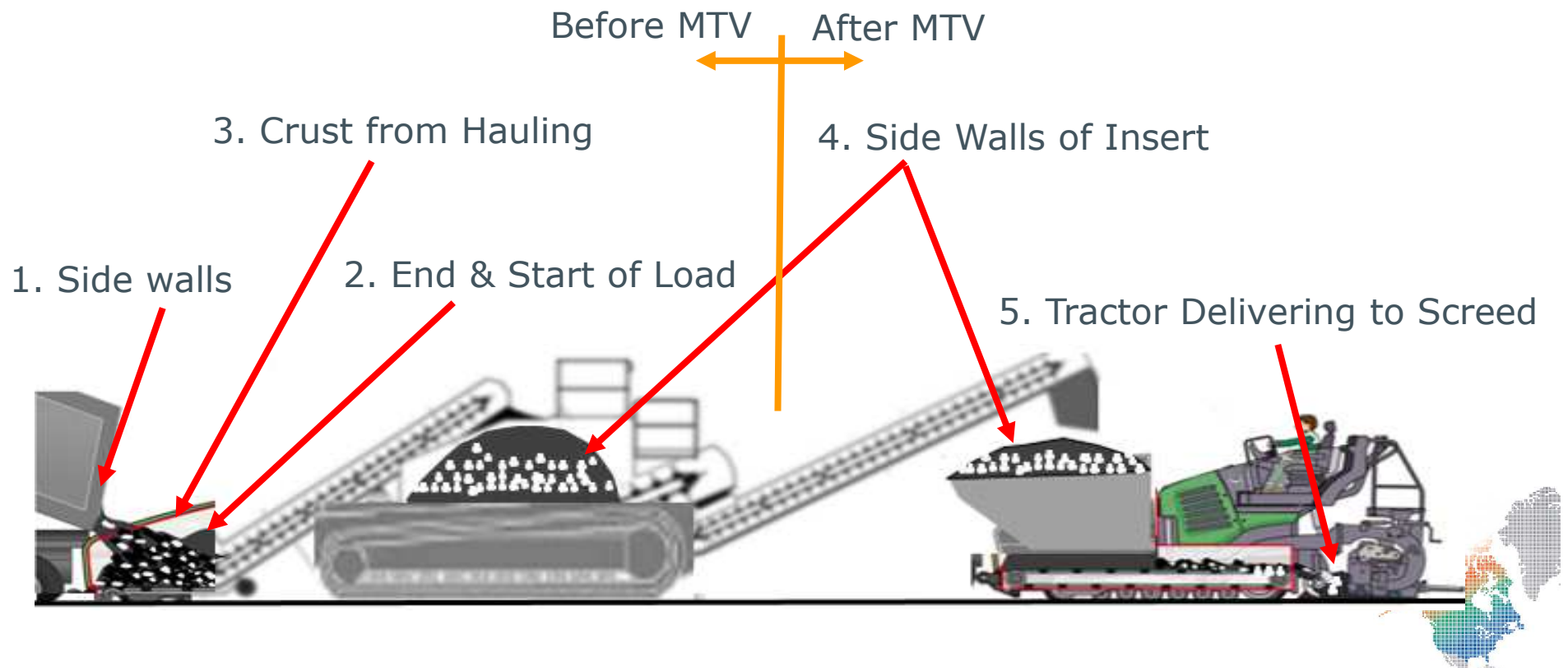
Eliminate with Remixing
at Ideal Location

Range	Category
$\leq 13.9^{\circ}\text{C}$ [25°F]	Good
$> 13.9^{\circ}\text{C}$ [25°F] to $\leq 27.8^{\circ}$ (50 °F)	Moderate
$> 27.8^{\circ}\text{C}$ (50 °F)	Severe



Remixing at Placement – Why & Where??

5 Locations.....3 Before the MTV and 2 After the MTV



1. Segregation along Side Wall of Truck Bed



Variable Pitch Augers in MTV Receiving Hopper

- Auger Re-blend segregates stones
 - As it moves to the center



2. Segregation from End & Start of Dumping



Solution: Re-mixing Augers & Front Tilting Hopper:

- Hopper Dumps on top of Augers
- Auger Re-blend End & Start of Load Segregation
 - Also Potential for Thermal Segregation



3. Crust from Side Wall of Truck Bed & Insert



Combination of Re-blending Augers Flight Chains and Grate System in Insert

- Augers re-blend cold crust as it moves the material to the belt
- Several flight Chains brakes up the crust as it moves to the next conveyor

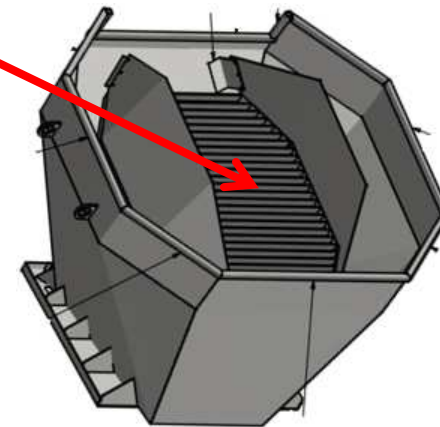
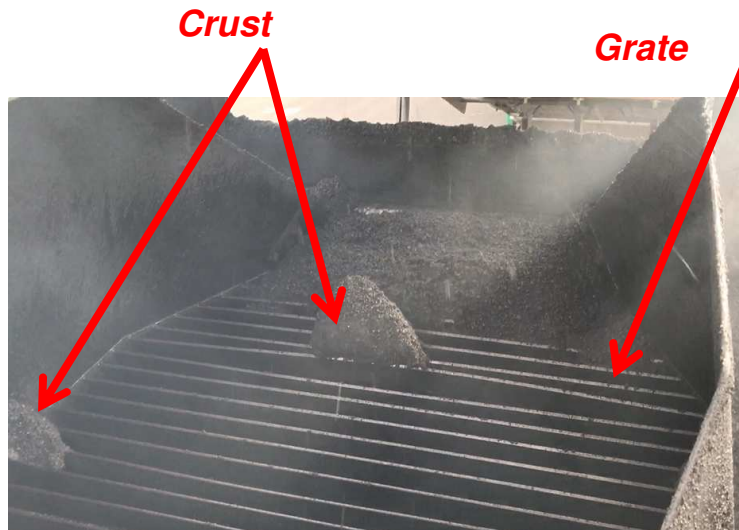


3. Crust from Side Wall of Truck Bed & Insert



Passive Remixing Insert with Grate Baffles System:

- Grate System: Brake up Large Crust
 - Surrounding Hotter mix heats up smaller crust
 - Also Traps Clunkers from Plant etc.

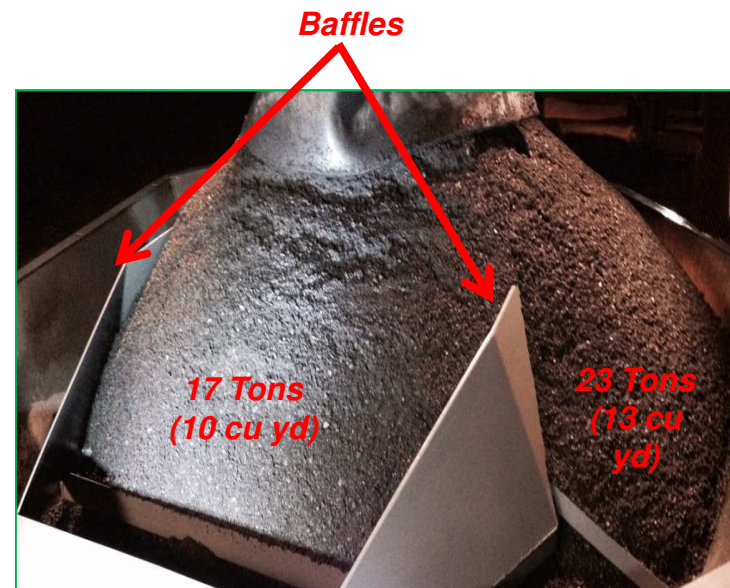
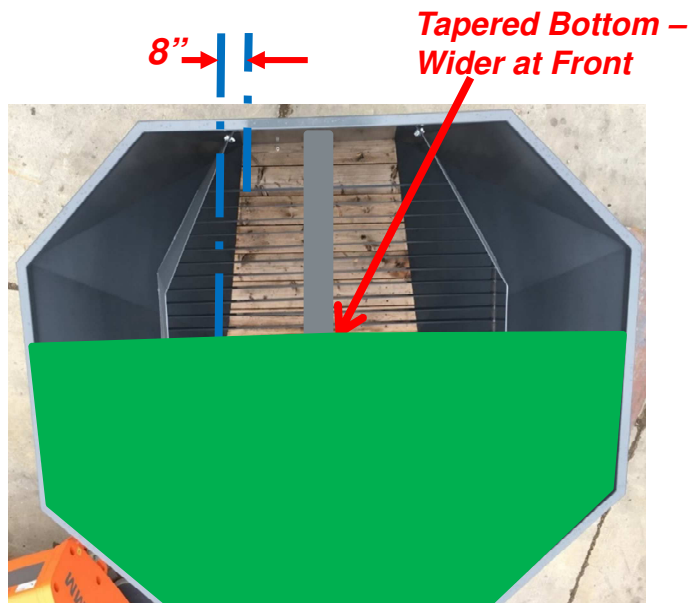


4. Segregation from Pile in Insert during filling



Passive Re-mixing Insert with Baffles & Tapered Bottom Opening

- The Baffles Reduce the length of the slope of Pile
 - Also Provides Dual Capacities
- Tapered Bottom Spreads the segregated stones along the side walls



5. Segregation created During tractor delivery

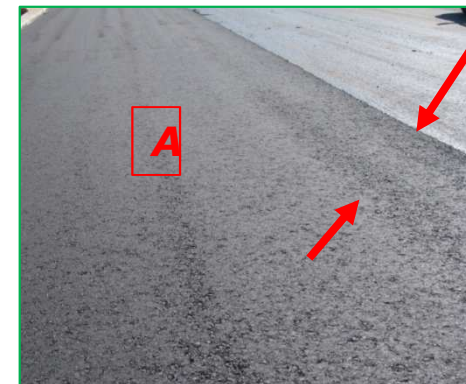
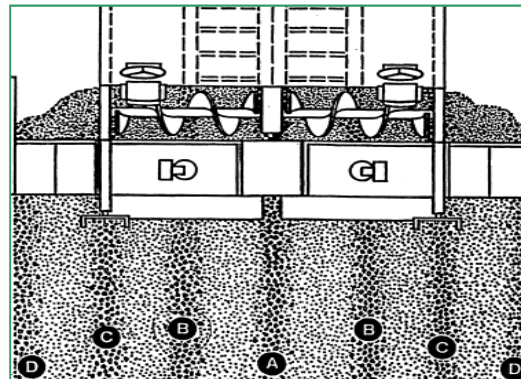
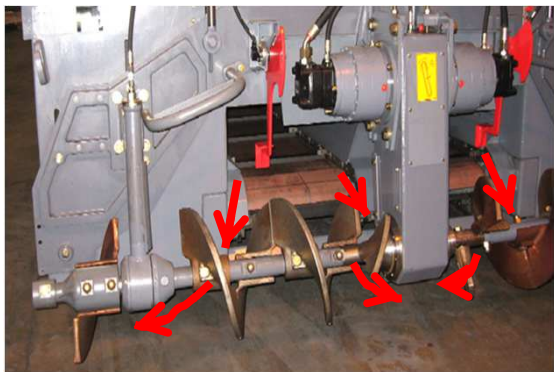


Several Devices use to Minimize at Different Locations

- A: Reverse Auger Flights
- B – C: Insert Design as Previously Discussed

Delta Plate

Screed to Auger distance



CLOSE TO OUR CUSTOMERS



QUESTIONS???

Laikram Narsingh (Nars)

laikram.narsingh@wirtgen-group.com
C - 717 729 8484

