

Minnesota's Experience with Warm Mix Asphalt

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*Global Warm Mix Asphalt Workshop
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Motivation to Use WMA

- Environmental
 - ★ Lower greenhouse gas emissions
 - ★ Lower fuel consumption
- Operational
 - ★ Better compaction
 - ★ More comfortable working conditions
 - ★ More uniformity
- Performance
 - ★ Can use RAP and/or shingles with WMA
 - ★ Eliminates bumps in overlays
 - ★ Reduced binder aging – reduced cracking



FROM TRIAL TO IMPLEMENTATION IN 5 YEARS



WMA Technologies Used in MN



- Maxam AquaBlack

- ★ Installed on many plants
- ★ Nozzles are almost always on



- Revix / Evotherm 3G

- ★ Easy for contractors



- Advera & LEADCAP

- ★ 1 project each



*MnDOT does not endorse any particular proprietary product or technology



WMA Experience in Minnesota

- Olmsted & Goodhue Counties (2007)
- Crow Wing County (2008)
- MnROAD (2008)
- TH 95 (2009)
- Districts 3 & 7 (2010)
- TH 169 (2011)



2011 WMA Use

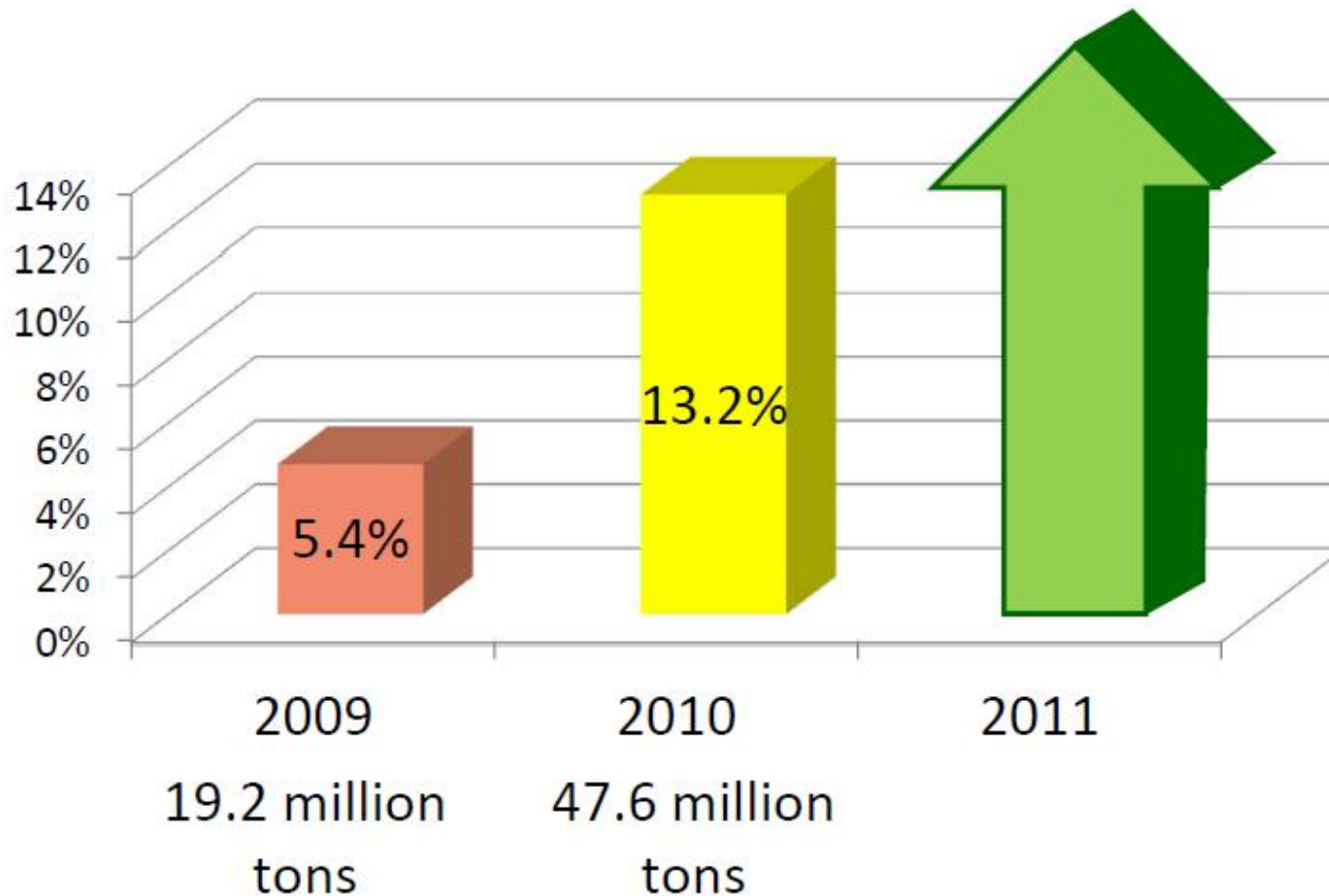
- 1,000,000 tons WMA!!
- FHWA Every Day Counts Initiative
- Plant foaming nozzles are always “on”



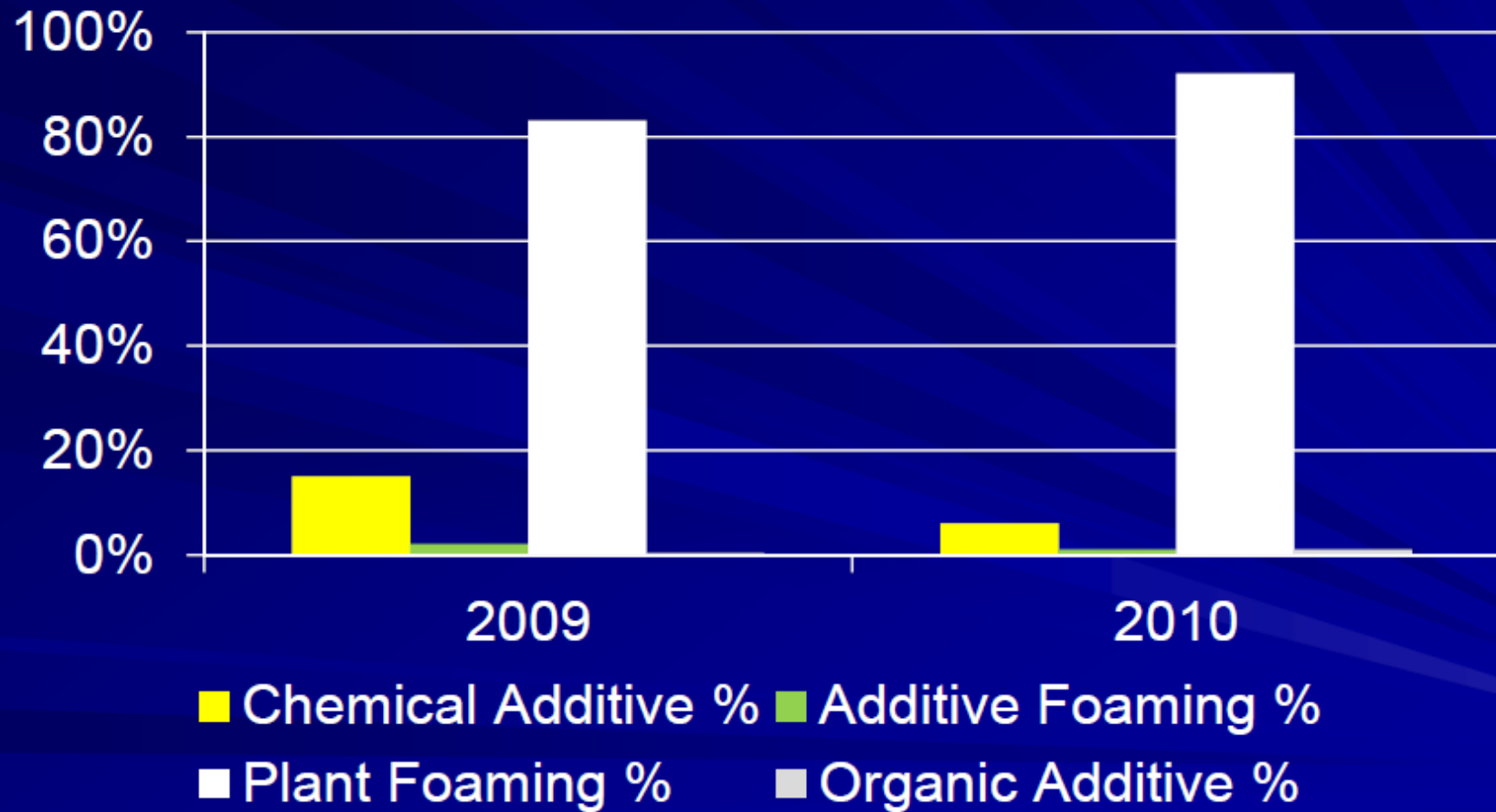


WMA Usage

Percentage of **Total** Asphalt Production in US
source: National Asphalt Pavement Association

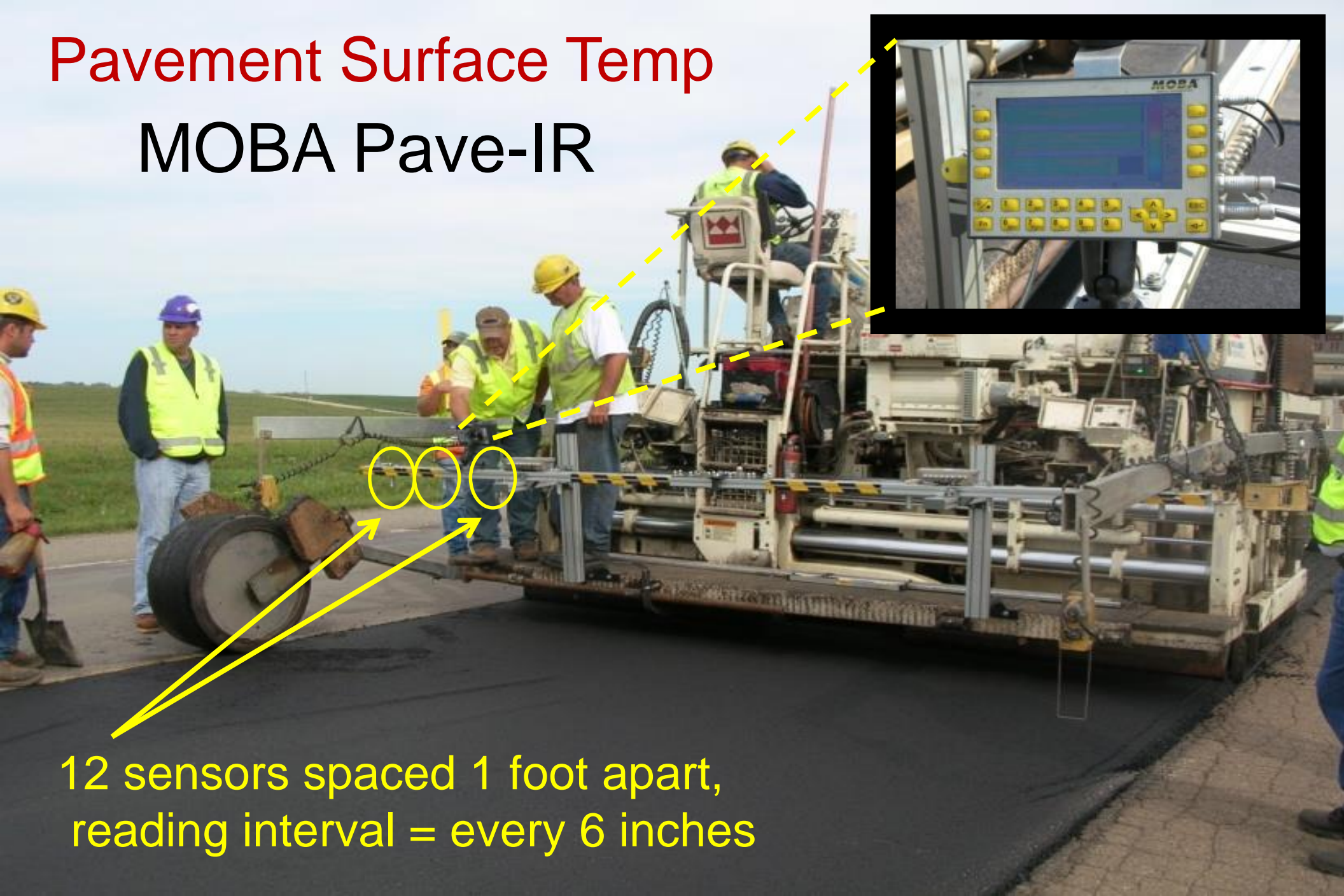


Reported WMA by Type

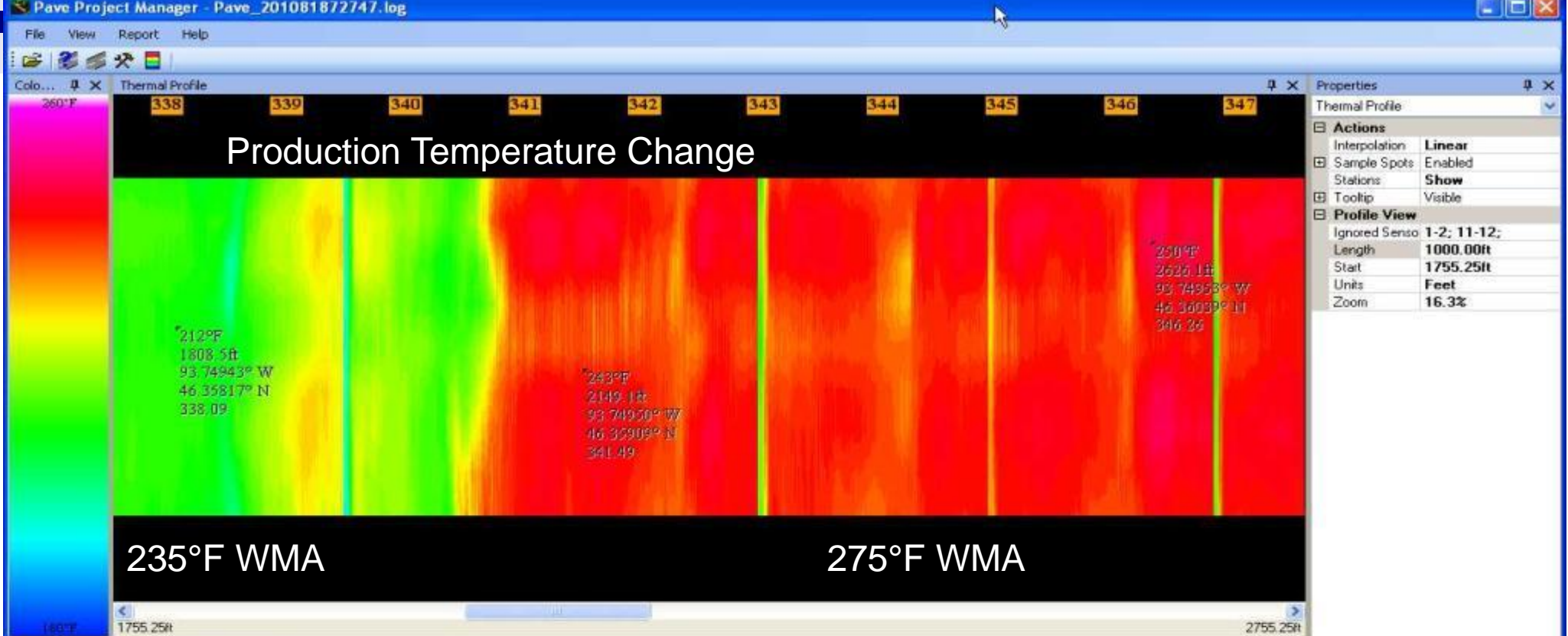


Pavement Surface Temp

MOBA Pave-IR



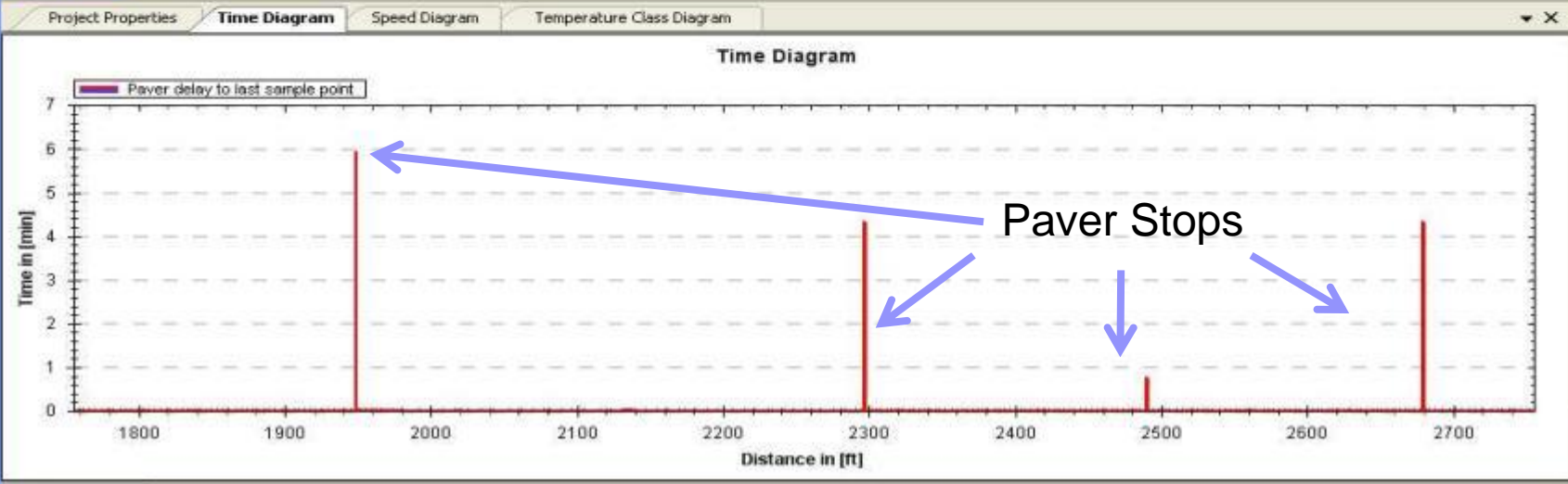
12 sensors spaced 1 foot apart,
reading interval = every 6 inches



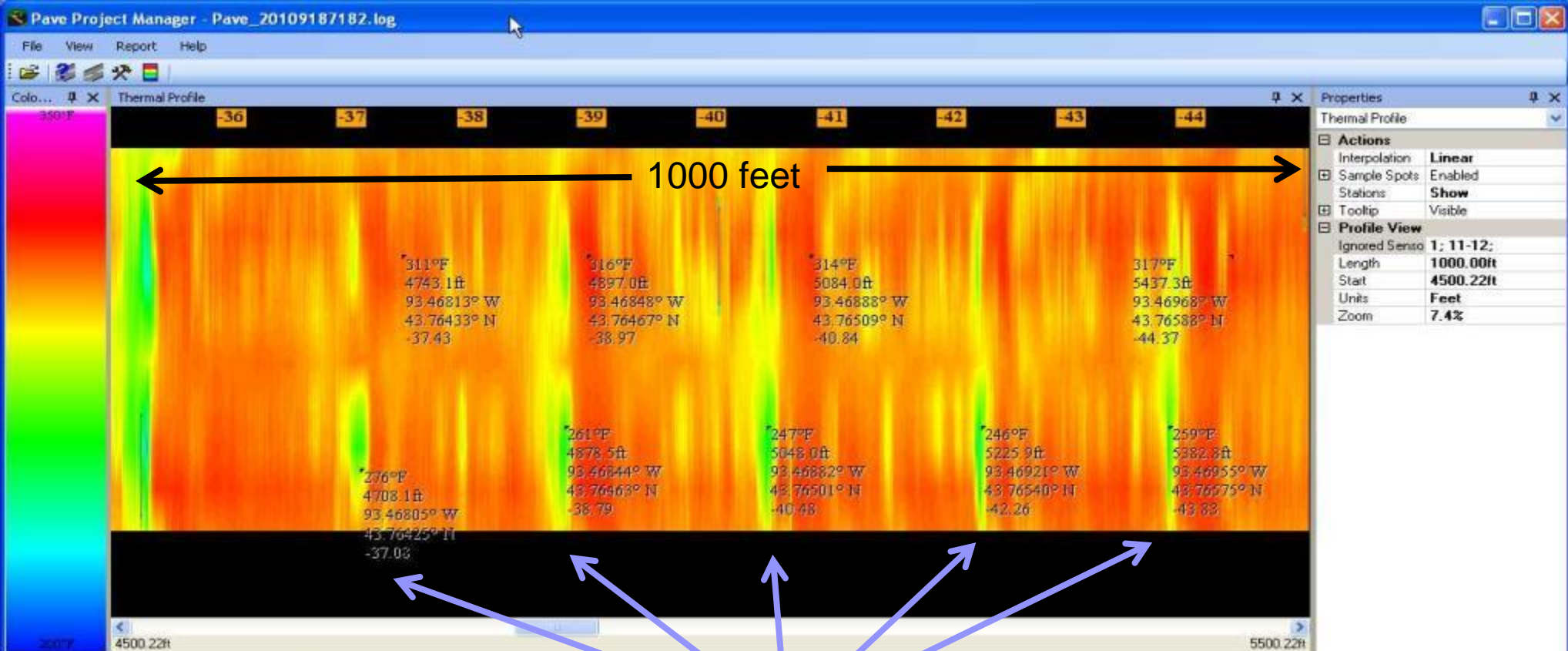
Properties

Thermal Profile

Actions	
Interpolation	Linear
Sample Spots	Enabled
Stations	Show
Tooltip	Visible
Profile View	
Ignored Senses	1-2; 11-12;
Length	1000.00ft
Start	1755.25ft
Units	Feet
Zoom	16.3%



Length
The Profile's length in the Profile Window.



Cyclic End of Truckload Thermal Segregation

- This picture is HMA
- WMA paving did not see same segregation at end of truck



MnDOT Policy & Specification

- 2009 & 2011 Position Memos
- Permissive Spec
 - ★ RAP & RAS are allowed
 - ★ No changes in mix design
 - ★ Labs must be aware of compaction temps for QA
 - ★ No pre-approved products list
 - ★ No binder grade bump
- www.mndot.gov/materials/bituminous.html



PROS



Contractor Driven

- Achieve density during late-season paving
- Increase plant production rate with harsh mixes
- Green construction
- Worker comfort
- Competitiveness (reach other markets)



Mix Design

- Can use typical HMA mix design
- “Drop in” WMA technology
- For aggregates with binder absorption < 1%
 - If absorption > 1%, perform mix design with WMA technology



Other Benefits

- Business as usual at plant and paver
- Reduced fumes & emissions
- Fuel savings
- Public relations



CONS



QC/QA Testing *Communication*

- **Compaction temperatures**
 - If compacted immediately, use field compaction temperatures
 - If reheated, use typical HMA compaction temps
- **Must meet all other volumetric & performance criteria**



Statewide WMA Implementation



- Portable plants
- Outstate districts

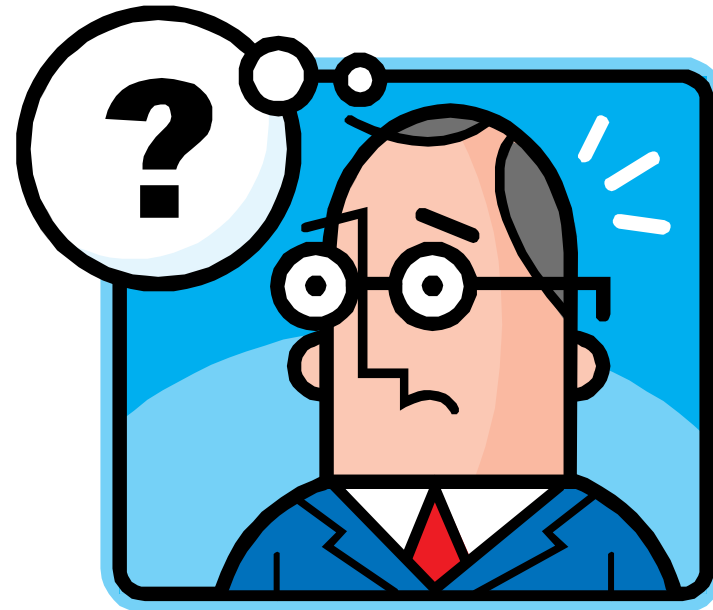
Blending with RAP/RAS Binders

- How much RAP / RAS can be used?
- Laboratory testing & analysis from MnROAD showed inadequate blending
- Long term durability



Lack of Long Term Performance Data

- Moisture damage
- Thermal cracking
- Reflective cracking
- Rutting



Future Prospects

- Is the buzz wearing off?
 - Probably not – instead becoming the norm
- MnDOT continues to support WMA
- Ultimately up to contractor's choice
- Continue to build on successes



Questions?



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