What MnDOT is Doing to Improve PM Treatments Performance

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MnDOT
Topics

• Brief look at MnDOT Spec’s and Methods
• The Most Over Looked Factors for Building Successful PMT
• Micro Milling & PMT Update
• Micro Surfacing Research
• Texas Underseal Update
• NRRA
MnDOT Chip Seal Video

• Available at https://www.youtube.com/watch?v=Ol5R7n8zGoc
What Makes MnDOT Specification Work

• Micro Surfacing
  – Require calibration of all machines with all materials used
  – Night time test strip for all projects
  – Apply scratch course on all projects
What Makes MnDOT Specification Work

– Pay for aggregate by ton
– Emulsion by gallon
– Require yield spot check numerous times per day
– Both on aggregate and emulsion
– Check curing rate
What Makes MnDOT Specification Work

• Chip Sealing
  – Strict gradation requirement
    • < 1 % passing # 200 sieve
  – Crushing required on all natural gravels
What Makes MnDOT Specification Work

– Require a design to determine starting application rate of material to be completed
– Limitation on working season
– Pay items to encourage proper application
What Makes MnDOT Specification Work

- Sweep same day
- Fog seal all chip seal
- Contractor responsible for all vehicle damage until permeant pavement marks are placed
What Makes MnDOT Specification Work

• Crack Sealing / Filling
  – Use only pre-approved products
  – Sample from end of wand
  – Temperature
    • At recommend pouring
  – Pay by road station
The Most Over Looked Factors for Building Successful PMT
What is the goal of the project

• Is it a true PM project
• Correcting defects
  – Rutting
  – Raveling
  – Segregation
What is the goal of the project

• Safety enhancements
  – Friction
  – Hydroplaning
• Ride improvement
What is Success

• What measure will you use to determine success
  – Are your goals realistic for the roadway in question and the treatment you have choosen

• Just because you understand your goals doesn’t mean the public does
What is the Right Treatment?
Evaluate Your Existing Pavement
Evaluate Your Existing Pavement
Pick the Correct Project
Bidding

• What is needed to succeed
  – How much aggregate
  – How much binder
  – # of layers
  – Combinations of treatments

• Does the specification insure wanted out comes
Project Planning

• Post letting
  – Do you have trained inspectors
  – Training sources
    • Upper Great Plains Transportation Institute
    • NCPP
    • Your State DOT
    • ISSA
  – MnDOT is developing PMT Experts in each District
Construction

• Pre-con meeting
  – Discuss special requirements with Contractor
  – Does the Contractor have trained employees that understand your requirements
  – Pick time and location for calibration of equipment
  – Make sure all designs are completed
  – Test strip if required
Outcome a Successful Project
Micro Milling with Chip Seal or Micro Surfacing

• Why?
  – Need lower cost alternative to 1 ½ inch over lay
  – To improve ride

• What are the performance targets
  – Equal to 1½ inch over lay
Micro Milling with Chip Seal or Micro Surfacing

- Quicker than overlay
- Less costly overlay
  - Chip seal 40% of the cost of 1½ inch overlay
  - Micro Surfacing 60% cost of 1 ½ inch overlay
Micro Milling
Micro Milling with Chip Seal
Results for Chip Seal

Southbound RWP TH89 RP 60-74 Micro Mill / Chipseal

<table>
<thead>
<tr>
<th></th>
<th>IRI (in/mile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before Micro Mill (2013)</td>
<td>85</td>
</tr>
<tr>
<td>After Micro Mill (2013)</td>
<td>65</td>
</tr>
<tr>
<td>After Chip Seal (2013)</td>
<td>60</td>
</tr>
<tr>
<td>After 1 year (2014)</td>
<td>60</td>
</tr>
<tr>
<td>After 2 year (2015)</td>
<td>65</td>
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Micro Milling with Micro Surfacing
TH 64 Pre Condition
SB TH 64 Average of Both Wheel Paths

- **Before**
- **After Micro Mill**
- **1 Year Later (2015)**
- **Micro Mill and Microsurface**
- **Expon. (Before)**
- **Expon. (After Micro Mill)**
- **Expon. (1 Year Later (2015))**
- **Micro Mill and Microsurface**
Current Condition
Micro Surfacing Research
Issues with Micro Surfacing

- Brittle Mixture
- All cracks reflect thru
- Delamination
- Snow plow damage
- Poor performance of pavement markings
- Wear off in 5 to 7 years on high volume roadways
Hypothesis

• Higher asphalt content will
  – Reduce reflective cracks
  – More durability/longer life
  – Help with delamination
  – Last longer

• Softer base asphalt will reduce reflective cracks
Where MnDOT Currently is

- Past hard based asphalt  40 – 90 Pen (PG 64-22) (CQS-1Hp)
- Current softer base asphalt  90 – 200 Pen (PG 58-28) (CQS-1p)
On Going Research Efforts

- Allowed PG 49-34 construction season 2015
  - Two project built successfully so far with PG 49-34
- Have seen less snow plow damage on pavement markings with softer based asphalt
On Going Research Efforts

• Smoother surface
• Allow use of SBS modified asphalt in place of latex modifications
  – Contractor/Supplier choice
On Going Research Efforts

• Working on higher asphalt content micro surfacing
  – Normal asphalt content 7 to 8%
  – Testing performance of micro with 9 to 12 % asphalt content

• Higher polymer loading
  – 4 ½ % verses 3 %
On Going Research Efforts

• Results
• No issue with tracking or rutting
• Appears to increase wear resistance
  – Less snow plow chatter marks
• Has greatly reduced # of cracks
• Seem to heal during hot weather
• Pavement marking perform similar to HMA over lay
TH 23 Pre-Condition
Hard Based Micro Surfacing
TH 23 Current Condition
TH 64 Pre Condition
Soft Based Micro Surfacing
Current Condition
Texas Under Seal Update
Texas Under Seal

- Chip Seal applied before HMA Overlay
  - Milled surface
  - Non milled surface
- 3/8” minus chip
- CRS-2p
- Light on cover aggregate
- Can pave as soon as rolling & sweeping is completed
PM Performance Data

Performance of Texas Under Seal

RQI

PM Data by Year

2010 2011 2012 2013 2014 2015

3.6 3.6 3.6 3.6 3.5 3.4

2.9 2.9 2.9 2.7 2.6

Control Section Performance

Trigger Value
Texas Under Seal

• Lesson Learned
  – Lay out test sections to count existing cracks
  – Be careful with fog sealing

• Next Steps
  – Placing Ultra Thin Bonded Wearing Course directly over concrete then traditional over lay
  – Trying to substitute paving with a spray paver in place of under seal
Strategic Implementation through Cooperative Pavement Research
What is NRRA?

• Non-traditional pooled fund
• Collaboration between transportation agencies, industry, and academia.
• Direct the future of MnROAD research
  – $2.5 million in MnDOT construction funding
Initial Development

2014 National Peer Exchange

• Pavement experts focusing on
  – Quantifying & Communicating the Value of Research
  – Development of MnROAD’s Future Research

13 Participating Agencies
+LRRB+FHWA+TRB
+ University of Washington
Question?

THANK YOU