Performance and Safety Enhancements using New Preservation Techniques

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October 13, 2016

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- Project Design
- Initial Results
- Three Year Follow Up
- Summary

Project History

- I-40 near Wilmington, NC
- OGFC placed in 2001
- Other sections failing
  - Severe raveling
  - Poor surface friction
  - Increased wet weather accidents
- Similar pattern emerging
- Funding a critical issue

Issues Faced

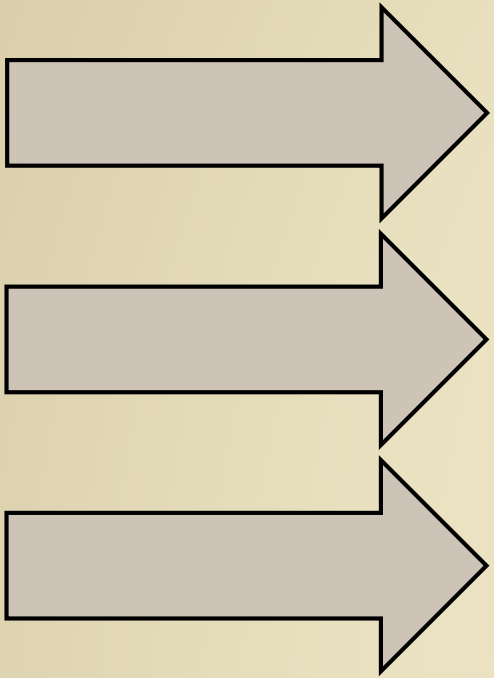
- Pavement was not performing
- Safety concerns elevating
- Traditional solutions not possible – lack of funds
- Pavement needed attention
- DOT searching for options

Issues Faced

- When will it fail?
- Can failure be delayed?
  - Well past the “top of the curve”
- What options exist?
- How to fund?
- Prompt action was required to restore friction

Solution

- How can these issues be addressed?



Texturing solves friction, but not raveling

Rejuvenation may retard raveling, but decreases friction (at least temporarily)

Combination of technologies may solve both issues

Performance Based Design

- Outflow Meter (ASTM E2380)
  - Average 10 seconds or less per lot
- Recovered Binder Viscosity (AASHTO T 316)
  - 20% improvement 2 weeks after treatment
- Friction Testing (ASTM E274)
  - No limits set

Project Design Concerns

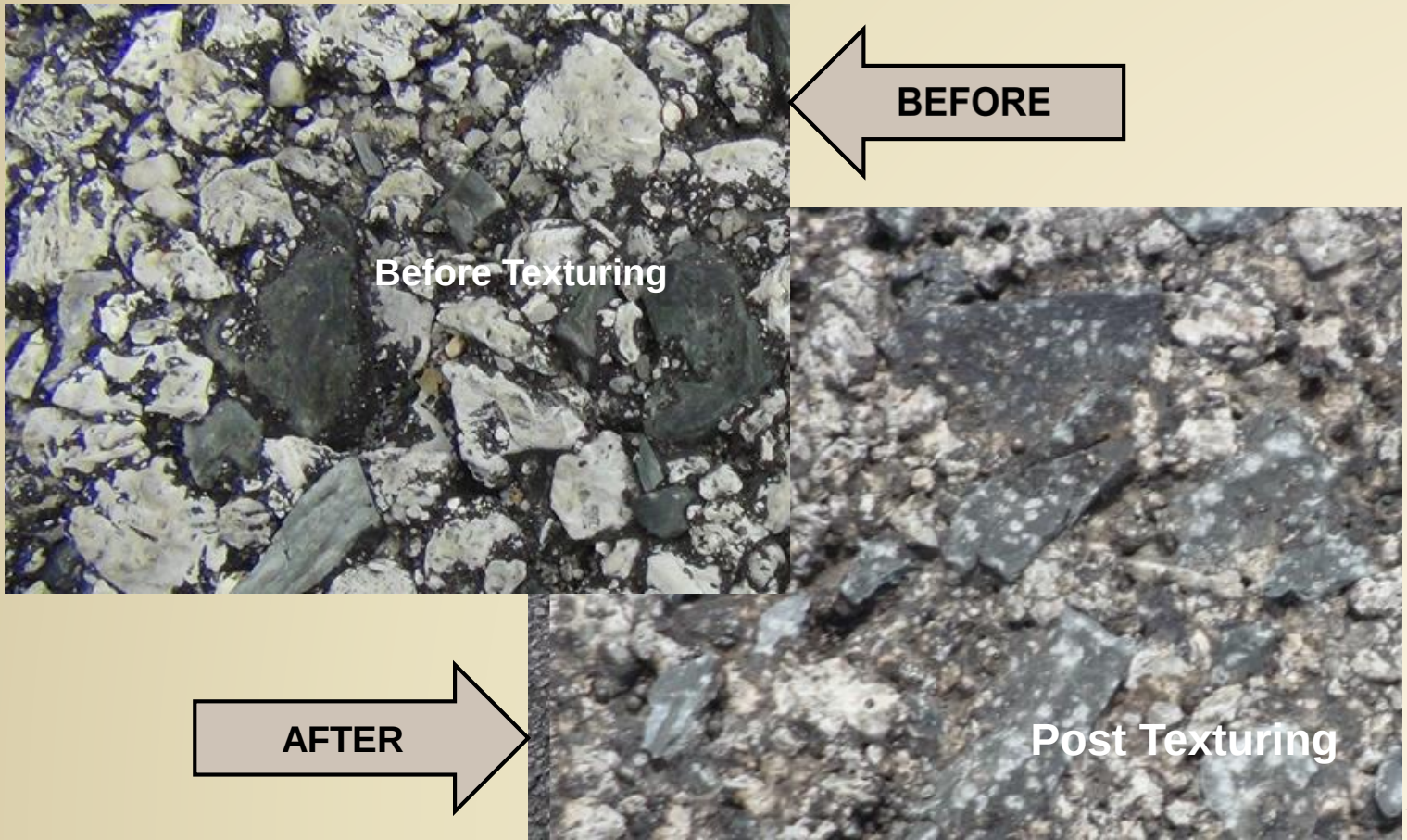
- Texturing
  - May break aggregate bond
  - Will not prevent future polishing
- Rejuvenation
  - First use on OGFC in NC
  - Net friction improvement should be positive
  - Highly oxidized modified binder

Pavement Abrasion Project Evaluation of NCDOT Crash Data

Project Design

- Six segments
  - Four OGFC on I-40
  - Two dense graded mix on secondary road
- Pavement Markings retained
  - Texturing between markings
  - Rejuvenator does not discolor markings
- Testing by contractor
  - Outflow Meter by contractor
  - Viscosity by independent laboratory
  - Friction testing by independent firm (and DOT)

Texturing



Initial Results

- Performance Requirements Exceeded
  - OGFC Outflow improved 39%
  - Dense graded Outflow improved 73%
  - Viscosity improved 32.4%
  - Skid numbers improved ~30%

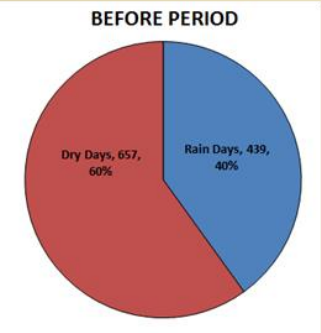
1.5 Year Safety Data

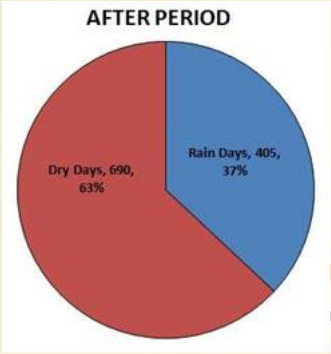
- Skid numbers back to near initial levels
- Accident Data (as of Feb. 20, 2014)
  - 14% Decrease in total crashes
  - 72% Decrease in wet crashes
  - 16% Decrease in lane departure crashes
  - 75% Decrease in lane departure wet crashes

3 Year Safety Data Analysis

- Analyzed crash data for 3 years prior to work
- Analyzed same data for 3 years after completion

Weather Data (Greater than 0.01in)	Before 3.0 Yrs	After 3.0 Yrs
Total Calendar Days	1,096	1,095
Total Precipitation (inches)	163.88 in	166.55 in
Total Wet Days	439	405
Average Rain Total Per Event (inches)	0.37 in	0.41 in
Percentage of Rain Days	40.1 %	37.0 %





3 Year Safety Data Analysis

- Segment 1 – Longest Segment

Seg-1 I-40 Pender County Eastbound: MP 18.33 - 25.83	Before 3.0 Yrs	After 3.0 Yrs	Percent Reduction (-) Percent Increase (+)
Total Crashes	81	70	- 13.6 %
Total WET Crashes	26	9	- 65.4 %
Lane Departure Crashes	46	39	- 15.2 %
LD-Wet Crashes (Codes 1-3)	22	4	- 81.8 %

Total Crashes

Segment #	Prior 3 Years	After 3 Years	Percent Change
1	81	70	-13.6%
2	24	2	- 91.7%
3	9	8	-11.1%
4	10	6	- 40.0%
5a	5	2	- 60.0%
5b	8	5	- 37.5%
6	7	5	- 28.6%

Total Wet Crashes

Segment #	Prior 3 Years	After 3 Years	Percent Change
1	26	9	- 65.4%
2	14	1	- 92.9%
3	6	2	- 66.7%
4	4	0	- 100%
5a	1	0	- 100%
5b	0	1	+100%
6	1	0	- 100%

Total Lane Departure Crashes

Segment #	Prior 3 Years	After 3 Years	Percent Change
1	46	39	- 15.2%
2	18	2	- 88.9%
3	9	6	- 33.3%
4	6	4	- 33.3%
5a	1	0	- 100%
5b	1	0	-100%
6	2	0	- 100%

Total LD – Wet Crashes

Segment #	Prior 3 Years	After 3 Years	Percent Change
1	22	4	- 81.8%
2	14	1	- 92.9%
3	6	2	- 66.7%
4	3	0	- 100%
5a	1	0	- 100%
5b	0	0	0.0%
6	1	0	- 100%

Summary

- Project was a success!
  - Consistent reduction in accidents
  - Rate of pavement distress slowed
  - Skid numbers reverted back but wet weather accidents lessened

Summary

- Current status
  - Being rehabilitated now (4 years later after concerns of imminent failure in 2011)
  - Agency pleased with extended life

Questions?