UPDATE
Implementing the Ultra High Pressure Water Cutter for Treatment of Flushed Pavements
TxDOT 5-5230

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85th Annual Transportation Short Course
Bryan, TX
October 11, 2011
The Problem: FLUSHED PAVEMENTS
The Solution: ULTRA HIGH PRESSURE WATER CUTTING
RESEARCH OBJECTIVE

- Implement the UHP water cutter as an efficient, cost-effective maintenance tool to restore texture on roads surfaced with a seal coat or surface treatment which exhibit minor to severe flushing.

- Implements findings of 0-5230
  - UHP water cutter experiences in New Zealand and Australia
  - UHP water cutter demonstration project, Grimes County, TX (BRY), in March 2010
Implementing the Ultra High Pressure Water Cutter for Treatment of Flushed Pavements

METHOD
WORK PLAN SUMMARY

1. Start date: November 29, 2010
2. Work plan:
   - Treat flushed pavements using UHP process on 14 test sites (Feb-Mar 2011)
   - Pretest and posttest for each site consisting of skid number, dynamic friction test, sand patch and circular track meter
   - Follow-up testing at all sites in Jul 2011, Jan 2012, Jul 2012
3. Data analysis: in process
4. Completion date: August 31, 2012
Test Site Locations…

- Four districts representing the four FWHA climatic regions in Texas

- A total of 14 test sites:
  - BRY… 6 sites
  - LRD… 2 sites
  - BMT… 3 sites
  - AMA… 3 sites

- Initial UHP Treatment: Jan 31 – Mar 2
TYPICAL TEST PLAN LAYOUT

½ mile
SAND PATCH TEST
(texture)
SAND PATCH

Sand Patch Mean Texture Depth (mm)

- Pre-Treatment in WP
- Pre-Treatment BWP
- Post Treatment in WP
- Monitoring 1 in WP
TxDOT SKID TRUCK
(friction)
DYNAMIC FRICTION TESTER (DFT)
ASTM E-1911 (friction)
WORK PLAN

1. Treat Jan-Mar 2011
   A. Pretest
   B. Posttest
2. Follow-up Jul 2011
3. Follow-up Jan 2012
4. Follow-up Jul 2012

- Does it WORK?
- Does it LAST?
- What’s it COST?
Q1. DOES IT WORK? (effectiveness)
SUMMARY

DOES IT WORK?

• Texture Data
  • SP: +46 to +344
  • Avg +180%
  • CTM: +38 to +354
  • Avg +186%

• Friction Data
  • SN: +0 to +351
  • Avg +124%
  • DFT: +1 to +348
  • Avg +119%

YES

Initial treatment showed improvement in both macrotexture and microtexture
Q2. DOES IT LAST? (durability)
<table>
<thead>
<tr>
<th>Month/Year of Testing</th>
<th>% Change in Sand Patch MTD from Pre-Treatment Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb-11</td>
<td>344</td>
</tr>
<tr>
<td>Mar-11</td>
<td>180</td>
</tr>
<tr>
<td>Apr-11</td>
<td>109</td>
</tr>
<tr>
<td>May-11</td>
<td>7</td>
</tr>
</tbody>
</table>

The graph shows a linear decrease in % change over time from February to July 2011.
% Change in Skid Number from Pre-Treatment Conditions

Month/Year of Testing:
- Feb-11
- Mar-11
- Apr-11
- May-11
- Jun-11
- Jul-11

- High
- Low
- Average
- Linear (Average)
% Change in DFT Friction Number from Pre-Treatment Conditions

Month/Year of Testing

Feb-11 | Mar-11 | Apr-11 | May-11 | Jun-11 | Jul-11

High: 348 | Low: 183 | Average: 119 | Linear (Average): 75

High: 13
SUMMARY

DOES IT LAST?

- Sand Patch
  - +180% to +109%
- CTM
  - +186% to +102%
- Skid Number
  - +124% to +64%
- DFT
  - +119% to +75%

MIXED RESULTS

Promising, still obtaining data; too early to tell
Q3. WHAT’S IT COST? (affordability)
# UHP Treatment Speeds and Production Rates

<table>
<thead>
<tr>
<th>Site</th>
<th>Treatment Speed (mph)</th>
<th>Production Rate (SY/hour)</th>
<th>Surface Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
<td>Avg</td>
</tr>
<tr>
<td>BRY1</td>
<td>0.5</td>
<td></td>
<td>0.6</td>
</tr>
<tr>
<td>BRY2</td>
<td>0.7</td>
<td></td>
<td>0.7</td>
</tr>
<tr>
<td>BRY4</td>
<td>1.0</td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>BRY5</td>
<td>0.5</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>BRY7</td>
<td>0.7</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td>BRY9</td>
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<td>0.7</td>
</tr>
<tr>
<td>LRD2</td>
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<td>0.7</td>
</tr>
<tr>
<td>LRD3</td>
<td>0.5</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>BMT1</td>
<td></td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>BMT2</td>
<td>1.1</td>
<td>2.4</td>
<td>1.6</td>
</tr>
<tr>
<td>BMT3</td>
<td>1.0</td>
<td>1.1</td>
<td>1.0</td>
</tr>
<tr>
<td>AMA1</td>
<td></td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>AMA2</td>
<td>0.8</td>
<td>1.3</td>
<td>1.1</td>
</tr>
<tr>
<td>AMA3</td>
<td>0.4</td>
<td>0.7</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Speed**: 0.5 to 1.6, avg 0.8mph  
**Production**: 590 to 1870, avg 990 sy/hr
# Unit Costs for Current Treatments (Flushing)

<table>
<thead>
<tr>
<th>Function Code</th>
<th>Function Code Description</th>
<th>Turn-key Maintenance Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>212</td>
<td>Leveling or Overlay with Maintainer…</td>
<td>District Minimum $/SY: $3.91</td>
</tr>
<tr>
<td>214</td>
<td>Leveling or Overlay with Drag Box…</td>
<td>District Minimum $/SY: $1.71</td>
</tr>
<tr>
<td>232</td>
<td>Strip or Spot Seal Coat (Chip Seal)…</td>
<td>District Minimum $/SY: $2.19</td>
</tr>
<tr>
<td>252</td>
<td>Milling or Planing…</td>
<td>District Minimum $/SY: $1.37</td>
</tr>
<tr>
<td>253</td>
<td>Spot Milling…</td>
<td>District Minimum $/SY: $3.19</td>
</tr>
</tbody>
</table>
Unit Costs for UHP Water Cutting (Flushing)

SUB-CONTRACT
(UHP Water Cutting - No Support Services)
- MIN: $0.90/SY
- MAX: $1.15/SY

GENERAL CONTRACT
(Turn Key UHP Water Cutting)
- MIN: $1.40/SY
- MAX: $1.65/SY

COSTS REPORTED BY UHP CONTRACTOR
SUMMARY

WHAT’S IT COST?

- Compare to Strip/Spot Seals:
  - < $1.05/sy cheaper
  - < 41%
  - < 25 to 77% compared to other maintenance functions

CHEAPER than strip seals and other methods
Interim Conclusion

- UHP Water Cutting for treatment of flushed pavement surfaces:
  - **Works**... treatment is effective
  - **Lasts(?)**... mixed results, promising, still under review
  - **Costs**... less than currently-available maintenance methods
THANK YOU!

TECHMRT
- Sanjaya Senadheera
- Andrew Tubb
- Timothy Wood
- Michael Leaverton
- Jake Blessen
- John Papa
- Conrad Lovejoy
- Rod Henderson

RAMPART HYDRO SERVICES
- Jeff Parks
- Bob Beadling
- Jim Windich

TXDOT
- Darlene Goehl
- & many, many more