TRB 2009 Visibility Symposium

Drying Additive for Faster Drying Rates of Waterborne Pavement Markings

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May 2009
**Drying Additive - What is it?**

Waterborne Traffic Paint:
High pH system with “Quickset” chemistry

Drying Additive:
A polymeric bead that efficiently absorbs water and reduces the pH of fast dry waterborne paints.

Result:
By co-spraying the drying additive beads into paint spray fans, a two-fold increase in drying rate of waterborne pavement markings is possible.
A polymeric bead drying additive has been developed that:

1. effectively absorbs water
2. reduces the pH of fast dry waterborne paints
3. provides a two-fold increase in drying rate of wb markings

**Fastrack QS-2**
300-800 micron diameter beads
Drying Additive - Where can it be used?

- Standard Waterborne
- High Build, High Durability WB
  (Fed Spec TTP-1952E Type III for improved durability)
  (Type III can be based on Fastrack HD-21A binder)

FAA research “Paint and Bead Durability Study” (March 2003)*
found that the durable waterborne product based on HD-21A
“... had the superior performance since it held the beads in place better”

* DOT/FAA/AR-02/128 (H. Cyrus)
www.airporttech.tc.faa.gov
Drying Additive - Why is it needed?

Performance:
Dry Time / Water Washout / Durability

Dow Advanced Materials
Drying Additive - When is it needed?

- Weather conditions
- Night time striping
- Productivity Improvements
- Durability Improvements

Super High Build Paints –
next step in Durability
Drying Additive - Blend With Glass Beads

Approach:
• Blend Drying Additive with Small Glass Beads

Benefits:
• Easier to control Fastrack™ QS-2 dosage (dilute material)
• Small glass beads “inside” paint film, similar to thermo
• Possible durability advantage
Drying Additive for High Build Water Based Traffic Markings

Pavement Marking with and without Drying Adjuvant

Super High Build with Fastrack QS-2

GLASS BEADS

HD-21A PAINT (up to 35 wet mils)

Fastrack QS-2 drying additive

Small Glass Beads

ROAD SURFACE

Note: Thermo contains small glass beads throughout the marking as well as surface beads for reflectivity.

Schematic of Standard 15 mil & Small Glass Beads

No Fastrack QS-2 drying additive
Drying Additive for High Build Water Based Traffic Markings

Benefit:
Improved Water Washout Resistance on the Road

- Heavy rain 1 hour after last line applied

Picture after 9 DAYS

Low level DA  NO DA added  High level DA

Center three lines with NO Drying Adjuvant show early deterioration
(paint washed from the roadway due to early rain event)
Benefit: **Improved Water Wash-off Resistance**

**With Drying Adjuvant**  **Without Drying Adjuvant**

*Paint dried for 15 minutes then direct water spray application*
## Drying Additive - Prototype Long line Trials

Evaluation of Dry to No Pick-Up

<table>
<thead>
<tr>
<th>Location</th>
<th>Conditions Air/%RH/Road</th>
<th>Without Drying Additive</th>
<th>With Drying Additive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saskatchewan</td>
<td>83°F / 40% / 95°F</td>
<td>~ 4 min</td>
<td>~2 min</td>
</tr>
<tr>
<td>Alberta</td>
<td>59°F / 66% / 58°F</td>
<td>~11 min</td>
<td>~4 ½ min</td>
</tr>
<tr>
<td>Ontario</td>
<td>88°F / 19% / 111°F</td>
<td>~4 ½ min</td>
<td>&lt;2 min</td>
</tr>
</tbody>
</table>
# Test Deck Trial Results

Date: 10-15-08       Location: Route 202S Doylestown, PA       Surface: Concrete  
Conditions: %RH - 47% / Air – 71 °F / Road – 72 °F

~22 wet mils of Fastrack HD-21A based, High Build, WB Paint  
Drying Additive Injected (Fastrack QS-2 / small glass bead blend)

<table>
<thead>
<tr>
<th>Drying Additive</th>
<th>Drying Additive Blend Level</th>
<th>Finger touch No Pressure</th>
<th>Retro at 3 months Skip Line / Wheel Track</th>
<th>Retro at 5 months Skip Line/WT (after winter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>None-Control</td>
<td>5 min</td>
<td>539 mcd / 237 mcd</td>
<td>394 mcd / 133 mcd</td>
</tr>
<tr>
<td>Yes</td>
<td>Low* (235/m²)</td>
<td>2 min</td>
<td>550 mcd / 470 mcd</td>
<td>504 mcd / 306 mcd</td>
</tr>
</tbody>
</table>

*Blend is 1:4 QS-2 / glass  
437 g/m² of VisiPlus II glass beads
Application - Road Trial 5-6-09

Assessment:

- Level of Drying Additive
- Durability
- Dry Time Effect
- Application - Equipment Set-up
  (front or back)

Picture of a “BACK” Set-up
Road Trial Results – Dry Time Comparison

Date: 5-6-09       Location: Route 202S Doylestown, PA       Surface: Concrete

Conditions: %RH - 91% / Air – 62 °F / Road – 64 °F
Rain for 8 days previous – 10 hour no rain window - ~4 hrs after application very heavy rain – continued rain/drizzle for another 3 days

35 wet mils of Fastrack HD-21A based, High Build, WB Paint

Drying Additive Injected (Fastrack QS-2 / small glass bead blend)

<table>
<thead>
<tr>
<th>Drying Additive</th>
<th>Drying Additive Blend Level*</th>
<th>Finger touch No Pressure</th>
<th>Finger touch Light Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>None- Control</td>
<td>5 min</td>
<td>7 min</td>
</tr>
<tr>
<td>Yes</td>
<td>Low (150g/m²)</td>
<td>1 min</td>
<td>1.5 min</td>
</tr>
<tr>
<td>Yes</td>
<td>High (250g/m²)</td>
<td>30 sec</td>
<td>1 min</td>
</tr>
</tbody>
</table>

*Blend is 1:2 QS-2 / glass
Drying Additive - Challenges

- Barrier to entry due to equipment modifications
- Additional cost incurred due to Drying Additive
- Complexity of the overall equipment
  - Need additional spray gun
  - More suited for the sophisticated contractor
  - Requires trials for proof (time)
## Typical Costs Associated with Traffic Markings*

<table>
<thead>
<tr>
<th>Marking Material</th>
<th>Averaged Cost ($ / ft)</th>
<th>Averaged Service Life (years)</th>
<th>Averaged Life-Cycle Cost ($ / ft / year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Waterborne Paint</td>
<td>0.08</td>
<td>1</td>
<td>0.08</td>
</tr>
<tr>
<td>High Build Waterborne Paint</td>
<td>0.13</td>
<td>2</td>
<td>0.065</td>
</tr>
<tr>
<td>Spray Thermoplastic</td>
<td>0.33</td>
<td>3</td>
<td>0.11</td>
</tr>
<tr>
<td>Epoxy</td>
<td>0.30</td>
<td>3</td>
<td>0.10</td>
</tr>
<tr>
<td>Tape</td>
<td>2.70</td>
<td>5</td>
<td>0.54</td>
</tr>
<tr>
<td>Polyurea</td>
<td>0.71</td>
<td>4</td>
<td>0.18</td>
</tr>
</tbody>
</table>

*From 2008 ATSSA Survey
**Drying Additive - Advantages**

- Versatility - Can be switched on or off depending on conditions (low temp and/or high humidity)
- Less claims against DOT for paint tracked on cars
- Less unsightly paint tracking
- Improved retroreflectivity due to less damage from early tire rollovers
- Improved “wash-out” resistance of freshly applied markings
- Faster moving applications to relieve congestion and driver stress
- Opens the stripping window to include marginal conditions
**Drying Additive - Advantages**

- Enables use of larger glass beads and new reflective materials
- Enables wb to be a more “acceptable” for a “wet night” offering
- Additional cost still far from the cost of other marking systems
- Reduce the need to “cone” high build markings
- Contractor can use current truck to place “durable” thermo-like lines
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Thank you!