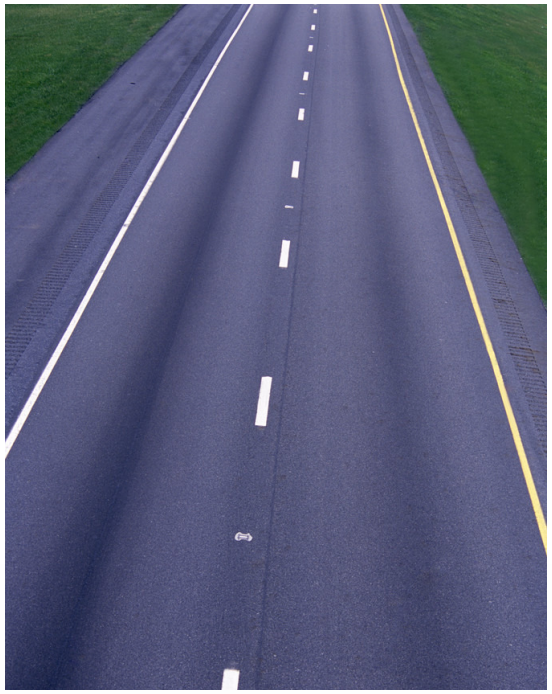
TRB 2009 Visibility Symposium

Drying Additive for Faster Drying Rates of Waterborne Pavement Markings



Cynthia Randazzo

The Dow Chemical Company

May 2009

DOW

Advanced Materials

Drying Additive - What is it?

Waterborne Traffic Paint:

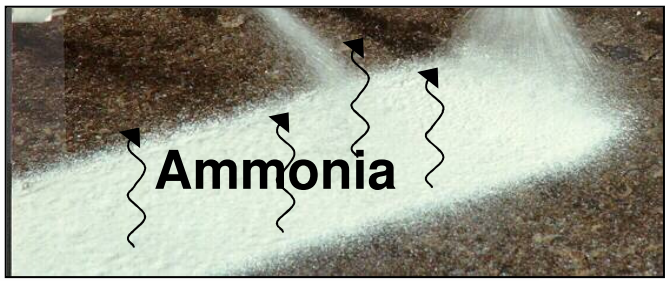
High pH system with “Quickset” chemistry

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.



DOW
Advanced Materials

Drying Additive = Fastrack™ QS-2

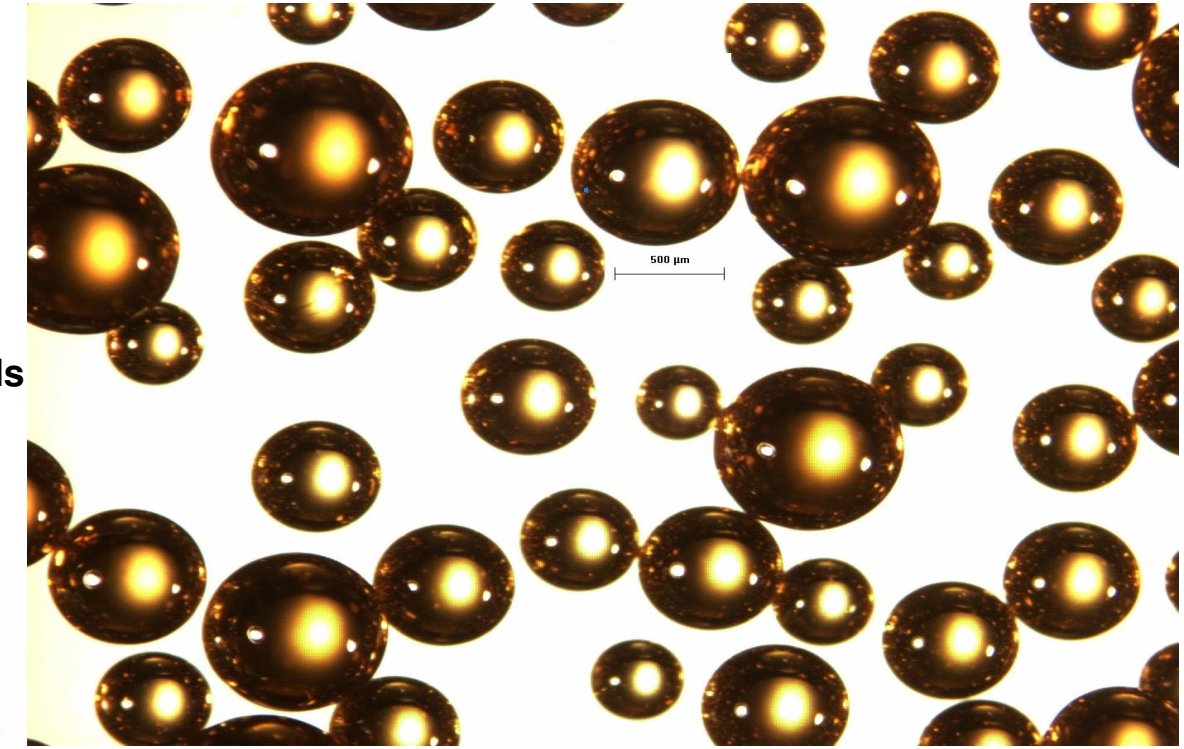
A polymeric bead drying additive has been developed that:

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



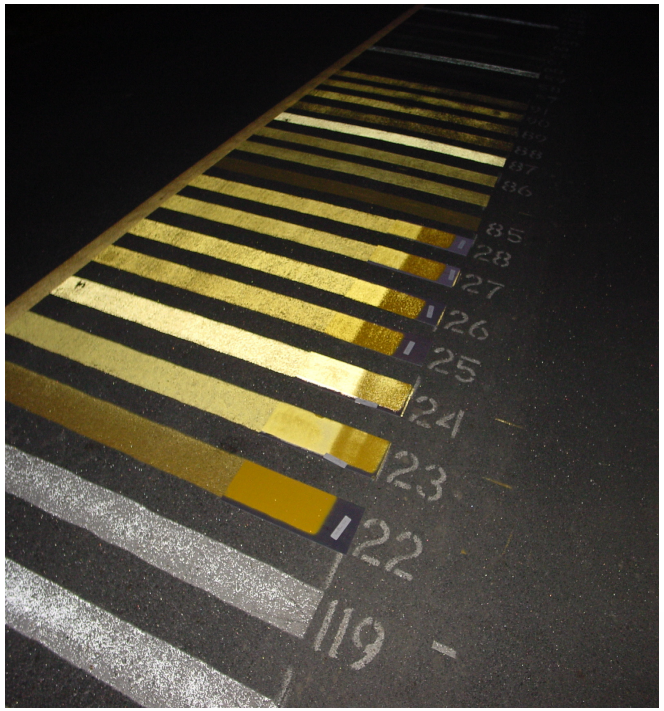
DOW
Advanced Materials

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

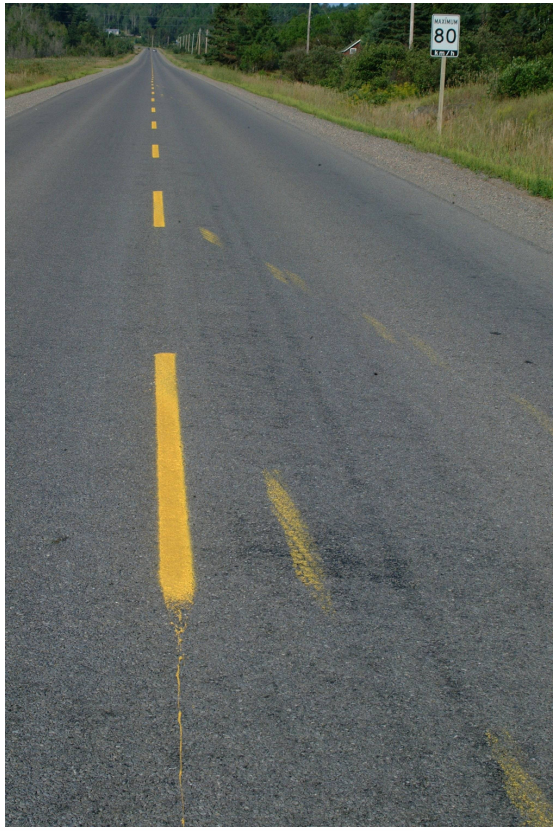
DOW Advanced Materials

FASTRACK™ ROAD MARKING TECHNOLOGY

Drying Additive - Why is it needed?

Performance:

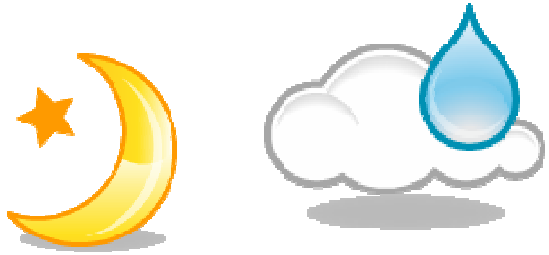
Dry Time / Water Washout / Durability



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

DOW

Advanced Materials

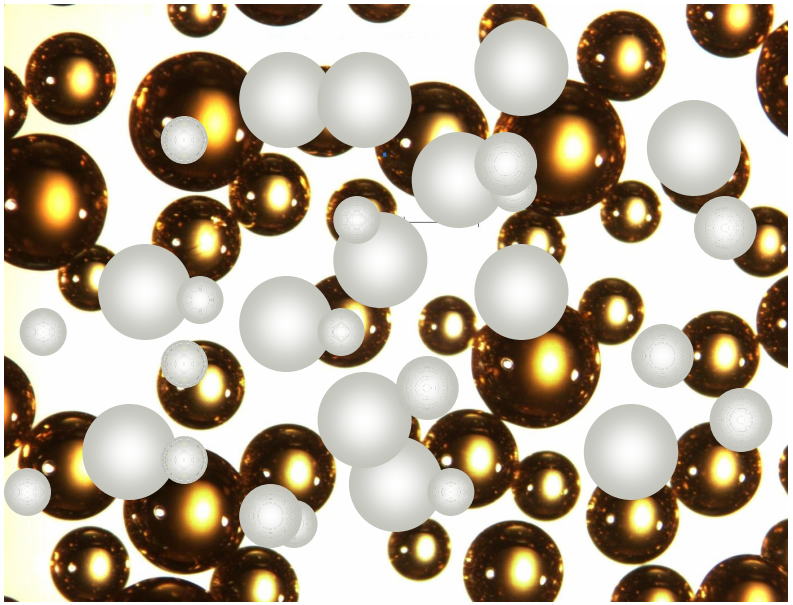
Drying Additive - Blend With Glass Beads

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**



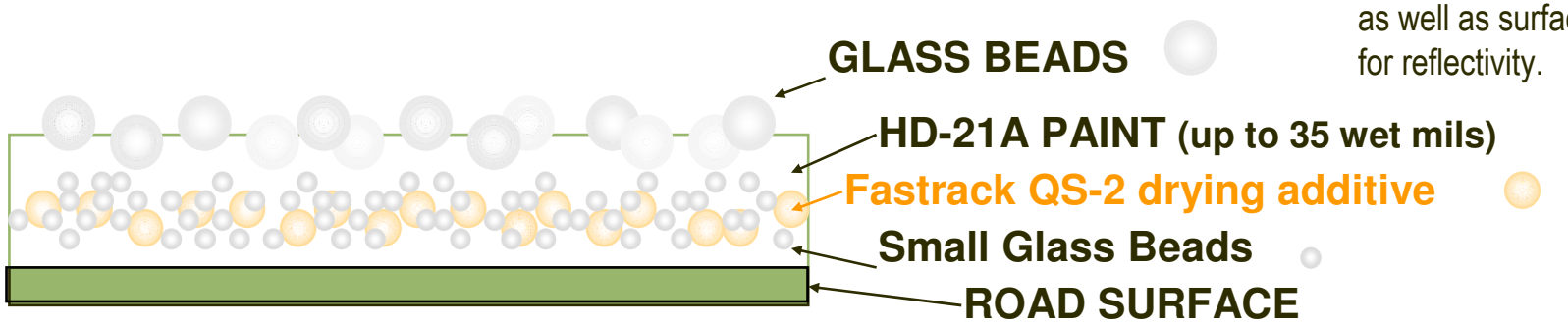
DOW
Advanced Materials

Drying Additive for High Build Water Based Traffic Markings

Pavement Marking with and without Drying Adjuvant

Super High Build with Fastrack QS-2

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

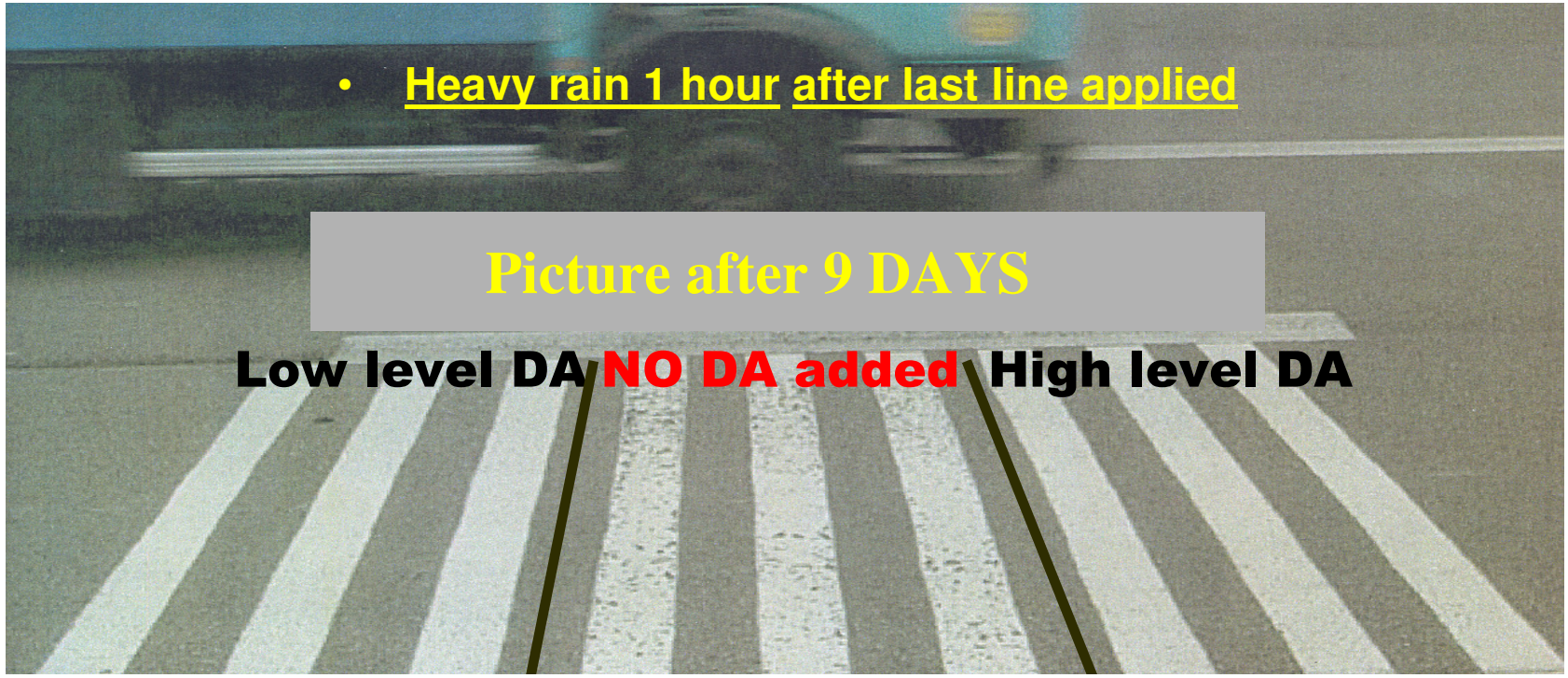


Schematic of Standard 15 mil & Small Glass Beads
No Fastrack QS-2 drying additive

Drying Additive for High Build Water Based Traffic Markings

Benefit:

Improved Water Washout Resistance on the Road



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

DOW

Advanced Materials

Drying Additive -
Prototype Long line Trials

Evaluation of Dry to No Pick-Up

Location	Conditions Air/%RH/Road	Without Drying Additive	With Drying Additive
Saskatchewan	83°F / 40% / 95°F	~ 4 min	~2 min
Alberta	59°F / 66% / 58°F	~11 min	~4 ½ min
Ontario	88°F / 19% / 111°F	~4 ½ min	<2 min

DOW
Advanced Materials

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)

Drying Additive	Drying Additive Blend Level	Finger touch No Pressure	Retro at 3 months Skip Line / Wheel Track	Retro at 5 months Skip Line/WT (after winter)
NO	None-Control	5 min	539 mcd / 237 mcd	394 mcd / 133 mcd
Yes	Low* (235/m^2)	2 min	550 mcd/ 470 mcd	504 mcd/ 306 mcd

*Blend is 1:4 QS-2 / glass

437 g/m^2 of VisiPlus II glass beads

Application - Road Trial 5-6-09

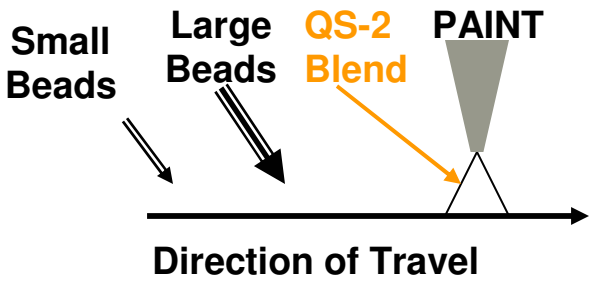
Assessment:

- Level of Drying Additive
- Durability
- Dry Time Effect
- Application - Equipment Set-up

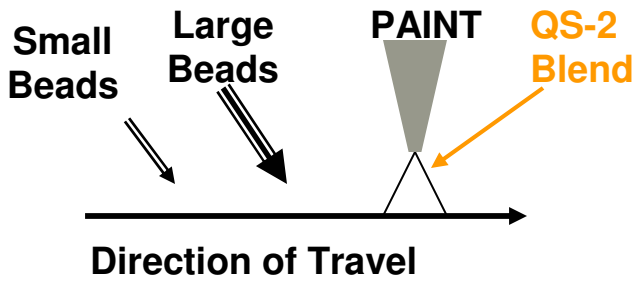
  (front or back)

Picture of a “BACK” Set-up

BACK Set-up



FRONT 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)

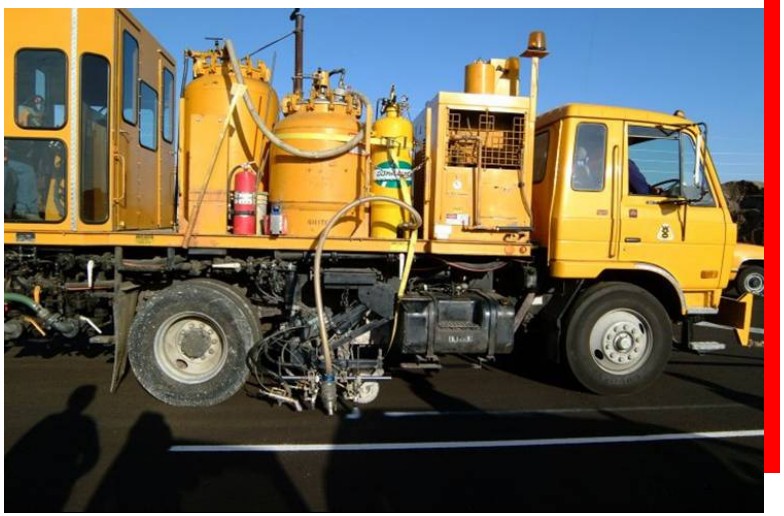
Drying Additive	Drying Additive Blend Level*	Finger touch No Pressure	Finger touch Light Pressure
NO	None- Control	5 min	7 min
Yes	Low (150g/m^2)	1 min	1.5 min
Yes	High (250g/m^2)	30 sec	1 min

*Blend is 1:2 QS-2 / glass

DOW Advanced Materials

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)**



DOW
Advanced Materials

Typical Costs Associated with Traffic Markings*

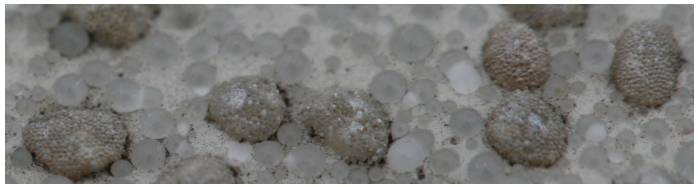
Marking Material	Averaged Cost ($ / ft)	Averaged Service Life (years)	Averaged Life-Cycle Cost ($ / ft / year)
Standard Waterborne Paint	0.08	1	0.08
High Build Waterborne Paint	0.13	2	0.065
Spray Thermoplastic	0.33	3	0.11
Epoxy	0.30	3	0.10
Tape	2.70	5	0.54
Polyurea	0.71	4	0.18

•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**

DOW

Advanced Materials

TRB 2009 Visibility Symposium

Drying Additive for
Faster Drying Rates of
Waterborne Pavement Markings

Thank you!

DOW
Advanced Materials