2011 NEPPP

Annual Meeting November 2011

Boston, MA

Status Update: Identifying Research Needs for Emulsion Applications

Colin Franco P.E. – RI DOT

Contributors: Bryan Engstrom – RIDOT and Andrew Hanz – UW Madison and

MARC MODIFIED ASPHALT RESEARCH CENTER

Background

- ✓ Idea conceived at AEMA-ISSA-ARRA meeting February 2008 under guidance of Jim Sorenson, FHWA
- ✓ Identified need for industry expertise and involvement in ongoing research activities pertaining to asphalt emulsions and finished product systems
- ✓ First meeting in Newport Beach, CA April 7-8, 2008

Original Scope

- ✓ Review needs for Preservation Materials Research- Emulsion & Aggregate
- ✓ Evaluate existing R&D Roadmap Problem Statements in the Area of Emulsions
- ✓ Evaluate Work Plans and Review Ongoing Research in PP Emulsion
- ✓ Make Recommendations and integrate work activities

Original Scope Deliverables

- ✓ ***Advance the Effort to Develop Performance Based Methods & Specification for Emulsions***
  - ***Protocols for design***
  - ***Protocols for performance***
  - ***Protocols for inspection & acceptance***

- ✓ ***Encourage Adoption of Uniform National Standards***

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Task Force Representation

ETF

Co-Chair- Roger Hayner, Colas Inc., AEMA

Co-Chair- Colin Franco RI DOT, TSP2, PPETG, SOMtrls, SCOR

Members From:

- Industry: AEMA/ ARRA/ ISSA
- Academics: CSU/ TX A&M/ U.WISC/ Cal State
- State DOT's: TX, IA, UT, RI, CA
- FHWA
- NCPP

Subcommittees

ETF

1) **Emulsion Testing & Residue Recovery Methods**
   - Arlis Kadrmas- Chair
2) **Residue Tests**
   - Gayle King- Chair

Note: Subcommittees Combined as of March 2010
   - Arlis Kadrmas to chair combined group

Subcommittees

ETF

3) **Aggregates, Mix Design, and Performance Tests**
   - Mary Stroup-Gardiner- Chair
4) **Approved Supplier Certification**
   - Roger Hayner- Chair
5) **Inspection & Acceptance**
   - Colin Franco- Chair
6) **Tack Coat Review** (Formed 7/26/10)
   - Chris Abadie- Chair

ETF Survey Efforts

- To determine ETF AND Customer needs TWO surveys were conducted in 2010 by MARC and RIDOT

Survey Efforts

Survey Intent	Date Sent	Distribution
1. Prioritize Emulsion Applications. 2. Identify Research Needs	July 2010	Emulsion Task Force (DOT, Industry, Academia)
1. Identify properties for specs. 2. Availability of tests. 3. Define effects of aging/moisture.	November 2010	DOT Materials and Maintenance Engineers Industry/Academia

Summary of Applications Considered - Surface Treatments

- Tack Coat
- Fog Seal
- Prime Coats – Emulsion
- Prime Coats - Penetrating
- Dust Palliative (Non-Permanent)
- Sand Seal
- Cape Seal
- Chip Seal
- Micro-surfacing
- Slurry Seal

- Others (identified by respondents): Flush Coat for OGFC in SW States, Crack filling, Cold Patching
- Rank all: High/Medium/Low

High Priority Applications

- Surface Treatments (N=24)
  - Chip Seals (100%)
  - Tack Coat (66.7%)
  - Micro-surfacing (62.5%)
  - Slurry Seal (39.1%)
- Cold Mixes (N=24)
  - FDR and CIR ~40% ranked High Priority
  - Cold Mixes (Plant Recycled/Virgin): 55% Medium Priority

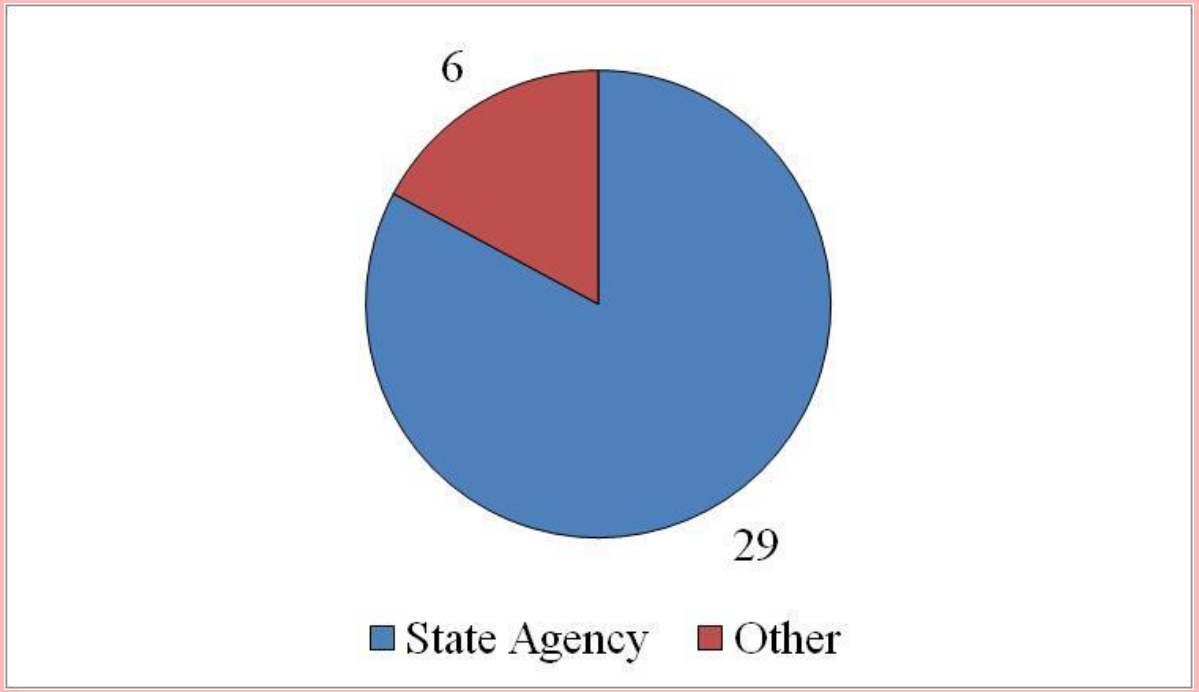
Research Needs – *Chip Seals*

- Research adhesive test and other industries to improve adhesive properties of emulsions.
  - *ETF recommended BBS test for evaluation of adhesion (AASHTO TP91)*
- Application of DSR testing to better classify emulsion residues, tests available are currently inadequate. Include lab-field validation.
  - *ETF recommended NCHRP Problem statement.*
- Improvements to the Sweep Test with attention to pavement condition. Apply the ISSA WTA Test to chip seals.
  - *ETF promoting implementation of NCHRP 14-17.*

High Priority Applications

- Intent of survey was to prioritize applications.
- Three Surface Treatments were identified as high priority (N=24)
  - Chip Seals (100%)
  - Tack Coat (66.7%)
  - Micro-surfacing (62.5%)
- New survey written to focus on these areas.
  - Open from 11/1 – 12/31/2010.

New Survey – Participation and Distribution



- State Agency – NCPP. Sent to maintenance engineers.
- Other (Industry/Academia) – AEMA news blast and note from ETF.

Layout of New Survey

1. Identify properties required for a suitable Spec.
2. Identify main modes of failure and their mechanisms.
3. Are their tests available to address these failure modes?
4. Do aging/moisture damage contribute to failure?
   a) If yes, identify tests available and categorize them as: A: Adequate, B: In need of further development, C: Test available in other industry, or D: Development needed.
   b) If no test is available (D) indicate what properties a new test should evaluate.

Properties for Specifications

- **Construction Properties – *Current ETF Focus***
  - Viscosity, breaking/setting rate, application rate, application temperature
- **Residue Properties - *Current ETF Focus***
  - Elasticity/Ductility, adhesion/cohesion, rheology from HT to LT.
- **QC/QA Testing**
  - Emulsion quality, AASHTO Testing, aggregate properties, emulsion/aggregate compatibility

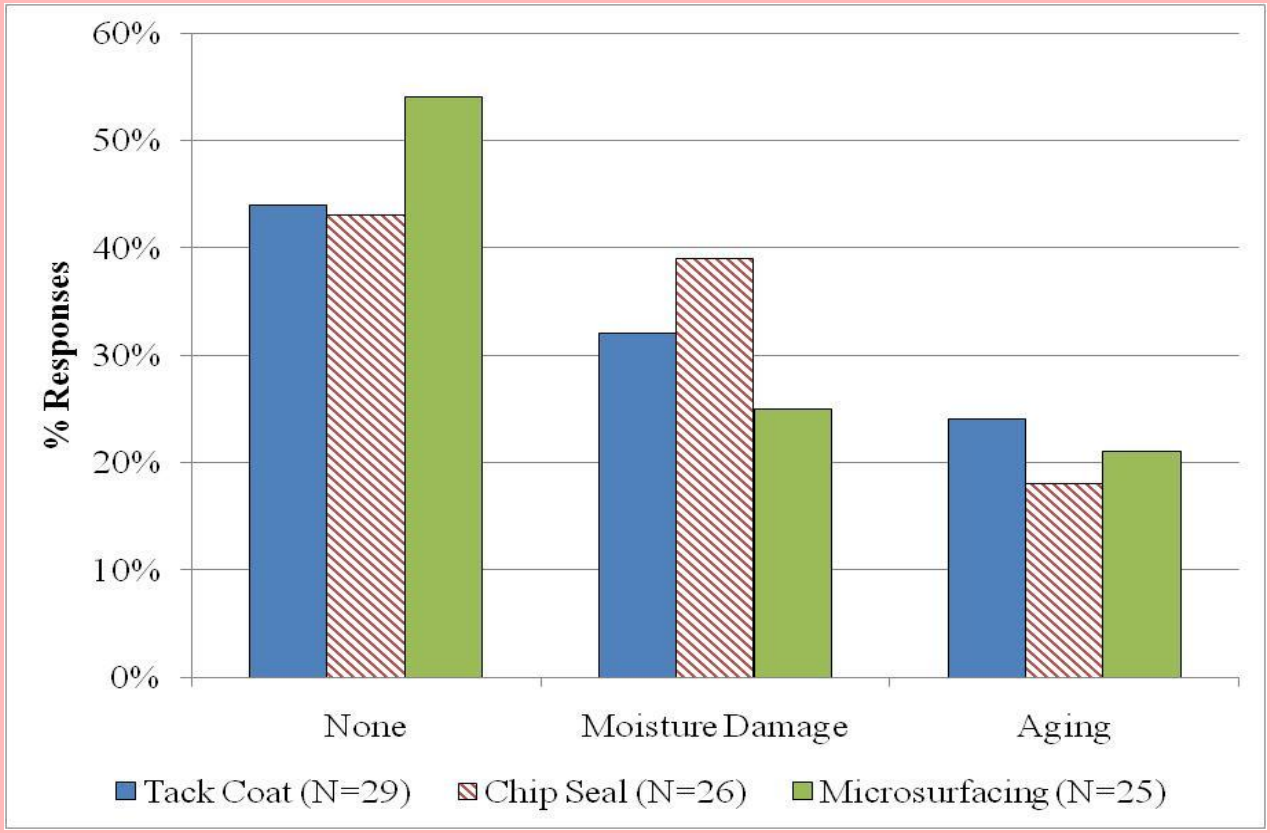
Distribution of Properties Required in a Specification

Modes of Failure and Mechanisms – Chip Seals - Examples

Treatment	Failure Mode	Materials Related	Design or Construction Related
Chip Seal	Chip Loss	Emulsion Performance Adhesion	Aggregate Quality Premature Opening Application Rate
	Bleeding	Emulsion Performance Turning Movements	Application Rate Gradation Traffic Volume

For both treatments design/construction guidance needed to reduce failures.

Influence of Moisture Damage/Aging on Performance

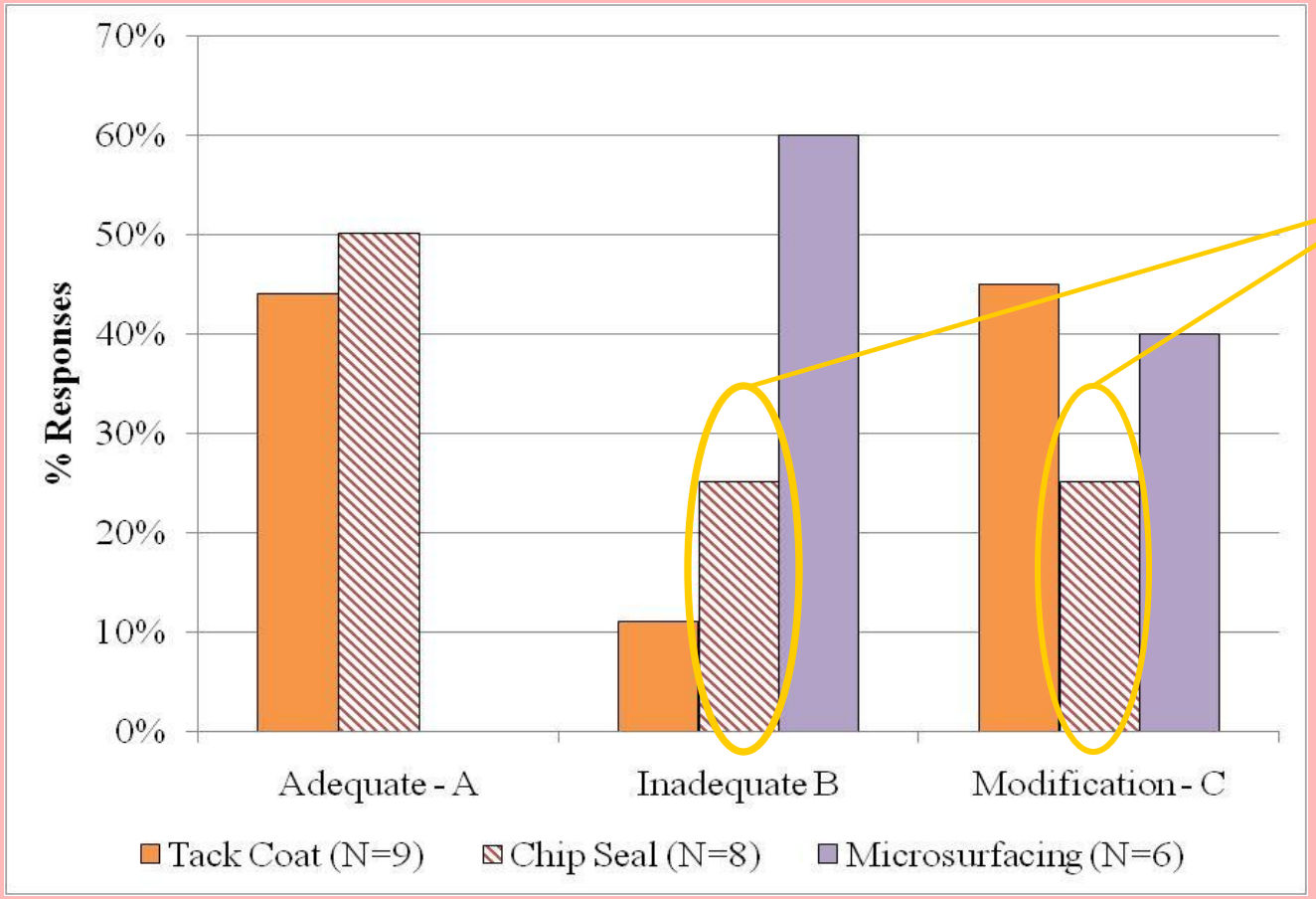


Majority feel aging is not important.

Mixed results for moisture damage.

For all treatments, the most frequent response was "None."

Availability of Test Methods to Evaluate Moisture Damage/Aging



40% of respondents feel new test is needed.

Summary of Comments – Aging and Moisture Damage – Chip Seals

- **Current Methods**
  - A (Adequate): Gradation, Mix Design, Viscosity
  - B (Inadequate): DSR for initial unaged binder and BBR or DSR for low temp stiffness.
  - C (Modification): Construction Control
- **Research Needs**
  - Adhesion, evaluation of oxidation, simulate aggregate retention. *Materials Evaluation (ETF)*
  - Moisture content of substrate. Aggregate properties need to be measured and controlled. *Construction Control*

Conclusions

- ETF activities are focused on high priority emulsion applications.
- ETF is working to provide test methods to improve performance evaluation of materials.
- Opportunity exists to provide further guidance:
  - Mix Design Criteria and Limits
  - Construction Guidelines
- Survey indicates these contribute significantly to failures.

Thank you for your time!

Colin Franco
cfranco@dot.ri.gov

Andrew Hanz
ajhanz@wisc.edu