# AASHTO TSP2 - Emulsion Task Force (ETF) Meeting

*PRI Asphalt Technologies, Inc. Offices – Tampa, FL*
*December 13-14, 2016*

**MINUTES**

**Day 1**
**Tuesday, December 13, 2016**

**Welcome, Introductions & Roll Call** Franco/Lubbers

**Agenda Overview** Franco

**Approval of May 5-6, 2016 Meeting Minutes**

- Page 2 e1) 48 participating states, 19 vendors, change for bridge and preservation.
- Page 5 c.i.2) Also providing feedback to ISSA on slurry/micro performance tests *so that ISSA can improve their own standards.*
- Approved w/changes

**Reviewing ETF Mission & Goals** Franco/Lubbers

**Activity Reports (Quick, 5 Minutes/Group)**

a. $FP^2$ Inc. Moulthrop
   i. Focused on working on transportation funding legislation.
b. AEMA Ishee
   i. Selected a new administrative contractor.
   ii. Executed a contract to develop an online emulsion manufacture course with University of Arkansas.
c. ISSA Price/Jerman
   i. Marketing of AEMA/ISSA/ARRA as a joint organization.
   ii. Slurry systems workshop next month.
d. ARRA Thomas
   i. Recycling workshop to demonstrate preservation technologies, perhaps in Ohio.
   ii. Held semi-annual meeting last month. NCAT test track includes some recycling sections.
   iii. NCHRP 09-62 project "Assessment of Asphalt-Based Cold Recycling" will be awarded early 2017.
   iv. Submitted standards for cold recycling to AASHTO, after they are accepted ARRA is interested in training.
e. AASHTO TSP•2 Galehouse
   i. AASHTO is undergoing a re-organization that will take approximately 2 years. Subcommittee on Maintenance and Materials remains unaffected.
   ii. TSP2 remains the representative for AASHTO regarding preservation.
   iii. National conference was very well attended. Included 20 sessions covering 4 different technical tracks.
f. Asphalt Binder & Mixture ETG Hanz
   i. 4mm Task Group submitted procedures for sample loading and compliance correction. Follow up discussion on research needs including specimen equilibrium, reproducibility, etc. were discussed.

**Ongoing Field Research**

a. LTPP and Pavement Preservation Hicks
   i. Experimental work and development of plan is progressing well. Funding for Phase II of construction is uncertain.
   ii. Documents developed in Phase I will be made available to states for individual implementation. Pooled fund is being investigated as an opportunity to continue effort.

iii. AEMA has meeting with FHWA at TRB to discuss areas of interest. White paper to supplement the discussion would be of benefit.

b. MN Road / NCAT Pooled Fund Study Moulthrop
   i. NCAT Lee Rd. built in 2012 (100 ft sections). Many companion sections built in Minnesota in 2016, all these sections are 528 ft long.
   ii. Intent is to monitor pavement sections until they meet pre-treatment level of distress to define service life extension of treatments.
   iii. Distresses observed from snow plow damage and some cracking in MN sections. Photographs of sections shown by Larry Galehouse, taken 11/30 and two snow events (11/19 and 11/23, totaling 11.5 in). Appendix A

c. PPETG Dietz
   i. Established 5 core areas, developed work plans (Tab 3 in meeting handout) and have begun work.

**Update AASHTO Deliverables** Franco/Voth

a. AASHTO SOM TS 2a Annual Meeting – Greenville, SC – Summary
   i. Provisional standards submitted in 2010 (PP 71, PP 72, and TP 91) have at most two years left for provisional standing then will need to either be accepted or dropped.
   ii. Standards drafted in 2011 as deliverables from NCHRP 14-17. They are currently under review by ETF and need to be reviewed to discuss which should be moved forward.
   iii. Best Practices document. Draft has been developed for chip seal and micro-surfacing. Need to find an organization to publish. Possible candidates include AASHTO Subcommittee on Maintenance, or others.
   iv. New AASHTO Tech Section – TS 5b for Pavement Preservation. Some standards developed by ETF will be moved over to TS 5b (i.e. treatment specs), others will stay in TS 2a (i.e. emulsion specs).

b. Published - 2016 Standards and Practices
   i. M140-16, M208-16, M316-16
   ii. Chip Seal and Micro Surfacing Treatments
   iii. TP71, TP72 – Full Standards

c. Draft MP Standards and RP Practices - Full SOM Ballot in November, 2016
   ii. Cold-In-Place Recycling (CIR)
   iii. Slurry Seal
   iv. Fog Seal
   v. Tack Coat

1. Need construction guide specs and best practices for all these treatments.
2. Will be notified if standards were accepted in early 2017. Numerous comments on each were received and addressed prior to summer AASHTO meeting.

d. NCHRP Program
   i. NCHRP 10-92 Construction Guide Specs for Chip Seal and Micro Surfacing
   ii. NCHRP 9-62 QA and Specs for CIR using Asphalt-Based Recycling Agents
   iii. SPG Problem Statement Submission – RI DOT Sponsor
      - Develop and Validate a Performance Related Specification for Emulsified Asphalts. Identified as a high priority for TRB and for a funding level of $600k.

**Membership Reviews** Franco/Lubbers

a. ETF Membership SC Chairs
b. Subcommittee (SC) Membership

**Action Items**

- Members and Friends notify Chris if contact information or affiliation has changed since May 2016.

**Follow-Up Actions by Subcommittees** Franco/Lubbers

a. New Standards and Design Practices for Additional Emulsion Treatments
b. Construction Guide Specifications for Emulsion Treatments
c. Best Practices for Emulsion Treatments

**SC Break-Outs**

a. Meet as-needed
    i. Some SC's Have Current Deliverables Completed
b. Residue Recovery & Testing Kadrmas
    - Will give updates on ash content test.
    - Concerns on specifications.
    - Emulsion viscosity (Saybolt vs. Paddle), field viscosity (NCHRP 14-17)
c. Design Group – Mix Moulthrop
    i. New Specs and Design Practices
        - Micro-surfacing and slurry seal are completed. Comments related to aggregate specs will be discussed.
        - Ultra-Thin Bonded Wearing Coarse (UTBWC) and sand seal specs will be discussed.
    ii. Construction Guide Specs / Best Practices
d. Design Group – Spray Hicks
    i. New Specs and Design Practices
        - Leadership needs to decide how to handle low tracking tack coat products.
        - Significant discussion within TS2a regarding materials specifications for tack coat.
    ii. Construction Guide Specs / Best Practices
        - Chip seal and micro-surfacing complete. Guide for hot applied chip seals under development.
    iii. Scrub Seal Stds. and Use of Rejuvenators
        - Significant effort needed for materials specification. Design and construction specs are set.
e. Quality Assurance (QA) & Certification Shields
    i. Proposed Schedule and Plan for Drafting of Standards
f. Recycling Emulsions Thomas
    i. New Specs and Design Practices
        - Submitted for CIR.
        - Will discuss next priorities: Foam stabilization/recycling, FDR, others.
    ii. Construction Guide Specs / Best Practices
        - Need to discuss recycling guides
g. Research Hazlett
    i. Identifying Potential Funding Sources
    ii. Development of Research Needs Statements
        - Pavement preservation roadmap has identified many research needs, some of which have been worked on.
        - Submitted a problem statement for design and practice that will be funded.

**Tour of Lab**

a. Lab Tour and Hurricane Damage Demo — Ken

**SPG** - **Performance Grading Specifications** — Franco/Voth/King

**Presentations and Discussion on Performance Grading Specifications**

a. Gayle King – Comparison of Approaches + National Implementation Needs
b. Discussion Points
   i. Three new specifications under review 1) Texas A&M SPG, 2) NCSU NCHRP 9-50, and 3) ETF Consensus (in progress).
   ii. High temperature: MSCR vs. G*/sind, specification can include tables for both.
   iii. PAV aging: Should it be included?
   iv. Polymers: Universal test vs. PG Plus specs.

**c. Presentation 1: Gayle King – Update Since May 2016 meeting. Specification Input (Appendix B & C)**

   i. Review current draft specification.
   ii. Develop consensus
   iii. Open Discussion
      1. Agency concerns, industry concerns, academia input.
   iv. Implementation
      1. Lead States
      2. Pavement Preservation Partnerships
      3. User/Producer Groups
      4. Training
      5. Lead Laboratory – AI?

**d. Presentation 2: TxDOT SPG Implementation – Evolution of Field Performance Validation for SPG Binder Specification – Prof. Amy Epps-Martin, Texas A&M (Appendix D)**

   i. Primary Distresses
      1. Aggregate Loss (80%)
      2. Bleeding (20%)
      3. Aggregate Embedment
      4. Cracking (Structure related)
   ii. Field Experience (TxDOT): If seal lasts first winter it will perform.
   iii. Surface Condition Index: ≥75% Pass, 70% ≤ SCI< 75%, Marginal, < 70% Fail.
   iv. Field vs. Lab
      1. Passing Lab – Passes climate PG testing
      2. Passing field – SCI >70%
      3. Pass Lab/Fail Field – Very high embedment, very low embedment, or very high traffic.
   v. SPG binder selection
      1. Basis of selection is climate. Polymer modification requirements are included by grade bumping based on useful temperature interval> 86°C or determination by agency that there is high traffic. They can increase either high temperature grade (like M320 for hot applied asphalt) or low temperature.
         a) The selection of what temperature to adjust for “grade bumping” is now based on a discussion between the materials engineer and the agency. Can other agencies follow this approach?
      2. The phase angle requirement is blind to type of modification. Same value for SBS and SBR.
         a) More discussion to follow about implications of this after all presentations.

**e. Performance Graded-Specifications for Emulsions Used in Pavement Preservation Surface Treatments, Prof. Richard Kim, NCSU (Appendix E)**

i. Example Grade: CRS-EPG61-19M (CRS – Emulsion Chemistry, EPG = Emulsion Performance Grade, 61 = high temperature grade, -19 = low temperature grade, M = Traffic Level.

ii. Temperature Selection
   1. Bumped 3C higher on both ends i.e. PG 58-28 = EPG 61-19. Met same requirements as current base PG asphalts.

iii. Approach to setting limits was to correlate emulsion residue properties to laboratory mixture performance tests for bleeding or rutting (micro) (MMLS-3) and aggregate loss in chip seals (Vialit test), or cracking in micro-surfacing (Single Edge Notched Bending – SENB).

iv. Evaluated current M320 and M332 parameters for high temperature vs performance test.
   1. G*/sind worked well for chip seal (bleeding) and poorly for micro-surfacing (rutting). Jnr worked well for both applications.
   2. Chip seal Jnr limits set for low, medium and high traffic. Microsurfacing has two traffic thresholds, low and medium/high.

v. Evaluated BBR specification in M320 and found different results for modified or unmodified emulsions and/or weak correlations with mixture performance.
   1. Most promising parameter was cross-over modulus (G'=G") = when phase angle =45°. To remove temperature dependence the parameter selected is maximum modulus at critical phase angle which varies based on low temperature EPG.
   2. Where does the critical phase angle come at different EPGs come from? Solved by iteration to best fit aggregate loss vs. G* at critical phase angle plot.

vi. Intermediate temperature raveling is not included in EPG because the research felt that it was an issue to be addressed in the mix design due to compatibility with aggregate and effects of application rate.

vii. No phase angle requirement or any other polymer identification test included in current version of EPG.

**f. Surface PG/Emulsion PG Residue Testing – Gaylon Baumgardner, Ph.D., Paragon Technical Services (Appendix F)**

i. Objectives of study 1) Evaluate surrogate DSR tests to replace conventional empirical tests of emulsion residues (i.e. pen and softening point). 2) Compare to PG grading in accordance with SPG and EPG systems.

ii. Test Methods:
   1. PP 72 Recovery (low temperature evaporation)
   2. SPG/EPG Grading
   3. DSR Temp Sweep at 1 rad/sec, 43C to 79C at 6C increments.
      a) Report G* and delta, interpolate to temperature at which G*=1200 PaS
   4. Creep and recovery on as-recovered and as-recovered +PAV at multiple stress levels.

iii. Comparison of SPG and EPG. Different high temperature and low temperature grades were observed between the two systems.

iv. For EPG high temperature low traffic and high traffic failure temperatures differed by approximately 6C. Therefore three grades may not be necessary for the final EPG specification.
   1. Proposed adjustment of Jnr @ 3.2kPa of 16 kPa-1 (low) and 8 kPa-1 (high traffic). With this change EPG and SPG grades were similar.

v. Is there an intermediate parameter to differentiate between modified vs. unmodified? Hard vs. soft?
   1. Candidates include: Softening Point? Penetration? Elastic Recovery? % Recovery? Yield Energy?
   2. Empirical correlations are available to convert between pen and G* and to estimate softening point using G* and delta. Both were unable to differentiate between unmodified and modified.
   3. Jnr and %R from creep and recovery at multiple stress levels at EPG high temp could not identify modification. Possible next step is to evaluate %R at 25C. Also potentially look at %R on the aged binder.

**g. Comparison of SBS and SBR in Texas SPG – Arlis Kadrmas, BASF (Appendix G)**

i. Shared report sent to the SPWG on comparing different emulsion formulations using the TxDOT SPG specification.
ii. Focus of the discussion and future testing is final product, not raw materials.
iii. Compared a polymer modified emulsion and latex modified emulsion. Received polymer modified base to make blends with different target SBS loadings.
iv. Results showed that phase angle specifications could be met with very low SBS loadings. End results were that the reduced polymer material had much higher aggregate loss in the sweep test. The polymer and latex modified emulsions had similar performance.
v. Since the lower polymer material meets specification, the concern is that an inferior material will be allowed.
    1. New version of M316 includes %Elastic Recovery with a provision of minimum 2.5% polymer content.

**Critical Issues**

1. Polymer Identification
    a. Some modified formulations include a heat reaction to strengthen polymer networking, this occurs during recovery by distillation, but when low temperature recovery is used.
    b. EPG does not include polymer identification test. Framework should be performance related rather than reverting back to a recipe spec.
    c. What is the purpose of polymer identifier? What is an acceptable threshold? More elastic response is not necessarily better.
        i. A successful method should be able to differentiate between the extent of cross-linking and polymer dosage.
    d. Candidates include BYET, MSCR at 25C.
    e. Need to discuss how to approach in specification:
        i. Texas method of extending UTI.
        ii.
2. "Ideal" Emulsion Specification
    a. Recovery Procedure B – thin film
    b. No reheating
    c. Maximize use of DSR
    d. Climate Based Grading with 6C increments
        i. High temp off-set by 3C for surface temp vs. 1" pavement depth.
        ii. Low temp – should it be offset? PG 67-22 or PG 67-19?
    e. PAV Aging
        i. Sample size
        ii. Pour/reheat
        iii. Do we need to age materials?
            1. When does distress occur? Primarily if the seal survives the first season it will perform.
            2. Paragon has done some thin film aging with 25g in PAV pans. 3.5 days storage at 76C was required to get equivalent properties to PAV.
            3. How much aging occurs in the field?
    f. Residue Recovery
        i. PP-72: Need to refine sample preparation (film draw down) procedure to minimize pooling and understand effect of silicone mat type.
    g. 4mm DSR Ruggedness and Repeatability Study
        i. Lab volunteers: TTI, Colas, MTE, Paragon, MSU (Kutay)?, FHWA Central Federal Lands
        ii. How should the test procedure be applied? Research? Specification? Acceptance?
        iii. How long until implementation?

iv. What are the deliverables and what is the impact?
v. Factors to consider
    1. Establish a test procedure.
    2. Single and multi-lab reproducibility.
    3. Practices for data analysis.
    4. Custom compliance correction
    5. Concerns
        a. Technician training
        b. Reproducibility
        c. Are binders soft enough to 8mm?

**Action Item**

- Agenda item for next meeting focused on review of procedure and present data.

h. Low temperature properties:
    i. Interim solution: Implement Richard's critical phase angle approach at 5C and 15C.
    ii. Further review of 4mm plate test procedure.

i. Purchase Specifications
    i. Emulsion Properties
        1. Application & Stability: Saybolt or Paddle viscosity. Brookfield? Must include note that requirement is waived if successful application is achieved.
        2. High Float testing: DSR method published by Joe Brandenberg, Marathon Petroleum
    ii. Residue Recovery Method
        1. PP72 Method B
    iii. Residue Specification

**Action Item**

- Gayle King, Andrew Hanz, and others will produce an initial strawman specification that identifies areas with a proposed test and areas that require further research.

**Day 2**
**Wednesday, December 14, 2016**

**Quality Assurance (QA) – Matls., Prod Eval., Education, Cert.** Shields/Franco

a. Intro and Overview

**Quality Assurance (QA) – Materials and Production** Dvorek/Shields/Franco

a. Acceptance Testing; QC (Process Control), Independent Assurance
b. Protocols for Agency Acceptance of the Projects
    i. Materials and Construction Workmanship
        - Many chip seal failures observed are workmanship issues rather than materials issues.
c. QC (Contractor) Plans and Requirements
    i. Materials and Construction Workmanship
d. New Product Acceptance Procedures

**Action Item:**

- Contact Todd and Colin with any additional comments.

**Quality Assurance (QA) – Education and Certification (Appendix F)** Galehouse

a. Education and Training Leading to Certification of Personnel
    i. Contractors personnel are certified in Nevada and other states.
    ii. Nevada will also start requiring certification of contractors for 2017 construction season.
    iii. Evaluation will be conducted by AASHTO resource.
    iv. Hands on training currently provided by trade associations.
b. Certification of Plants/Materials
c. Accreditation of Labs

**Next Steps** Franco/Lubbers

a. Next Meeting
b. Tie-up Loose Ends

**Workshop – SPG – Performance Grading Specifications and Quality Assurance (QA) – Optional**

11:30 a.m. – 12:30 p.m. ***Lunch Break***

12:30 p.m. – 3:00 p.m. **SPG + QA – Open Discussions** Franco

**Attached Presentations:**

- **Appendix A: NCAT/MNROAD Test Sections US-169 and CSAH 8 Performance after 2 Snow Events.**
- **Appendix B: Development of AASHTO Emulsion Performance Grading Standards**
- **Appendix C: Update & Discussion: Performance-Graded Specifications for Asphalt Emulsions**
- **Appendix D: Evolution of Field Performance Validation for SPG Binder Specification**
- **Appendix E: Performance-Graded Specifications for Emulsions Used in Pavement Preservation Surface Treatments**
- **Appendix F: Surface PG/Emulsion PG Residue Testing**
- **Appendix G: Comparison of SBS vs. SBR Modified CRS Emulsions in Texas SPG Specifications**
- **Appendix H: Pavement Preservation Certification**