

AASHTO Innovation Initiative

[Proposed] Nomination of Innovation Ready for Implementation

Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation. If selected, the sponsoring DOT will be asked to promote the innovation to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative.

1. **Sponsoring DOT (State):** California DOT
2. **Name and Title:** Barry Marcks Associate Chemical Testing Engineer

Organization: California Department of Transportation

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Innovation Description (10 points)

The term “innovation” may include processes, products, techniques, procedures, and practices.

3. **Name of the innovation:**

Waterborne Acrylic Latex/ FEVE blend coating

4. **Please describe the innovation.**

Traditional styrenated acrylic latex resin is blended(60/40) with a Fluoroethylene vinyl ether emulsion (Lumiflon FE-4300) to make a single component, UV-resistant coating for painting

structural steel bridges. The acrylic/Lumiflon blend technology significantly extends the service life of the coating saving the Department money needed to repaint the bridges.

5. What is the existing baseline practice that the innovation intends to replace/improve?

Overcoating State bridges with traditional styrenated acrylic latex coatings.

6. What problems associated with the baseline practice does the innovation propose to solve?

Caltrans typically overcoats bridges for maintenance painting, which is expensive, so adding 10 – 20 yrs. of extra service life for a coatings system is a big cost savings. The Lumiflon coatings are about 3 times more expensive than the original acrylic latex finish paint but compared to the overall cost of re-coating a bridge, it is negligible.

7. Briefly describe the history of its development.

The California Dept. of Transportation (Caltrans), has been formulating its own coatings for over 95 years. In 2014 Caltrans decided to update their Standard Green Finish Paint Formulation (PWB-172B), seeking to provide better performance properties. As part of the evaluation process a (Lumiflon FE 4300) resin blend was included in one of the potential formulations. Laboratory tests showed that after 4135 hrs. of QUV exposure the Lumiflon formulation had 40% improved gloss and 33% better color retention compared to the original PWB-172B coating. Gloss and color retention can be considered a measure of weatherability for a coating system and its ability to stay intact, protecting the steel from corrosion. Results indicated that using the Lumiflon resin blend could add about 10 to 20-yrs. of service life for a typical 25-yr. life span coating system.

8. What resources—such as technical specifications, training materials, and user guides—have you developed to assist with the deployment effort? If appropriate, please attach or provide weblinks to reports, videos, photographs, diagrams, or other images illustrating the appearance or functionality of the innovation (if electronic, please provide a separate file). Please list your attachments or weblinks here.

There are several Caltrans Paint Formulation Specifications currently available. Standard Green Formulations PWB-180A, PWB-181A. Coronado Blue Formulations PWB-175B, PWB-176B. These coating are used in compliance with Caltrans 2018 Standard Specifications, Section 59 STRUCTURAL STEEL COATINGS and Section 59-2.01C(4)(c) State Specification Paint Waterborne

Coating System. I presented a paper about Caltrans research developing and evaluating this Coating technology at the SSPC Annual Conference in Long Beach, CA. February 3-6, 2020. There is a SSPC Paint Specification being developed C.1.8 Fluoropolymer Coatings. SSPC also has a Technical update, SPC-TU 12, Ambient Curing Fluoropolymer Coatings.

https://design.onramp.dot.ca.gov/downloads/design/files/occs/2018/standard_specifications/2018_StdSpecs.docx

<https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/mets/pwb-180a-a11y.pdf>

<https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/mets/pwb-181a-a11y.pdf>

<https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/mets/pwb-175b-a11y.pdf>

<https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/mets/pwb-176b-a11y.pdf>

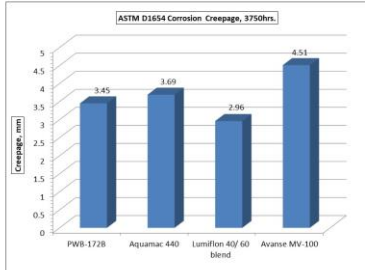
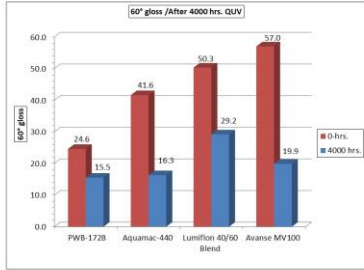
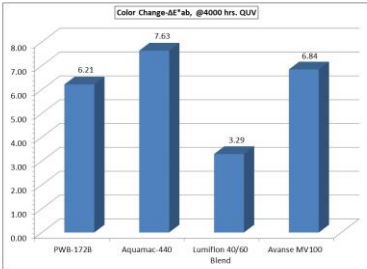
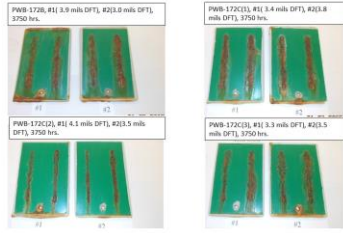
See attached report, SSPC Annual Conference, Long Beach Convention Center, Long Beach, CA. February 3-6, 2020, **“Improvements of Waterborne Acrylic Latex Finish Paint Properties by Incorporating Fluoroethylene Vinyl Ether (FEVE) Emulsion Technology”**

SSPC-TU Ambient Curing Fluoropolymer Coatings

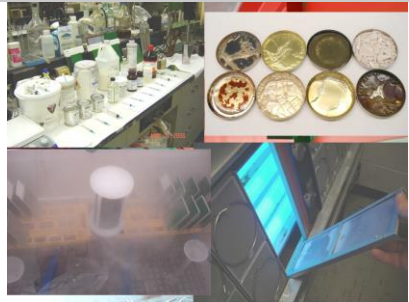
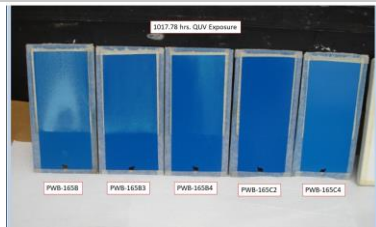
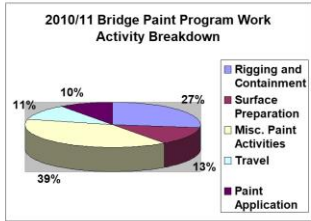
C1-8Fluoropolymer@standarddevelopment.sspc.org

Attach photographs, diagrams, or other images here. If images are of larger resolution size, please provide as separate files.

Grnd Ingredients	Found	Selloff	Weight %	
Water	17.00	2.84	1.84%	ESK0
Tamol 1502	2.20	0.33	0.07%	
Bayhyd CE-111	1.57	0.37	0.16%	
AmmoniumHydroxide	2.00	0.27	0.22%	ASTM D3951, Panel1 Hardness
Misc 4	20.00	2.59	1.29%	Control mix: ASTM D2095, 4 mil Road applicator
SodiumBicarb 10%	1.00	0.22	0.22%	ASTM D593, Glass - 60"
FoamStar A3B	3.00	0.37	0.37%	ASTM D4987, Glass - 60" @ 4000 hrs QUV
Praxair EG20	1.00	0.11	0.11%	ASTM D4987, A-E, Color @ 4000 hrs QUV
Accord 90-2020NPR	2.00	0.23	0.22%	ASTM D714, Blower Value @ 3750 hrs
Lat Oxide Dispersion	Found	Selloff	Weight %	ASTM D569, Rust Rating @ 3750 hrs
Aquamac 440	45.00	48.37	45.00%	ASTM D569, Failure at scotch, @ 3750 hrs
CPB coalescent	41.00	5.45	4.43%	
TEO-4H	4.00	0.86	0.46%	
Lumiflon 4500	37.30	29.37	29.99%	
Accord RM-999	1.00	0.15	0.11%	
Chemical Compounds and Additives	Found	Selloff	Weight %	
Organic Yellow 607-2003	42.900	4.688	1.27%	
Phthalocyan 607-5001	40.750	4.386	4.95%	
Yellow Iron Oxide 607-1001	23.000	1.623	3.28%	
Titanium Dioxide 607-2001	14.800	1.822	1.61%	
Totals	100.00	100.56	100.00%	
VOC, g/L	76.64			
PVOC, g/L	15.17%			
Volume solids %	40.05%			
Weight Solids %	40.44%			
Density, lb/gal	9.19			
Dry weight (g/g)	4.85%			
Solvent %	4.63%			
Solvent % on latex solids	12.48%			



Paint Formula	PWB-1728	Aquamac-440	Lumiflon 40/60 blend	Avanse MV100
ASTM D502_Viscosity	69 KU	74 KU	63 KU	75 KU
ASTM D495_Viscosity				
Brookfield	9.19	8.95	9.19	9.01
ASTM D895_Contract mix, 4 mil level Blader	43.10%	43.20%	44.47%	48.05%
ASTM D593_Glass - 60"	0.987	0.999	1.00	0.997
ASTM D4987_Glass - 60" @ 4000 hrs. QUV	24.6	41.6	50.3	57.0
ASTM D4987_A-E, Color @ 4000 hrs. QUV	15.5	16.3	29.2	19.9
ASTM D714_Blower Value @ 3750 hrs.	3.21	7.01	3.29	6.84
ASTM D569_Rust Rating @ 3750 hrs.	3.4 mm	3.6 mm	3.8 mm	3.4 mm
ASTM D569_Failure at scotch @ 3750 hrs.	10	10	10	10
ASTM D569_Failure at scotch @ 3750 hrs.	10	10	10	10
ASTM D569_Failure at scotch @ 3750 hrs.	3.45 mm	3.69 mm	2.96 mm	4.51 mm
Pull of adhesion ASTM D4541_Tape 8F, max.	1920 psi	1400 psi	1920 psi	2160 psi
Blender Price	\$32.00/gal	\$34.00/gal	\$41.00/gal	\$32.00/gal



State of Development (40 points)

Innovations must be successfully deployed in at least one State DOT. The All selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

9. How ready is this innovation for implementation in an operational environment? Please select from the following options. Please describe.

- Prototype is fully functional and yet to be piloted
- Prototype has been piloted successfully in an operational environment
- Technology has been deployed multiple times in an operational environment
- Technology is ready for full-scale implementation

Click or tap here to enter text.

10. What additional development is necessary to enable implementation of the innovation for routine use?

Nothing, The technology is routinely used by all paint crews and some contractors throughout the State of California

11. Are other organizations using, currently developing, or have they shown interest in this innovation or of similar technology?? Yes No

If so, please list organization names and contacts. Please identify the source of this information.

Organization	Name	Phone	Email
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Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over baseline practice .

12. How does the innovation meet customer or stakeholder needs in your State DOT or other organizations that have used it?

The coating needs no special mixing or application equipment. Can use the existing equipment and staff for painting. This coating lasts longer and saves money by not needing to re-paint as often.

13. Identify the top three benefit types your DOT has realized from using this innovation. Describe the type and scale of benefits of using this innovation over baseline practice. Provide additional information, if available, using quantitative metrics, to describe the benefits.

Benefit Types	Please describe:
Improved Asset Performance	Improved gloss and color stability
Improved Operation Performance	The coating system life-cycle is extended
Organizational Efficiency	Saves the State money by not having to repaint bridges

Provide any additional description, if necessary:

[Click or tap here to enter text.](#)

14 How broadly might this innovation be deployed for other applications. in the transportation industry (including other disciplines of a DOT, other transportation modes, and private industry)?

Not Sure, it's up to them.

Market Readiness (20 points)

The All selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

15. What specific actions would another organization need to take along each of the following dimensions to adopt this innovation?

Check boxes that apply	Dimensions	Please describe:
<input checked="" type="checkbox"/>	Gaining executive leadership support	A webinar by Caltrans showing managers who support its use.
<input checked="" type="checkbox"/>	Communicating benefits	A webinar by Caltrans showing its potential benefits
<input checked="" type="checkbox"/>	Overcoming funding constraints	A webinar by Caltrans showing its potential cost savings
<input type="checkbox"/>	Acquiring in-house capabilities	Click or tap here to enter text.
<input type="checkbox"/>	Addressing legal issues (if applicable) (e.g., liability and intellectual property)	Click or tap here to enter text.
<input type="checkbox"/>	Resolving conflicts with existing national/state regulations and standards	Click or tap here to enter text.
<input type="checkbox"/>	Other challenges	Click or tap here to enter text.

16. Please provide details of cost, effort, and length of time expended to deploy the innovation in your organization.

Cost: Not sure

Level of Effort: one person working for 2 yrs.

Time: 2-3 years

17. To what extent might implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.

Click or tap here to enter text. Caltrans contracts out the manufacture of this coating. A specialty coatings manufacturer-distributor will have to be found willing to make these coatings. A Laboratory capable of providing QA/QC of the coatings.