63RD PETERSEN ASPHALT RESEARCH CONFERENCE 2026

PROGRAM

JULY 13-16
2026

LARAMIE,
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INSTITUTE

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63RD PETERSEN ASPHALT RESEARCH CONFERENCE 2026

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WELCOME

Welcome to Laramie, the Gem City of the Plains, host of PARC 2026, the 63rd Petersen Asphalt Research Conference!

We are confident that this new edition will be another great one given that we had again great abstracts submitted, together with lots of participants, sponsors, and exhibitors. So, thank you all for coming! Get ready to explore cutting edge ideas and new approaches in our field of asphalt materials. Most of all, prepare to network, reconnect or make new friends. PARC 2026, just like the 62 previous editions, has been organized to give you the opportunity to interact with peers as much as possible. Note that we are still providing this conference remotely online for those who cannot (sadly) make it to Wyoming.

Thank you to Dr. Yogesh "Yogi" Kumbargeri, the conference director and the team at Western Research Institute (WRI) for making this possible. As usual, Yogi, the WRI team and all of our partners involved in the organization have been working almost a year in advance to make this new edition another success.

PARC 2026 will be again very rich and international. All attendees are invited to start the week by gathering during the Welcome Reception on the evening of Monday July 13th. Then, the technical part will open on Tuesday July 14th with a unique lecture on the history of WRI by Erin Shadrick and John Waggener. It will review the first 100 years of WRI, since its birth as a Bureau of Mines experimental station in 1924. One thing special about this year's edition is that every participant will be given a free copy of the book written by Erin and John on this topic. Then, we will have the keynote session by Mike Anderson, with the Asphalt Institute, entitled: "From Niche to Mainstream: The Growth in Understanding and Use of Polymer Modified Asphalt Since the 1990s" followed by Juan Jose Potti's talk "Driving Sustainability in European Asphalt Mixtures: From Circularity to Decarbonization" - a nice way to set the stage and discuss the challenges facing the industry. Four more sessions will follow, covering "Asphalt Chemistry", "Asphalt Emulsion", "Asphalt Rheology" and "Asphalt Aging". This clearly resonates with Dr. Claine Petersen's motto "Chemistry Matters", so relevant to PARC. The day will close on a poster session, giving a great opportunity to directly discuss with the authors of the 14 works presented.

On Wednesday morning, we will have a "Special Roofing Session", with special thanks to the roofing industry that sponsors it. It will be of interest to the paving industry as well since many topics do overlap, with presentations on recycling, rheology and the future of the roofing industry. We will then continue with sessions on "Asphalt Additives", "Artificial Intelligence in Asphalt" and "Asphalt Mixtures". It will thus be nice to keep networking in a relaxed environment, with an evening banquet at BR Infinity Event Center, for you to experience the famous Western hospitality unique to Laramie.

For Thursday morning, we have scheduled a few more sessions. We will first discuss "New Methods and Tests in Asphalt aging", "Case studies & field performance" and "Alternative Binders". This will close the scientific program.

Before you leave Laramie, we will give you an opportunity to visit our facilities in the North of the city. A tour is organized right after lunch for those who want to see WRI's amazing capabilities, at laboratory and pilot scale. We indeed have the unique ability to work on small quantities (a few grams) up to much larger volumes (up to several tons) on our diverse projects related to the chemistry of carbon, natural resources and wastes. Last but not least, we want then to make sure you enjoy our beautiful western outdoors. So, the last afternoon will be partly dedicated to outdoor outings to some nearby mountains – weather dependent. Register for it, it's free, fun, easy and you won't regret it!

One last thing: Please don't forget that we value your feedback: be sure to answer the brief survey that you will receive after the conference so that PARC 2027, the 64th will have a chance to be even greater.

We cannot leave before thanking all sponsors and exhibitors who are helping to make PARC 2026 possible!

We look forward to interacting with you during PARC 2026! Thank you again for attending. Enjoy the conference!

Dr. Didier Lesueur
Chief Executive Officer
Western Research Institute
Laramie, Wyoming

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2026 CONFERENCE AGENDA

Conference Venue: Marian H. Rochelle Gateway Center, Laramie, WY

MONDAY, JULY 13

6:00PM	Welcome Reception (at the conference venue) with drinks and appetizers *Note: Registration/Check-in & Badge pick-up available at the reception desk*	

TUESDAY, JULY 14

7:00AM	Registration/Check-in & Badge Pick-up	
8:00AM	Opening Remarks	
8:20AM	WRI History	John Waggener & Erin Shadrick *American Heritage Center, University of Wyoming*
8:40AM	KEYNOTE SESSION: Durability and PMA for the Future of Asphalt Pavements	Moderator: Didier Lesueur *Western Research Institute*
8:40AM	From Niche to Mainstream: The Growth in Understanding and Use of Polymer Modified Asphalt Since the 1990s	Mike Anderson *Asphalt Institute*
9:05AM	Driving Sustainability in European Asphalt Mixtures: From Circularity to Decarbonization	Juan Jose Potti *ASEFMA (Spanish Association of Asphalt Mixture Manufacturers)*
9:30AM	Break	
10:00AM	SESSION 1: Asphalt Chemistry	Moderator: Codrin Daranga *Paragon Technical Services*
10:00AM	Research progress on safer solvent extraction and asphalt recovery	Ramez Hajj *University of Illinois Urbana-Champaign*

10:30AM	A Chemical Framework for Predicting the Storage Stability of SBS-Modified Asphalts	Koorosh Naderi *Colas*
11:00AM	Linking Lignin Chemistry to Asphalt Binder Performance: Advanced Characterization, Blending Pitfalls, and Evidence of Intermolecular Interactions	Anand Sreeram Stefan Werkovits *University of Nottingham*
11:30AM	Assesment of Chemical Fingerprinting Techniques for Asphalt Binders Used in Louisiana	Moses Akentuna *Louisiana Transportation Research Center*
Noon	Lunch provided	
1:00PM	SESSION 2: Asphalt Emulsions	Moderator: Arlis Kadrmas *BASF*
1:00PM	Bituminous emulsions: State of the Art and Future	Frederick Delfosse & Didier Lesueur *Delfosse (Independent Consultant), Lesueur (Western Research Institute)*
1:30PM	Assessing the unique impact and effectiveness of a post additive to an emulsion for enhancing the properties into a significantly less-tracking tack coat.	Michael Jenkins *Zydex*
2:00PM	SESSION 3: Asphalt Rheology	Moderator: Saleh Yousefi *Crafco Inc.*
2:00PM	Development of a Plasticity-Based Fatigue Damage Model for Asphalt Binder	Haifang Wen *Washington State University*
2:30PM	Considerations on the development and validation of asphalt binder Mastercurves	David A. Anderson *Pennsylvania State University* Geoff Rowe *Abatech*
3:00PM	Capturing the Benefits of Polymer Modification: A Critical Review of Intermediate-Temperature Binder Performance Parameters	Richard Blackwell *Kraton Corporation*
3:30PM	Break	
4:00PM	SESSION 4: Asphalt Aging	Moderator: Chait Bhat *Asphalt Institute*
4:00PM	Development of the coupled diffusion-kinetics aging model (CDKAM) with hourly pavement temperatures for asphalt pavement performance prediction	Kun Zhang *California State University, Chico*

4:30PM	Investigating Photochemical Degradation of Asphalt Binders under Field-Representative Temperature Conditions	**Yusra I. Alhadidi** *Al-Balqa Applied University (BAU)*
5:00PM	Impact of Aging and Volatility on the Durability of Asphalt Binders Modified with Recycling Agents	**Behnam Jahangiri** *Turner-Fairbank Highway Research Center (TFHRC)*
5:30PM	Poster Session with drinks and appetizers	
7:30PM	Dinner on your own	

WEDNESDAY, JULY 15

8:00AM	PARC 2026 Special Roofing Session	Moderator: **Wes Cooper** *Asphalt Institute*
8:00AM	From Roof to Road and Back Again: Recovering and Rejuvenating Asphalt Shingle Binder for Circular Roofing and Pavement Applications	**Ana Rodrigues** *Soylei Innovative Products*
8:25AM	Northstar's Recycling Technology	**Gord Johnson** *Northstar Clean Technologies Inc.*
8:50AM	Case Studies Using a Recycled Pellet Asphalt Replacement	**Phillip Blankenship** *Blankenship Asphalt Tech and Training*
9:15AM	Advancing the Use of Recycled Asphalt Shingles (RAS) in Paving through Practical Strategy	**Courtney Rice & Toni Newsome** *Owens Corning*
9:40AM	Break	
10:00AM	Advancing the Future of Roofing Asphalts: A Report From the Asphalt Institute Roofing Technical Advisory Committee	**Wes Cooper** *Asphalt Institute*
10:25AM	Towards Rheology-Based Specifications for Impact-Resistant Coating Asphalt	**Punit Singhvi & Saleh Yousefi** *Crafco*
10:50AM	Q&A and Panel Discussion	

11:20AM	SESSION 5: Asphalt Additives	Moderator: Maede Mottaghi *Arkema*
11:20AM	Reactive Elastomeric Terpolymers as Alternative Pathways to Durable High Polymer Asphalt Binder Performance	Roxanne Jenkins *Dow*
11:50AM	Lunch provided	
1:00PM	Modified systems with high SBS content for low temperature climate	Martin Jasso & Brett Lambden *Jasso (University of Calgary), Lambden (Cenovus Energy)*
1:30PM	The effect of order of addition of reactive isocyanates on asphalt binder properties	Keara Saud *BASF*
2:00PM	SESSION 6: AI in Asphalt	Moderator: Ramez Hajj *University of Illinois Urbana Champaign*
2:00PM	Fundamentals of Artificial Intelligence: Asphalt Application examples for Machine and Deep Learning Algorithms	Chait Bhat *Asphalt Institute*
2:30PM	AI at the Bench: Introducing DORA, an Intelligent Research Assistant for Asphalt Technology	Raj Dongre *Dongre laboratory Services Inc.*
3:00PM	Break	
3:30PM	SESSION 7: Asphalt Mixtures	Moderator: Anand Sreeram *University of Nottingham*
3:30PM	Assessment of Durability in Recycled Bituminous Asphalt Mixtures Through Evaluation of Blend Homogeneity	Fayçal Lahjiri *Vinci Construction SP*
4:00PM	Examining Effects of Specimen Fabrication and Preparation Variabilities on Balanced Mix Design Tests	Aaron Leavitt *Federal Highway Administration*
4:30PM	Balanced Mix Design and Life Cycle Assessment of Asphalt Mixtures with Recycled Asphalt Shingles	Suri Gatiganti *National Center for Asphalt Technology*

5:00PM	Performance characteristics of asphalt mixtures modified with recycled plastic	Mansour Solaimanian *Pennsylvania State University*
5:30PM	Dismiss, rest, and drive to Banquet Venue: *BR Infinity Event Center* *704 Herrick Ln, Laramie, WY 82070* *Note: Attendees are encouraged to carpool to the banquet venue due to limited parking availability*	
6:00PM	Drinks and Banquet Dinner	

THURSDAY, JULY 16

8:00AM	SESSION 8: New Methods & Tests in Asphalt	Moderator: Sue Sasse *Infratest USA Inc.*
8:00AM	Responsible Asphalt Production	Pavel Kriz *Kriz Asphalt Technology*
8:30AM	From Bending to Torsion to Tension: Multi-Fixture DMA Characterization of Asphalt Shingles	Yuanchen Cui *Anton Paar USA, INC*
9:00AM	A New Approach to UV Ageing: Chemistry and Performance of Realistic Thin Bitumen Layers	Anand Sreeram *University of Nottingham, United Kingdom*
9:30AM	Evaluating Low-Temperature DSR Testing Methodology: Challenges, Data Quality, and Recommended Practices	Collin Pekol *Paragon Technical Services*
10:00AM	Modification of Asphalt Mixture Cyclic Fatigue Analysis	S. Farhad Abdollahi *Genex Systems | TFHRC*
10:30AM	Break	
10:45AM	SESSION 9: Case Studies & Field Performance	Moderator: Pavel Kriz *Kriz Asphalt Technology*
10:45AM	From Farm to Flexible Pavement: A Rural Iowa Demonstration of Soy-Enabled High-RAP Asphalt and Preservation Strategies	Eric Cochran *SoyLei Innovations*

11:15AM	Field Performance of Reactive Isocyanate Asphalt Binder Modifications: Case Studies from Kentucky and NCAT Trials	Phillip Blankenship *Blankenship Asphalt Tech and Training*
11:45AM	SESSION 10: Alternative Binders	Moderator: Mats Wendel *PEAB Asfalt*
11:45AM	The next generation of 100% biobased asphalts: A multi-scale design	Susie Guehenneux *INSA Lyon-IMP and Eiffage INFRASTRUCTURES*
12:15PM	Advancements in Coal-based Asphalt to Produce High-Quality Binders	Jeramie Adams *Western Research Institute*
12:45PM	Closing remarks and dismiss	
1:00PM	Box Lunch	
2:00PM	Tour of Western Research Institute	
2:45PM	Outdoor Hike Activity start: *Turtle Rock Trail*	

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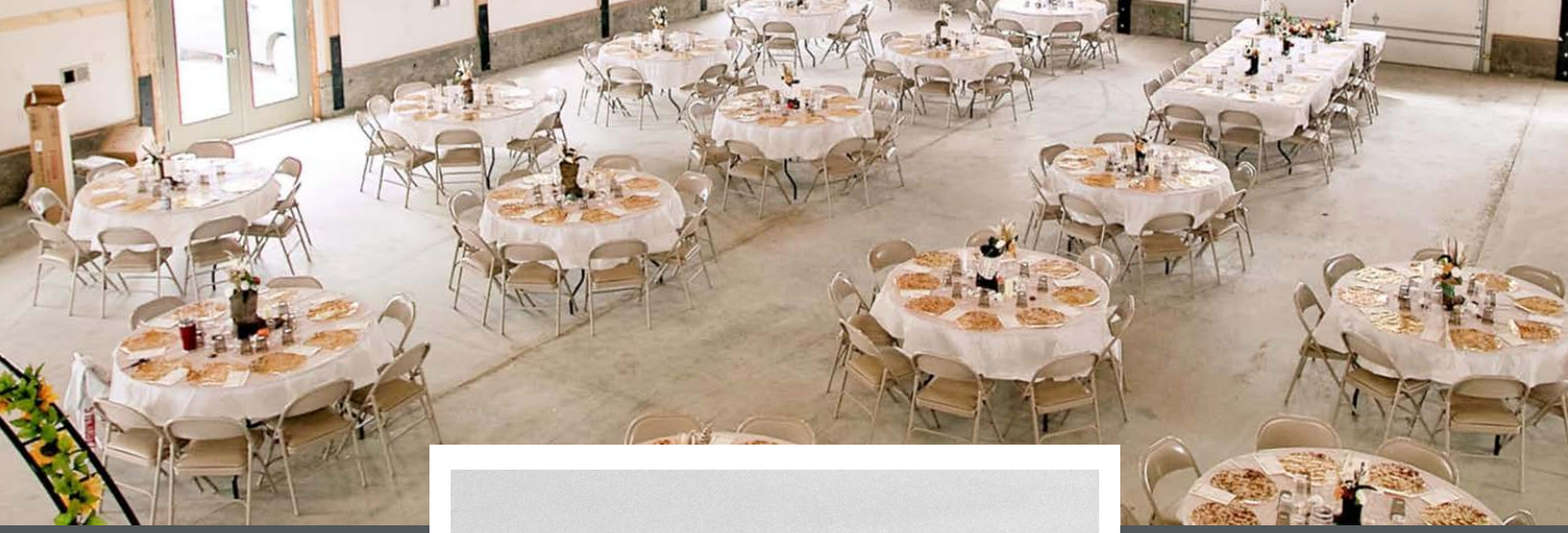
POSTER PRESENTATIONS

Tuesday July 14, 5:30PM-7:30PM

Author & Affiliation	Title of Poster Presentation
Jack Youtcheff *Federal Highway Administration*	**Physico-Chemical Impacts of Fines on Asphalt Performance** *Jack Youtcheff, Raj Dongre, Behnam Jahangirl, Adrian Andriescu, and Aaron Leavitt*
Richard Blackwell *Kraton Corporation*	**Clarifying MSCR and AASHTO M332: What the Parameters Really Tell Us About Modified Binder Performance** *Richard Blackwell*
Bradley Seats *Colorado State University Pueblo*	**Beyond Scalar Aging Indices: A Trajectory-Based Analysis of Asphalt Binder Master Curves** *Bradley Seats, Evelyn Malakowski, Aly Romero, Md Islam, and Saqib Gulzar*
Kenichi Sato *Fukuoka University*	**Material Properties of Asphalt Mixtures Using Agricultural Waste Plastic** *Kenichi SATO, Takuro Fujikawa, Chikashi Koga and Riku Yotsumoto*
Bruno Tiago Angelo da Silva *Federal University of Ceará*	**Mechanical Behavior of High-Reclaimed Asphalt Pavement Cold Mixes with Fly Ash and Plant-Based Rejuvenators** *Bruno Tiago Angelo da Silva, Suelly Helena de Araújo Barroso, and R. Christopher Williams*
Zifeng Zhao *University of Minnesota*	**Investigating Tree Shade Effect on Pavement Temperature** *Zifeng Zhao, Ethan Rossow, Nahum Yelizarov, Xue Feng, and Mihai Marasteanu*
Anneliese Jakisa Owor *University of Missouri-Columbia*	**Evaluation of Hamburg Wheel Tracking Test Analytical Methods Against TSR for Moisture Susceptibility Characterization of Asphalt Mixtures** *Anneliese Jakisa Owor, Punyaslok Rath, and William G. Buttlar*
Eric Cochran *SoyLei Innovations*	**Monetizing the Bottom of the Barrel: Reactive Bio-Oil Upgrading of Solvent-Deasphalting Pitch to Paving-Grade Asphalt Binder While Increasing DAO Recovery** *R. Chris Williams, Baker Kuehl, and Michael Forrester*
Yuefeng Zhu *California State University, Chico*	**Techno-Economic and Environmental Assessment of Grape Pomace Valorization as a Bio-modifier in Asphalt Pavements** *Yuefeng Zhu, Tirupathireddy Dodda, Samuel Paul Lowenhar, Clayton S. Jeffryes, Selina C. Wang, Jian Fang, Liv M Haselbach, and Kun Zhang*
Moises Saca *Texas A&M Transportation Institute*	**Thick Lift Paving** *Bryan Wilson, Moises Saca, and Darlene Goehl*

Awais Zahid *Arizona State University*	**A Practical Oven Aging Protocol for Evaluating Long-Term Cracking Performance of Asphalt Mixtures in Arizona** *Awais Zahid and Hasan Ozer*
Moises Saca *Texas A&M Transportation Institute*	**Current Methodologies for Ensuring Acceptable Friction Performance During Asphalt Mix Desing Validation in Texas, Their Gaps, And Ways to Improve Them** *Moises Saca, Darlene Goehl, and Bryan Wilson*
Jim Nevin *Unique Chemical Solutions, LLC*	**Novel Formulation and Process for the Ionic Charge Conversion of Polymer Latex** *Jim Nevin*
Yogesh Kumbargeri & Seth Bassham *Western Research Institute*	**Do similar PG binders and mixtures show similar pavement cracking performance? Think again!** *Yogesh Kumbargeri, Jeramie Adams, Phil Blankenship (BATTlab), Zack McKay (BATTlab), Alex Literati; Didier Lesueur, Seth Bassham*



Banquet

WEDNESDAY, JULY 15 | 6-9:00PM

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KEYNOTE SESSION

Durability and PMA for the Future of Asphalt Pavements

R. Michael (Mike) Anderson

Organization: Asphalt Institute

Presentation title: From Niche to Mainstream: The Growth in Understanding and Use of Polymer Modified Asphalt Since the 1990s

Mike Anderson has worked for the Asphalt Institute (AI) in Lexington, Kentucky since 1991, currently serving as the VP of Research and Laboratory Services. He is a member of several professional organizations, notably the Association of Asphalt Paving Technologists (AAPT), for which he served as President in 2008-09 and, since 2013, as its Executive Director. Mike is a registered professional engineer (PE) and Certified Association Executive (CAE).

Juan Jose Potti

Organization: ASEFMA (Spanish Association of Asphalt Mixture Manufacturers)

Presentation title: Driving Sustainability in European Asphalt Mixtures: From Circularity to Decarbonization

Dr. Juan José Potti, or @jjpotti in the digital world, has always been an innovative figure from many different perspectives. This brief overview clearly reflects that spirit: Executive President of ASEFMA, he is also Vice President of the AEC, former President of EAPA, the European association to which ASEFMA belongs, and former President of the Spanish Road Technology Platform (PTC). He is the founder of the International Road Maintenance Day (IRMD) and co-founder of World Road Day, as well as CILA's Delegate in Spain. Throughout his career, he has delivered more than 450 lectures in over 52 countries and has published more than 250 technical articles and scientific papers. He likes to describe himself as a "Knowmad", a term that literally means "knowledge seeker", capturing his passion for continuous learning, innovation, and the exchange of ideas.

SPECIAL ROOFING SESSION

From Roof to Road and Back Again: Recovering and Rejuvenating Asphalt Shingle Binder for Circular Roofing and Pavement Applications

Speaker: Ana Rodrigues

Organization: Soylei Innovative Products

Ana Rodrigues is a Civil Engineer who earned her PhD from Iowa State University, specializing in asphalt materials. Today, she serves as the Technical Sales Lead at SoyLei Innovations, where she turns technical research into real-world results. Ana helps clients leverage bio-based additives to extend pavement and roofing life and maximize the use of recycled materials, such as RAP and RAS

Northstar's Recycling Technology

Name: Gord Johnson

Organization: Northstar Clean Technologies Inc.

Gord Johnson is a co-founder of Northstar Clean Technologies and a seasoned business leader with more than 25 years of experience building and scaling innovative companies across multiple industries. He is also the co-founder and President of Empower Environmental Solutions, where he helped develop the proprietary technology that underpins Northstar's operations. Johnson has played a central role in advancing Northstar's mission to create a circular economy for asphalt shingles. The company's patented process enables the recovery and reuse of key materials—including liquid asphalt, aggregate, and fiber—from both post-industrial and post-consumer roofing waste, diverting significant volumes from landfill while reducing greenhouse gas emissions. Prior to founding Northstar and Empower, Johnson held leadership roles as CEO of several companies, including Save Energy Walls, Lodgeview Entertainment, and Intrepid Security, demonstrating a consistent track record of building high-growth businesses and commercializing new technologies. Through his work, Johnson has become a recognized figure in the construction and waste recovery sectors, focused on delivering scalable, sustainable solutions that transform construction and demolition waste into valuable industrial products.

Case Studies Using a Recycled Pellet Asphalt Replacement

Speaker: Phillip Blankenship

Organization: Blankenship Asphalt Tech and Training

Phil graduated in 1991 with a BS and 1993 with a MS in Civil Engineering from the University of Kentucky. From 1993-1995, Phil managed the Asphalt Binder Laboratory for the Kentucky Transportation Cabinet and was the Superpave Implementation Coordinator. In 1995, he joined Koch Pavement Solutions to be a Project Development Engineer. In 2007, Phil took on the role of Senior Research Engineer at Asphalt Institute. In 2017, Phil founded Blankenship Asphalt Tech and Training (BATT) as a consulting engineering company that uses his agency, industry, and association combined experience. Phil enjoys working with youth and is a volunteer with his local church. He also volunteers with Scouting America where he has also been a course director for their national leadership courses and serves on the Council executive board. He resides in Richmond KY with his wife, Greta, of 31 years.

Advancing the Use of Recycled Asphalt Shingles (RAS) in Paving through Practical

Strategy Speaker: Courtney Rice & Toni Newsome

Organization: Owens Corning

Courtney Rice has been in the asphalt industry for over 15 years. She received her Bachelor of Civil Engineering from Auburn University. While at Auburn, Courtney worked as a co-op student for The National Center for Asphalt Technology (NCAT). At NCAT she discovered her passion for asphalt and materials by performing various asphalt mixture designs, binder rheological testing, and asphalt mixture testing. Prior to joining Owens Corning in 2016, Courtney worked for Ingevity as a Product Development Engineer focusing on the development and commercialization of new products for high-RAP and high-RAS mixtures, as well as new products for warm-mix asphalt. At Owens Corning, Courtney plays a key role in the specialty paving business by identifying new technologies to bring to the asphalt paving market and plays an integral part in Owens Corning initiatives on shingle diversion from landfill.

Toni Newsome is a Senior Research & Development Leader of Asphalt R&D at Owens Corning, where she leads asphalt innovation and material excellence across the company's roofing portfolio. Her team's work spans asphalt material development, quality, and performance for residential shingles, roofing underlayments, and paving applications. Since joining Owens Corning in 2014, Toni has led product development, product research, product and material testing, and technology scouting initiatives across multiple businesses, driving advancements in materials and product performance. Toni holds a B.S. in Chemistry from Xavier University and a Ph.D. in Analytical Chemistry from The Ohio State University. She is actively

engaged in industry organizations including the Association of Modified Asphalt Producers (AMAP), Asphalt Institute (AI), and Asphalt Roofing Manufacturers Association (ARMA). A passionate advocate for STEM, Toni is committed to mentoring the next generation of scientists and encouraging young women to pursue careers in science and engineering.

Advancing the Future of Roofing Asphalts: A Report From the Asphalt Institute Roofing Technical Advisory Committee

Speaker: Wes Cooper

Organization: Asphalt Institute

Wes Cooper is the Laboratory Manager and Senior Research scientist at the Asphalt Institute. A veteran in asphalt testing, he has over 18 years of experience in asphalt science and education. He is a member of AAPT and is currently a contributor to several research projects, including AIF 22-03 and NCHRP 09-63. He also serves as the staff liaison for the Asphalt Institute Roofing Technical Advisory Committee and manages the Asphalt Institute Roofing Proficiency Sample Program. As an educator, he is involved in the National Binder Technician Certification program and Rheobit advanced rheology course and is a regular contributor to Asphalt Magazine.

Towards Rheology-Based Specifications for Impact-Resistant Coating Asphalt

Speakers: Punit Singhvi & Saleh Yousefi

Organization: Crafco

Dr. Punit Singhvi is a Research Engineer at Crafco, Inc., specializing in the characterization and performance of asphaltic materials for paving and roofing applications. His research focuses on innovation, sustainability, and life cycle assessment of asphalt-based products. Dr. Singhvi earned his Ph.D. from the University of Illinois Urbana-Champaign, where his work contributed to I-FIT test development, balanced mix designs (BMDs). long-term aging studies of asphalt binders and mixtures, and experimental characterization of asphalt materials.

Dr. Saleh Yousefi leads R&D efforts focused on innovative pavement preservation materials and sustainable asphalt technologies. He has over 17 years of academic and industry experience specializing in asphalt materials, sealants, polymer-modified systems, and performance-based product development. Saleh earned his Ph.D. in Civil Engineering from the University of Illinois Urbana-Champaign. His current work focuses on advancing the long-term performance and lifecycle value of pavements and asphaltic materials through innovation in asphalt materials and preservation systems.

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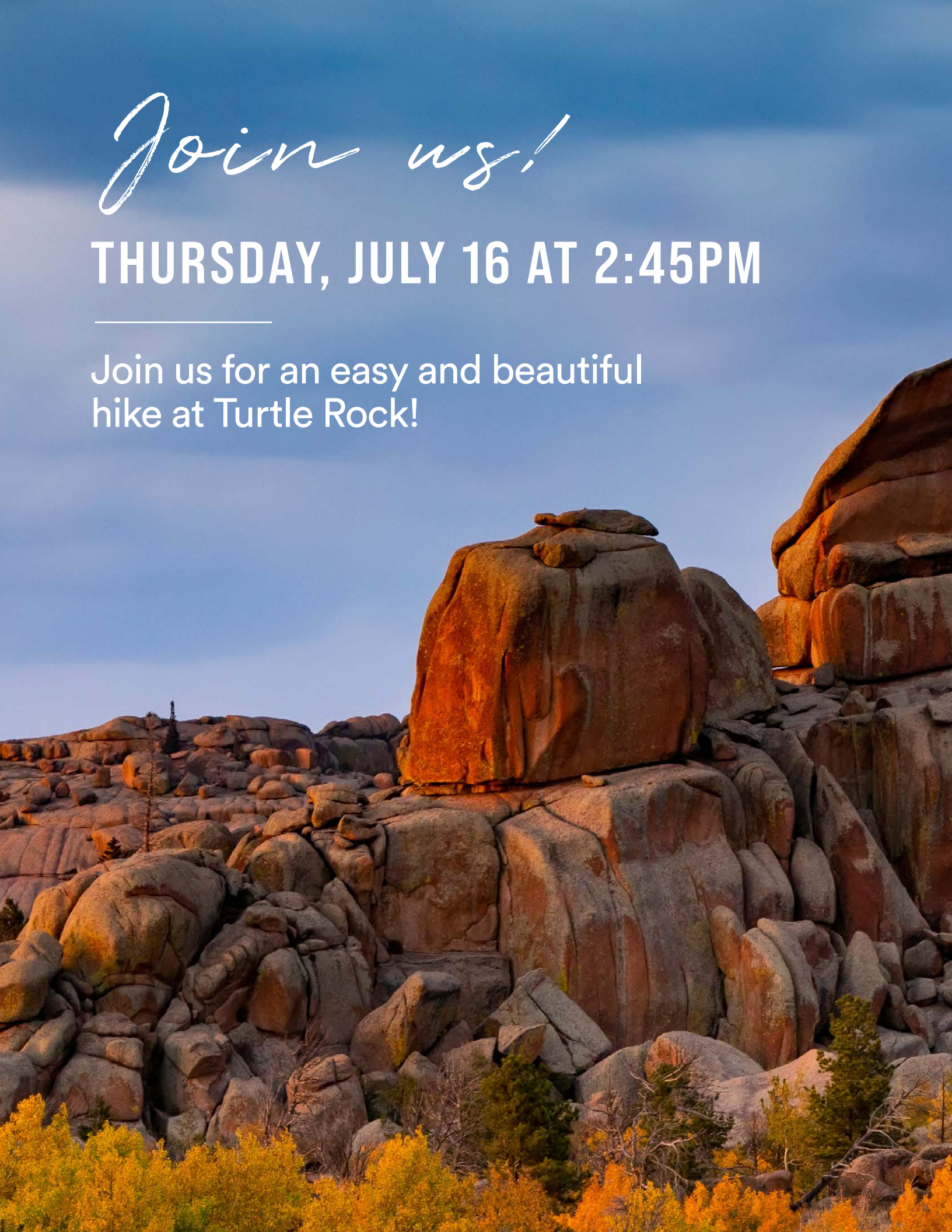
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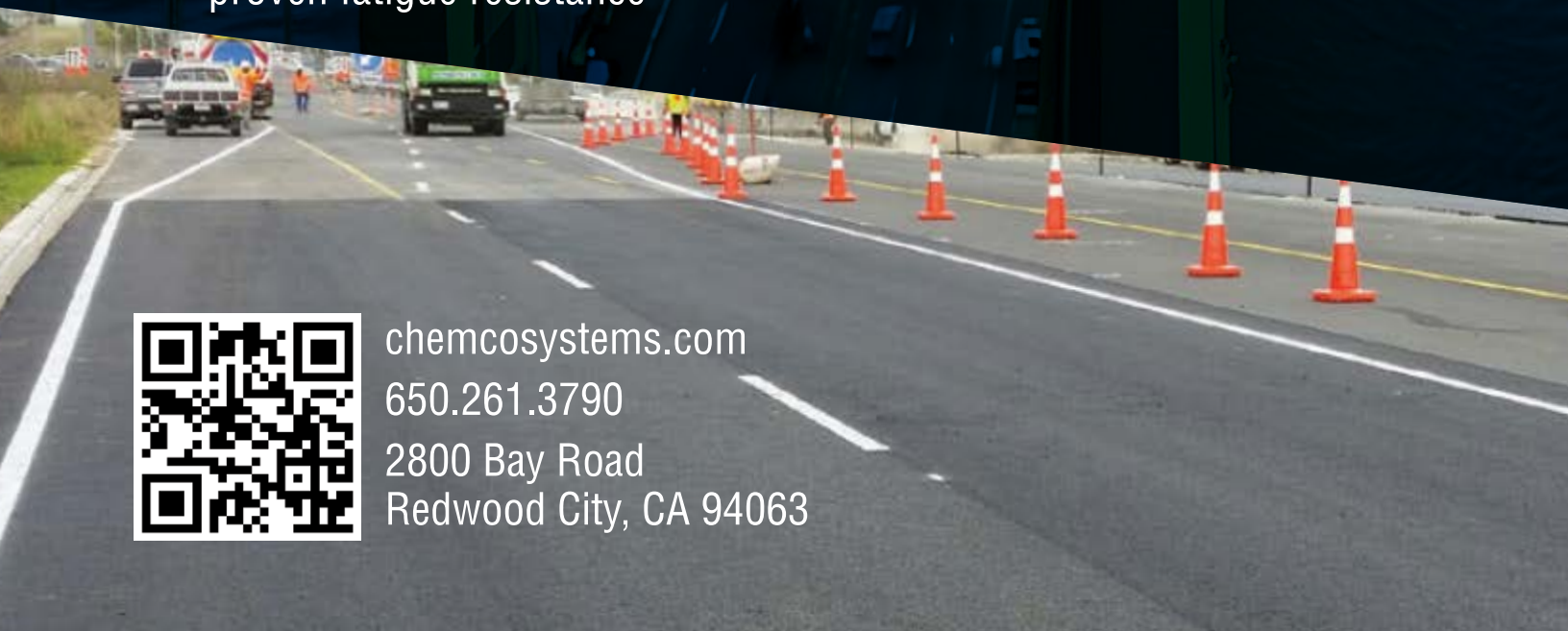

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ABSTRACTS

KEYNOTE SESSION: Durability and PMA for the Future of Asphalt Pavements

Note: It is a special invited session. No abstracts available but speaker bios (including photos) provided in the program.

SESSION 1: Asphalt Chemistry

Research progress on safer solvent extraction and asphalt recovery

Speaker: Ramez Hajj

Authors: Ramez Hajj (UIUC), Yudi Wang (UIUC)

Abstract: Since the United States Environmental Protection Agency (EPA) announced restrictions on the use of trichloroethylene (TCE) in October 2023, a principal objective of asphalt researchers and practitioners has been to identify safer alternatives. Recent research at the University of Illinois has identified several options which are less toxic based on existing materials use data, but still have some drawbacks in terms of high boiling points or low flash points. These alternatives include blends with toluene, d-limonene, and 3-octanone. In addition, new commercial products have come online which have been extensively evaluated. This presentation focuses on dissemination of information about these options. However, the rapidly changing landscape of solvent usage also necessitates alternative approaches to extraction and recovery. Herein, we also present a micro-extraction method which is effective, repeatable, and results in minimal residual solvent, for recovery of asphalt binder for testing in the Dynamic Shear Rheometer (DSR), Poker Chip test, and several chemical tests.

A Chemical Framework for Predicting the Storage Stability of SBS-Modified Asphalts

Speaker: Koorosh Naderi

Authors: Koorosh Naderi, Céline Jonas, Xavier Carbonneau

Abstract: Geopolitical-driven variability in asphalt-binder sources increases the need for reproducible binder quality. Storage stability is a key challenge for styrene–butadiene–styrene (SBS)–modified binders because chemical and physical incompatibilities with base bitumen can cause phase separation and functional loss. This study investigates separation mechanisms in the standard storage-stability tube test by analyzing top and bottom fractions with size-exclusion chromatography

(SEC) and fluorescence optical microscopy. SEC peak response distinguished polymer and binder contributions and tracked redistribution after thermal storage; microscopy provided spatial information on polymer morphology and migration. Results indicate that simple bulk property differences (such as softening point) do not explain instability. Rather, multiple concurrent processes such as polymer phase migration, progressive polymer swelling/dissolution, selective maltene uptake, and potential asphaltene expulsion and reaggregation contribute to varying combinations. To link these behaviors to base-bitumen chemistry, we correlated storage outcomes with SARA fractions, Fourier-transform infrared functional indices, and Hildebrand solubility parameters for fourteen binders from diverse sources, all blended with a constant SBS type and concentration. We evaluate the interpretive value and limitations of SEC, microscopy, and chemical indices, and identify which metrics are most informative for building a mechanistic, predictive framework for SBS-modified binder storage stability.

Linking Lignin Chemistry to Asphalt Binder Performance: Advanced Characterization, Blending Pitfalls, and Evidence of Intermolecular Interactions

Speaker: Anand Sreeram & Stefan Werkovits

Authors: Stefan Werkovits (Nottingham Transportation Engineering Centre (NTEC), Department of Civil Engineering, University of Nottingham), Akshay Kumar (Sir Peter Mansfield Imaging Centre, Department of Physics and Astronomy, University of Nottingham), Alexey Potapov (Sir Peter Mansfield Imaging Centre, Department of Physics and Astronomy, University of Nottingham), Oliver Musl (Institute of Chemistry of Renewables, University of Natural Resources and Life Sciences Vienna), Thomas Rosenau (Institute of Chemistry of Renewables, University of Natural Resources and Life Sciences Vienna), Gordon Airey (Nottingham Transportation Engineering Centre (NTEC), Department of Civil Engineering, University of Nottingham), Anand Sreeram (Nottingham Transportation Engineering Centre (NTEC), Department of Civil Engineering, University of Nottingham)

Abstract: Lignin is a promising bio-based partial replacement for bituminous binders because it is abundant, available as a paper and pulp industry byproduct, and structurally compatible with aromatic binder systems. However, its strong dependence on biomass source and extraction process leads to structural variability, resulting in wide performance variations of the asphalt products. This study integrates state-of-the-art lignin and bitumen characterization into asphalt binder research to identify key material parameters controlling blend behavior. Lignin–bitumen blends were produced at different replacement levels and analyzed using laser diffractometry, size exclusion chromatography with multi-angle laser light scattering, 2D nuclear magnetic resonance (NMR) spectroscopy, and electron paramagnetic resonance spectroscopy, with particular attention to challenges in quantification and comparability. The results were linked to rheological performance through dynamic viscosity testing at 100, 135, and 165°C; viscoelastic characterization by frequency sweeps from 70 to 0°C; and fatigue assessment using linear amplitude sweep tests. In addition, dynamic nuclear polarization solid-state NMR provided, for the first time, direct evidence of intermolecular interactions between lignin and bitumen. These findings show that the lignins´ source-dependent chemistry and physical structure directly control binder rheology and fatigue response, providing a basis for more reliable screening and design of lignin-modified asphalt binders.

Assessment of Chemical Fingerprinting Techniques for Asphalt Binders Used in Louisiana

Speaker: Moses Akentuna

Authors: Moses Akentuna, Saman Salari, Samuel Cooper III

Abstract: The objective of the study was to ascertain the capability of two chemical analysis techniques to fingerprint asphalt binders from different sources: Gel permeation chromatography and SARA fractionation using thin film flame ionization detection. The chemical variability of asphalt binders (PG 67-22, PG 70-22, and PG 76-22) obtained from multiple suppliers were assessed for consistency beyond standard performance grading. Principal Component Analysis (PCA) identified distinct chemical fingerprints driven by colloidal stiffness, asphaltene/polymer structure, and resin-based adhesion. Method comparison indicated that the 4-peak SARA method offered superior resin/aromatic resolution compared to the 3-peak manual filtration, which often grouped polar resins with aromatics. Results confirmed that suppliers employ diverse chemical strategies to achieve identical performance grades. While specific sources demonstrated consistent signatures, most exhibited significant batch variability. The study identifies the saturate fraction as the most effective individual fingerprinting parameter. Based on these findings, a comprehensive characterization protocol is recommended: GPC (LMS fraction) to verify polymer modification, followed by 4-peak SARA to identify crude source characteristics, and the Colloidal Instability Index (CII) to ensure stability. However, due to batch variability, chemical fingerprinting must be coupled with mechanical testing to fully ascertain performance implications.

SESSION 2: Asphalt Emulsions

Bituminous emulsions: State of the Art and Future

Speaker: Frederick Delfosse & Didier Didier Lesueur

Authors: Frederick Delfosse & Didier Didier Lesueur

Abstract: This presentation will cover the state of the art of bituminous emulsions. The way emulsions are currently produced will be reviewed, covering a few innovations that have developed in the past 20 yrs. Principles of emulsion formulation will be addressed, showing how the recipe is modified as a function of target application. Main emulsion properties will be then reviewed for each case: tack coat, chip seal, microsurfacing and plant-produced cold mixes. This gives an opportunity to conclude on the numerous specific additives that are now present in order to control the properties of this unique class of paving materials.

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Assessing the unique impact and effectiveness of a post additive to an emulsion for enhancing the properties into a significantly less-tracking tack coat

Speaker: Michael Jenkins

Authors: Michael Jenkins, Mikhil Ranka

Abstract: Less-Tracking-Non-Tracking Tack Coats (LTNTTC) has grown as a staple in the industry over the last 20 years. LTNTTC has been made with Hard Pen Asphalts (HPAs). Many Contractors, DOTs, and Universities have been seeking new innovative alternatives. A post additive to an emulsion provides an innovative product that does not rely on HPAs and supports the bond strength needed for roadways. Testing has shown that there is zero change to ASTM or AASHTO test methods. The additive will not change any characteristics or properties on the T49, T59, & T72 Test Methods. D6930M results for stability with the additive has shown improvement, over 28 days, compared to control. AASHTO M140 requirements passed all tests. The impact on the enhancement the additive is showing for bond strength, AASHTO TP114, Interlayer Shear Strength (ISS), increases from the control by 30%. NCHRP 09-64 Project, enhanced the ISS, resulting in the finished road product with a tight monolithic layer between the existing and new mix, less fatigue loss and shifting the failure point of the ISS from the interface to the mix point. Low dosage rates used with anionic or cationic emulsions, enhancing bond strength, accelerating dry time, and significantly reducing tracking.

SESSION 3: Asphalt Rheology

Development of a Plasticity-Based Fatigue Damage Model for Asphalt Binder

Speaker: Haifang Wen

Authors: Lin Wang (Washington State University), Haifang Wen (Washington State University) Yankai Wen (Washington State University)

Abstract: Fatigue cracking is one of the major distresses in asphalt pavement. In past studies that characterize the fatigue mechanism of asphaltic materials, plasticity has been considered independent of damage. However, the plasticity of asphalt binders significantly impacts the fatigue performance and service lifetime of asphalt pavement. The primary objective of this paper is to develop a plasticity-based fatigue damage model for asphalt binders to predict complex fatigue behaviors. An innovative experimental approach was used to integrate creep tests with unidirectional cyclic tests. Perzyna's viscoplastic model that incorporates the Drucker-Prager yield function is proposed to capture the asphalt binders' stress state and viscoplastic response. The Kachanov-Rabotnov damage evolution law is applied to predict the viscoplastic damage evolution of asphalt binders. The proposed model is validated by extensive experimental data under various loading paths at different temperatures. The results indicate that the plasticity-based fatigue damage model exhibits robust effectiveness in capturing the viscoplastic damage evolution of asphalt binders under various loading paths. Validation results demonstrate that the viscoplastic damage strain of asphalt binders under various loading paths of cyclic loading tests can be accurately predicted based on the model determined by long-term creep test results.

Considerations on the development and validation of asphalt binder Mastercurves

Speaker: David A. Anderson

Authors: David A. Anderson (Penn State University) & Geoff Rowe (Abatech)

Abstract: Asphalt Binder mastercurves are an important research and development tool. Mastercurves can be developed by a variety of different means although the goal remains the same – to generate a statistically-based time-temperature relationship for fundamental rheological physical properties. Mastercurve development should include several considerations: 1) its purpose , 2) measurement protocol, 3) measurement variability (elimination of outliers), 4) the shifting procedure used, 4) quality of the shifting, and 5) representation of the shifted data (tabular or model fitting). Critical components of each of these considerations are considered with primary attention given to measurement variability, shifting procedure, and the quality of the shifted data. Variations in measurement protocol such as specimen diameter and thickness, specimen preparation, testing in heat-up or cool-down, direction of change in strain amplitude, etc. are poorly understood and must be standardized (underway in ASTM). DSR data typically generate outliers and these must be eliminated if an accurate mastercurve is to be developed. Shifting can be accomplished with various protocols with paired shifting being the dominant procedure used today. Finally, a statistical evaluation of the quality of the shifted data (how well does it fit) is necessary. Each of these considerations is covered with graphical examples and relevant comments.

Capturing the Benefits of Polymer Modification: A Critical Review of Intermediate-Temperature Binder Performance Parameters

Speaker: Richard Blackwell

Authors: Richard Blackwell (Kraton Corporation)

Abstract: A number of "new" parameters have been proposed in recent years as potential replacements for the intermediate temperature parameter, G* x sin(), used in AASHTO M320 and M322, to better describe the susceptibility of asphalt binders to fatigue cracking. Several of these parameters were investigated as part of NCHRP Project 9-59, while others have been proposed in other forums. Many of these parameters have shown correlation to field performance and are often sensitive to binder aging and perceived binder "quality". However, most of these parameters do not consistently capture the known benefits of polymer modification on fatigue cracking. In some cases, the test temperature is critical for accurately assessing the influence of polymer modification. A comprehensive study was conducted to evaluate which parameter, or parameters, most adequately reflect expected performance changes as a function of several binder variables, including polymer modification. Parameters evaluated included the current intermediate temperature parameter, G* x sin (d), as well as R-value, Glover-Rowe, phase angle where G* = 10MPa, temperature where d =27 °, and d_diff. Data will be presented demonstrating the extent of correlation between binder variables and each of these parameters.

SESSION 4: Asphalt Aging

Development of the coupled diffusion-kinetics aging model (CDKAM) with hourly pavement temperatures for asphalt pavement performance prediction

Speaker: Kun Zhang

Authors: Kun Zhang (California State University, Chico)

Abstract: The asphalt aging model is an essential component of mechanistic-empirical pavement structural design and performance prediction. This presentation will discuss research integrating the pavement temperature model and the coupled diffusion-kinetics aging model (CDKAM) to predict the non-uniform, long-term field aging of asphalt pavements. The key factors affecting field aging of asphalt, including local weather conditions, binder aging susceptibility, air voids in asphalt mixtures, and binder diffusion, are accounted for in the developed aging model. Seven pavement sections in different climatic regions in the U.S. were used for aging model validation. Overall, the CDKAM, incorporating hourly pavement temperatures, can reasonably quantify non-uniform in situ asphalt aging. This model can also provide insight into the relative contributions of UV aging and thermal oxidation to asphalt aging across different climatic regions. Subsequently, a transfer function and a parallel model based on the law of mixtures were used to quantify the effect of asphalt binder aging on the stiffness of the asphalt mixture under different temperatures. Finally, a framework is designed to integrate the aging model of CDKAM with the elastic layered theory and a fatigue model to predict pavement fatigue performance through the integration of mixture design and structural analysis.

Investigating Photochemical Degradation of Asphalt Binders under Field-Representative Temperature Conditions

Speaker: Yusra I. Alhadidi

Authors: Akash Bajaj (Illinois Center for Transportation, Department of Civil & Environmental Engineering, Grainger College of Engineering, University of Illinois Urbana-Champaign), Yusra I. Alhadidi (Al-Balqa Applied University, Faculty of Engineering Technology), Abdulgafar Sulaiman (Illinois Center for Transportation, Department of Civil & Environmental Engineering, Grainger College of Engineering, University of Illinois Urbana-Champaign), Javier J. García Mainieri (Illinois Center for Transportation, Department of Civil & Environmental Engineering, Grainger College of Engineering, University of Illinois Urbana-Champaign), Alexander Sandoval Campos (Illinois Center for Transportation, Department of Civil & Environmental Engineering, Grainger College of Engineering, University of Illinois Urbana-Champaign), Imad L. Al-Qadi (Illinois Center for Transportation, Department of Civil & Environmental Engineering, Grainger College of Engineering, University of Illinois Urbana-Champaign)

Abstract: Asphalt pavements gradually age in service, increasing their vulnerability to cracking and other forms of distress, primarily due to oxidation of the asphalt binder. Field observations show that surface lifts experience more severe oxidation than underlying layers, a difference often associated with ultraviolet (UV) radiation exposure. However, most laboratory aging methods simulate only thermal effects using elevated temperatures and pressures. This study examines the role of UV irradiation in altering the rheological and chemical properties of asphalt binder under conditions that better reflect field aging. A neat PG 64-22 binder was subjected to UV exposure for 7 and 14 days at 25°C and 50°C. Rheological properties were evaluated using frequency sweeps in a dynamic shear rheometer (DSR), while low-temperature behavior was assessed with a 4-mm DSR configuration. Chemical changes were monitored using Fourier Transform Infrared Spectroscopy (FTIR) through functional group analysis. The findings reveal distinct mechanisms governing photochemical degradation and thermal oxidation. Increases in crossover temperature and R-value indicate stiffening and reduced viscoelasticity with UV exposure, with stronger effects observed at 25°C, suggesting temperature-dependent behavior. FTIR results showed increased hydroxyl formation and bond scission, consistent with field core observations, underscoring the need to incorporate both thermal and UV conditioning in aging protocols. KEYWORDS: asphalt binder, aging, UV, DSR, FTIR, TEAGE

Impact of Aging and Volatility on the Durability of Asphalt Binders Modified with Recycling Agents

Speaker: Behnam Jahangiri

Authors: Behnam Jahangiri (Genex Systems, Turner Fairbank Highway Research Center), Adrian Andriescu (Genex Systems, Turner Fairbank Highway Research Center), Aaron Leavitt (Federal Highway Administration), Raj Dongre (Dongre Laboratory Services Inc.), Farhad Abdollahi (Genex Systems, Turner Fairbank Highway Research Center), and Jack Youtcheff (Federal Highway Administration)

Abstract: Recycling agents (RAs) are widely used in the asphalt industry to restore durability and cracking resistance in aged binders. However, the long-term performance and chemical interactions between various RAs and binder sources remain poorly understood. This study evaluated three bio- and petroleum-based RAs incorporated into 11 binders from diverse U.S. sources at three dosages, resulting in 99 distinct binder blends. To assess long-term effectiveness, blends were subjected to four aging levels: 1RTFO, 2RTFO, PAV20, and PAV40. As conceptualized at PARC 2024, results indicate that RAs appear "binder-independent" based on classical high-temperature Performance Grading (PG). However, Glover-Rowe (G-R) parameter and FTIR spectroscopy reveal a different trend at harsher aging levels. Specifically, RAs that provide the greatest initial PG reduction often fail to maintain effectiveness at 2RTFO, PAV20, and PAV40. This decline in performance correlates with mass loss during 1RTFO and 2RTFO aging, raising concerns regarding RA volatility during the pavement's service life. These findings suggest that initial change in binder viscoelastic properties is an insufficient metric for long-term durability, emphasizing the need for aging- and volatility-resistant RA formulations. The upcoming phase of this research will involve mixture-level performance and workability testing to validate these binder-scale observations under simulated field aging conditions.

PARC 2026 Special Roofing Session

Note: It is a special invited session. No abstracts available but speaker bios (including photos) provided in the program.

SESSION 5: Asphalt Additives

Reactive Elastomeric Terpolymers as Alternative Pathways to Durable High Polymer Asphalt Binder Performance

Speaker: Roxanne Jenkins

Authors: Roxanne Jenkins, Hayley Brown, and Xingyu Zhou

Abstract: High-polymer asphalt binders are commonly employed to improve pavement durability under heavy traffic and severe service conditions. In conventional systems, enhanced elastic response and rutting resistance are typically achieved through high polymer loadings and the formation of a continuous polymer-rich phase. While effective, this approach can introduce challenges related to processability, storage stability, and formulation robustness. This study investigates a reactive modification strategy that enables high elastic response at reduced polymer loadings through chemically driven network formation rather than reliance on polymer phase continuity. The reactive modifier contains functional groups capable of chemically associating with complementary functional groups in the asphalt binder, promoting the formation of an integrated elastic network and improved polymer–binder compatibilization. Rheological characterization demonstrates that binders modified via this mechanism exhibit elastic recovery, rutting resistance, and temperature-dependent viscoelastic behavior comparable to high-polymer systems, while maintaining improved processing characteristics at lower polymer concentrations. These results provide insight into alternative pathways for achieving durable asphalt binder performance under high-demand service conditions.

Modified systems with high SBS content for low temperature climate

Speaker: Brett Lambden & Martin Jasso

Authors: Martin Jasso (University of Calgary), Brett Lambden (Cenovus Energy), Darren Anweiler (Cenovus Energy)

Abstract: Recent years brought new approaches to enhance the performance of bituminous pavements. One offers binder containing up to three-fold more polymer than commonly used modified asphalts. The unique microstructure with continuous polymer network significantly improves binder properties thus pointing to extension of its service life. Presented work focused on modified systems with high content of SBS with and without bio-oil for low-temperature climates. The investigated formulations included 200/300A Pen grade with 8 wt.% SBS, 150/200A Pen grade with 7 wt.% SBS with and without 2 wt.% bio-oil. The materials' performance was evaluated using Superpave binder specifications AASHTO M320 and M332, compared with the performance of commercial modified asphalt 200/300A Pen grade with 3 wt.% SBS. The performance of paving mixes was evaluated by Dynamic Modulus, Hamburg Wheel Tracking Test and determining the critical cracking temperature via Indirect Tensile Test. Results from paving mixes showed that systems with high content of SBS had superior performance at both high and low temperatures with suitability for harsh cold climates. Bio-oil did not significantly compromise their performance. The improved properties of the new materials were not fully captured by Superpave specification.

The effect of order of addition of reactive isocyanates on asphalt binder properties

Speaker: Keara Saud

Authors: Keara Saud (BASF), Brian Orr (BASF), Bernie Malonson (BASF), Joey Carrigan (BASF)

Abstract: Asphalt modification with reactive isocyanates have shown great potential for performance improvement of asphalt binders and mixtures. Specific improvements include rutting performance, strain resistance, compactibility, and H2S sequestration/scavenging. Until now, studies with reactive isocyanates have primarily focused on what properties they change and how they are changed. However, given the reactive nature of the isocyanate, there is reason to believe that these property changes may be affected by when an isocyanate is incorporated into a formulation. As such, a better understanding of how the order of addition of reactive isocyanates into formulations affects binder modification and performance is needed. In this study, we consider three additives to a typical asphalt binder: SBS, sulfur, and reactive isocyanate. We evaluate how the order of addition of each of these additives affects the binder's grading as well as the polymer stability in the binder. We will discuss implications in formulating and in plant design.

SESSION 6: AI in Asphalt

Fundamentals of Artificial Intelligence: Asphalt Application examples for Machine and Deep Learning Algorithms

Speaker: Chait Bhat

Authors: Chait Bhat

Abstract: The advent of artificial intelligence, specifically different kinds of machine learning and deep learning algorithms is a novel topic for the asphalt community. As with any new subject, focus on strong fundamentals is required. Proliferation of application without substantial understanding of inherent variability and suitability may trigger unintended consequences. The presentation will cover the following aspects around artificial intelligence, machine learning, and deep learning:

1. Fundamentals of statistical learning and relationship with AI, ML and DL.
2. Mathematical DNA behind different algorithms.
3. Foundational computational aspects of machine and deep learning: prediction and accuracy, supervised and unsupervised, regression and classification.
4. Different types of machine learning and deep learning algorithms: explained with examples across asphalt domain decision-making

Interpretability and Flexibility trade-offs between different algorithms.

AI at the Bench: Introducing DORA, an Intelligent Research Assistant for Asphalt Technology

Speaker: Raj Dongre

Authors: Raj Dongre

Abstract: The pace of AI development continues to accelerate. This presentation opens with a brief yearly update on the most consequential recent advances — including Agentic AI systems capable of autonomously planning and executing multi-step research tasks — and their near-term implications for asphalt and pavement engineering. Most of the session introduces DORA — the Dongre Research Assistant for Asphalt Technology — an AI-powered tool suite purpose-built for asphalt researchers, engineers, and students. DORA currently comprises four integrated tools: an asphalt chemo-mechanics knowledge base; a research paper review and evaluation assistant; a paper-to-presentation converter that generates conference-ready PowerPoint decks from technical documents; and a research paper writing assistant. A research paper publishing platform is under active development. All tools are demonstrated live using real asphalt research documents. DORA represents a vision for what domain-specific AI infrastructure can look like in this field — built by an asphalt researcher, for asphalt researchers. The session concludes with an invitation to a hands-on online AI workshop — August 24–26, 2026 — where attendees can learn to use these tools directly. No prior coding experience required.

SESSION 7: Asphalt Mixtures

Assessment of Durability in Recycled Bituminous Asphalt Mixtures Through Evaluation of Blend Homogeneity

Speaker: Fayçal Lahjiri

Authors: Fayçal Lahjiri (Vinci Construction SP), Corentin Verilhac (Vinci Construction SP)

Abstract: Recycling is increasingly regarded as a pivotal strategy in reducing the carbon footprint of road infrastructure. The integration of Reclaimed Asphalt Pavement (RAP) into high-performance asphalt mixtures effectively maximizes local material resources. However, ensuring the long-term durability of recycled asphalt requires comprehensive assessment of critical factors, including the quality and uniformity of the RAP stockpile and the extent of blending between aged and virgin binders. To address these challenges, a leaching test was introduced in 2011 and has since undergone continuous refinement. By subjecting loose asphalt mixtures to leaching and subsequently analyzing the leachates with Fourier Transform Infrared Spectroscopy (FTIR), it was found possible to evaluate the homogeneity of recycled material. Tracking specific chemical markers, such as carbonyl and sulfoxide functional groups for asphalt, or other specific tracers for additives like recycling agents and rejuvenators, enables precise assessment of binder quality and blend efficiency. The findings from these analyses facilitate the calibration of asphalt mixing plants, ensuring laboratory studies accurately reflect performance and durability standards required in field applications.

Examining Effects of Specimen Fabrication and Preparation Variabilities on Balanced Mix Design Tests

Speaker: Aaron Leavitt

Authors: Aaron Leavitt (Federal Highway Administration), Seyed Farhad Abdollahi (Genex Systems, Turner-Fairbank Highway Research Center), Behnam Jahangiri (Genex Systems, Turner-Fairbank Highway Research Center)

Abstract: This study systematically quantifies how procedural variabilities in specimen fabrication influence Balanced Mix Design (BMD) performance test results across five laboratories using 17 asphalt mixtures. Four critical fabrication factors were evaluated: maximum theoretical specific gravity (Gmm) aging protocols (short-term vs. long-term), conditioning methods (water bath vs. environmental chamber), loose mixture oven heating protocols, and Hamburg Wheel Tracking Test (HWTT) specimen trimming techniques. Performance was assessed using the Indirect Tensile Asphalt Cracking Test (IDEAL-CT), Indirect Tensile Asphalt Rutting Test (IDEAL-RT), and HWTT protocols. Statistical analyses, including Two-Way Analysis of Variance (ANOVA), showed that Gmm aging and conditioning methods had statistically insignificant universal effects on air voids and IDEAL-CT outcomes, but significantly influenced the IDEAL-RT (RT-Index). Oven heating protocols exhibited a statistically significant universal impact across all performance metrics, including CT-Index, RT-Index, Flexibility Index, and fracture energy, demonstrating that heating is not a neutral step, interacting with mixture-specific chemistry. HWTT results revealed that trimming techniques significantly affected Corrected Rut Depth, while stripping-related parameters remained predominantly mixture-dependent and universally

insignificant. These findings underscore the critical need for strict standardization of specimen fabrication protocols, particularly oven heating, to minimize inter-laboratory variability and ensure consistent, fair performance evaluations. The results provide actionable, evidence-based guidance for agencies aiming to harmonize laboratory practices and enhance the reliability of BMD specifications.

Balanced Mix Design and Life Cycle Assessment of Asphalt Mixtures with Recycled Asphalt Shingles

Speaker: Suri Gatiganti

Authors: Suri Gatiganti (NCAT), Lam Nguyen (NCAT), Samantha Dixon (NCAT), Fan Yin (NCAT), Courtney Rice (Owens Corning), Toni Newsome (Owens Corning)

Abstract: The use of reclaimed asphalt shingles (RAS) and reclaimed asphalt pavement (RAP) in asphalt mixtures offers economic and environmental benefits. However, adoption remains limited due to concerns over premature cracking from binder stiffening, the inability of volumetric mix design to account for recycled material contributions, and a lack of case studies quantifying life-cycle benefits. Balanced mix design (BMD) and life cycle assessment (LCA) offer complementary tools to address these concerns. This presentation reports findings from two case studies in Wisconsin and Pennsylvania. Each involved designing a RAP/RAS mixture using the Superpave volumetric system, then optimizing it through BMD modifications — softer virgin binder, asphalt rejuvenator, increased binder content, or a combination. The Pennsylvania case study further evaluated both manufacturer waste and tear-off shingles. A RAP-only control mixture was included for comparison, and all mixtures were tested per each state's BMD performance requirements and under long-term aging conditions. Cradle-to-gate LCA using plant-specific data was conducted for mixtures meeting BMD criteria. Findings show RAP/RAS mixtures can achieve rutting and cracking performance comparable to RAP-only mixtures. BMD-optimized RAP/RAS mixtures had global warming potentials equivalent to or lower than those of RAP-only mixtures, providing practitioners with evidence-based guidance for incorporating RAS into BMD frameworks.

Performance characteristics of asphalt mixtures modified with recycled plastic

Speaker: Mansour Solaimanian

Authors: Mansour Solaimanian (Penn State University)

Abstract: A research study was undertaken to evaluate technical feasibility, performance characteristics, and environmental impacts of incorporating recycled plastics as modifiers in asphalt pavements. Three different types of plastics were included in modifying asphalt binders and mixtures and evaluating performance of the modified mixtures through laboratory performance tests. Rheological characterization of binders was conducted through DSR, MSCR, LAS, and BBR testing. Mixture performance was evaluated using Hamburg Wheel Tracking (AASHTO T 324) and IDEAL-CT (ASTM D8225). The research also included the interaction between plastic dosage rate (low and high) and the inclusion of 15% Reclaimed Asphalt Pavement (RAP). It was found that recycled plastics serve as effective stiffening modifiers, increasing the high temperature grade of the binder and improving rutting resistance. Plastic modification could also reduce the non-recoverable creep compliance by up to 50% or more, particularly in softer base binders. The incorporation of some plastics resulted

in a slight decrease in the low-temperature continuous grade of asphalt binders. The intermediate temperature performance with respect to cracking was mixed with one case showing improvement and two cases leading to reduction in the IDEAL CT index.

SESSION 8: New Methods & Tests in Asphalt

Responsible Asphalt Production

Speaker: Pavel Kriz

Authors: Pavel Kriz

Abstract: The refining industry is experiencing a significant transformation driven by political, economic, environmental, and societal pressures. Once a low-valued byproduct, asphalt has become a specialized material of increasing importance. The asphalt industry must adapt to changes in refinery production related to cost, availability, and composition while responding to the growing demand for secondary materials, including recycled, waste, and bio-sourced products. This overview underscores the necessity for updated specifications to effectively evaluate asphalt binder performance. By refining testing protocols and performance metrics, the industry can ensure modern asphalt mixtures meet longevity requirements while fostering sustainable practices. The insights presented will highlight the importance of aligning industry standards with technological advancements, paving the way for a resilient and responsible future in asphalt production.

From Bending to Torsion to Tension: Multi-Fixture DMA Characterization of Asphalt Shingles

Speaker: Yuanchen Cui

Authors: Simon Cui (Advanced Technical Center, Rheology Division, Anton Paar USA, INC) Abhishek Shetty (Advanced Technical Center, Rheology Division, Anton Paar USA, INC)

Abstract: Dynamic mechanical analyzers (DMA) can precisely quantify the viscoelastic properties of materials as functions of temperature, time, frequency, and amplitude. Using established loading modes—tension, bending, compression, torsion, and axial-torsional combinations—DMA enables detailed mechanical characterization. For asphalt shingles, fixtures such as three-point bending (TPB), single and dual cantilever (S-CTL and D-CTL), and solid rectangular fixtures (SRF) were used to evaluate force–displacement behavior, creep and recovery, relaxation, and thermal expansion. Selecting the same fixture in different sizes also allows assessment of shingle behavior under varying constraints, helping simulate real service conditions. Different deformation modes on DMA can represent practical scenarios. Bending simulates sagging during storage or handling. Folding deformation reflects wind-induced uplift that may bend or fracture shingles. Torsional motion represents resistance to twisting or tearing forces. This study focuses on two key challenges: achieving consistent sample preparation for reproducible results, and selecting appropriate geometries to represent specific mechanical conditions. Experimental findings show that when samples are prepared consistently and the correct geometry is chosen, DMA provides reliable measurements for asphalt shingles.

A New Approach to UV Ageing: Chemistry and Performance of Realistic Thin Bitumen Layers

Speaker: Anand Sreeram

Authors: Shobhit Jain (University of Nottinghm), Gordon Airey (Nottingham Transportation Engineering Centre, University of Nottingham), Anand Sreeram (University of Nottingham)

Abstract: Photo-oxidative ageing of asphalt binders is driven by UV-initiated surface reactions that are largely invisible to thermo-oxidative protocols performed on bulk or millimetre-scale material. This study introduces a thin-layer framework that targets realistic binder coverages of 20-50 µm, alongside 100 and 500 µm, to resolve thickness-dependent degradation pathways in a 60/80 penetration grade bitumen. After short-term ageing, films were subjected either to oven exposure at 45 °C or to combined UV–thermal exposure in a QUV chamber (UV-A, 0.89 W/m²/nm, peak 340 nm) under identical temperature conditions. Surface-sensitive FTIR, SARA fractionation, and rheological testing from high to low temperatures were used to couple molecular-scale chemistry with mechanical performance. For the 20-50 µm layers, UV exposure produced up to about 2.5-fold higher carbonyl development than thermal ageing at equal time, together with a 20-30% loss of aromatics and enrichment of resins and asphaltenes, evidencing a strong, thickness-dependent maltene imbalance. In contrast, oven-aged specimens showed almost no systematic variation with layer thickness, and UV-aged 100-500 µm material displayed chemistry and rheology close to their thermally aged counterparts. The framework shows that only realistic thin layers reveal the true severity of UV-induced surface embrittlement and that conventional thermal protocols can lead to overly optimistic durability assessments.

Evaluating Low-Temperature DSR Testing Methodology: Challenges, Data Quality, and Recommended Practices

Speaker: Collin Pekol

Authors: Collin Pekol (Paragon Technical Services), Codrin Daranga (Paragon Technical Services)

Abstract: Low-temperature binder characterization within the Superpave framework relies primarily on the bending beam rheometer (BBR). Advancements in dynamic shear rheometer (DSR) technology have enabled growing interest in low-temperature DSR tests for evaluating stiffness, thermal cracking behavior, and performance grading criteria. Properly implemented low-temperature DSR testing offers potential for quick, consistent testing with minimal required sample volume compared to traditional BBR testing. This mode of testing introduces unique challenges such as instrument compliance concerns, sensitivity to sample preparation and geometry, and thermal equilibration of the sample. Data analysis of low-temperature DSR data can often include implicit assumptions about low temperature viscoelastic behavior of binders such as viscoelastic linearity and thermorheological simplicity. This work examines current strategies and practices in low-temperature DSR measurements as well as the challenges, limitations, and assumptions involved. These methods are compared to several techniques for performing low-temperature DSR tests, using criteria by which to measure data quality such as Black's Space, instrument compliance calibrations, and thermal analysis from differential scanning calorimetry (DSC). From this evaluation, we propose recommended test parameters, practices, and instrumentation for low-temperature DSR testing as well as methods of assessing data quality and validity.

Modification of Asphalt Mixture Cyclic Fatigue Analysis

Speaker: S. Farhad Abdollahi

Authors: S. Farhad Abdollahi (Genex Systems | TFHRC), Behnam Jahanagiri (Genex Systems | TFHRC), Aaron Leavitt (FHWA)

Abstract: Fatigue cracking is a primary deterioration mechanism in asphalt pavements, which can be characterized using the cyclic fatigue test and analyzed via the Simplified Viscoelastic Continuum Damage (S-VECD) framework. This study presents adjustments to the S-VECD methodology to improve the analytical approach beyond current AASHTO T411-24 specifications. A primary contribution is the incorporation of a strain-level calibration to capture the dependency of the dynamic modulus on the applied strain specifically during pull-pull cyclic fatigue loading. This calibrated approach was applied to cyclic fatigue test data from different asphalt mixtures collected across 11 lanes at the FHWA Pavement Testing Facility. The dataset consists of multiple aging states, including loose mixtures sampled during construction, as well as field cores extracted 6-months and 1-year post-construction. Furthermore, this study introduces AutoDMCF program, a newly developed Python-based automated framework for comprehensive data processing and test result analysis. This user-independent platform integrates rigorous consistency checks and automated outlier detection to streamline analytical workflows. By refining these procedures, the proposed methodology addresses existing computational challenges and mitigates the high variability often encountered in complex materials such as stone matrix asphalt.

SESSION 9: Case Studies & Field Performance

From Farm to Flexible Pavement: A Rural Iowa Demonstration of Soy-Enabled High-RAP Asphalt and Preservation Strategies

Speaker: Eric Cochran

Authors: R. Chris Williams (SoyLei Innovations), Baker Kuehl (SoyLei Innovations), Michael Forrester (SoyLei Innovations)

Abstract: This paper presents a rural implementation model for soy-enabled asphalt technologies based on the Clayton–Fayette county demonstration in northeast Iowa. The project was developed to meet three practical goals: increase the use of reclaimed asphalt pavement (RAP), improve low-temperature performance through a binder “bump,” and introduce soy-based additives into large-scale commercial practice. In Clayton County, the design used a 30% RAP mix with a 1.5% soy-based additive, a 1 in. mill-and-3 in. overlay strategy, and project quantities totaling approximately 37,000 tons of asphalt and 33.1 tons of soy additive. The work also required a special provision to allow greater use of non-virgin binder in the surface mixture. Field observations reported strong compaction, competitive binder economics, and practical lessons on roller pattern, constructability, and smoothness control. Framed more broadly, the project shows how county agencies, Iowa State University, industry partners, and SoyLei can translate bio-based pavement technology from research into biddable specifications, contractor execution, and community-scale benefit. The paper discusses the technical rationale, specification pathway, field observations, and a scalable template for future rural preservation and rehabilitation projects.

Field Performance of Reactive Isocyanate Asphalt Binder Modifications: Case Studies from Kentucky and NCAT Trials

Speaker: Phillip Blankenship

Authors: Phillip Blankenship and Zack McKay

Abstract: B2Last reactive Isocyanate asphalt modifier is a low viscosity liquid asphalt modification additive that improves adhesion performance by crosslinking within the liquid asphalt. This abstract presents an ongoing evaluation of the reactive isocyanate-based additive in asphalt mixtures, featuring three field trials constructed in Kentucky (2019 and 2021) and a fourth at the National Center for Asphalt Technology (NCAT) test track in 2020. Trials compared performance of mixtures containing the isocyanate additive to control sections. In the Kentucky projects, the additive was blended with neat PG 64-22 asphalt binder, while the NCAT trial used SBS-modified PG 76-22 binder. All mixtures incorporated aggregate and reclaimed asphalt pavement (RAP). Construction and field performance were thoroughly documented, and each KY section has been monitored annually, with the most recent pavement condition index (PCI) data collected in 2025 through video analysis using deep machine learning software. The track section data was collected by NCAT. Results indicate that the isocyanate-modified sections performed comparably to controls in Kentucky, while the NCAT section exhibited similar performance despite higher-than-expected sub-base moisture leading to increased strain. These findings support the viability of reactive isocyanate additives for enhancing pavement durability and suggest their potential for broader adoption in pavement engineering.

SESSION 10: Alternative Binders

The next generation of 100% biobased asphalts: A multi-scale design

Speaker: Susie Guehenneux

Authors: Susie Guehenneux (INSA Lyon-IMP and Eiffage INFRASTRUCTURES), Florent Dalmas (INSA Lyon), Françoise Méchin (INSA Lyon), Flavien Geisler (Eiffage INFRASTRUCTURES), Simon Pouget (Eiffage INFRASTRUCTURES), Rémi Perrin (SOPREMA), Agnès Rannee (SOPREMA), Antoine Duval (SOPREMA), Gérard Mortha (Grenoble INP UGA - LGP2)

Abstract: As the asphalt industry transitions toward carbon neutrality, the upcycling of renewable and waste feedstocks into high-performance alternative asphalt binders has become a priority. However, achieving 100% bio-based formulations requires more than simple feedstock substitution, it demands a robust multi-scale design framework. This study proposes a structure–compatibility–performance approach to engineer a 100% bio-based, non-crude-oil asphalt Hansen solubility parameters (HSP) were used to quantify the compatibility between bio-based components designed to replicate the functional roles of asphaltenes and maltenes. Interaction distances (Ra) and compatibility ratios were benchmarked against conventional asphaltene–maltene systems to evaluate bio-based blends feasibility. Guided by these compatibility results, several fully bio-based asphalts were formulated using a mixing protocol adapted from conventional asphalt manufacturing practices. Rheological evaluation combined with multi-scale characterization (Small Angle X-Rays Scaterring and microscopy) revealed that higher Hansen compatibility promotes greater network development, leading to enhanced viscoelastic properties. Conversely, lower compatibility limits network

development and viscosity evolution. An optimized 100% bio-based asphalt was ultimately developed, reproducing the viscoelastic response of a conventional 50/70 bitumen over a broad temperature range. These results demonstrate that integrating predictive compatibility analysis with advanced structural tools is a powerful strategy for designing the next generation of bio-based asphalt.

Advancements in Coal-based Asphalt to Produce High-Quality Binders

Speaker: Jeramie Adams

Authors: Jeramie J. Adams, Cheng-Yen Pan, Trina Pheiffer, LC Muller, Seth Bassham, Yogesh Kumbargeri, Alex Literati

Abstract: Coal-based asphalt has continued to mature. Currently, grades from PG 52-40 and 70-22 have been produced at the laboratory scale. The rheological response for these binders, even after RTFO/PAV aging remains very similar to petroleum-based asphalt as judged by the Black's space plot. SAR-AD analysis also shows that aging of these new products is similar to changes which occur for petroleum asphalt. The current advancement in coal-based asphalt properties comes from a two-stage process where the first step is obtaining smaller coal molecular fragments by extraction/ liquefaction with small, cheap and abundant alcohols; and the second stop is producing a coal-based binder with high-quality PG properties by reacting these coal molecules with fatty acids.

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POSTER ABSTRACTS

Physico-Chemical Impacts of Fines on Asphalt Performance

Speaker: Youtcheff, Jack

Authors: Jack Youtcheff (Turner-Fairbank Highway Research Center, Federal Highway Administration), Raj Dongre (Dongre Laboratories), Behnam Jahangirl (Genex Systems), Adrian Andriescu (Genex Systems), and Aaron Leavitt1 (Turner-Fairbank Highway Research Center, Federal Highway Administration)

Abstract: Fine aggregate particles can strongly influence asphalt mixture durability through both physico-chemical interactions and measurable changes in binder and mastic performance. This study examines how contaminants, clays, and mineral fillers affect Hot Mix Asphalt (HMA), high-Recycled Asphalt Pavement (RAP) mixtures, and Stone Matrix Asphalt (SMA), with emphasis on stiffening, brittleness, and drain-down resistance. At the chemical level, the work considers adsorption of polar asphaltenes onto mineral surfaces and the resulting structured binder layer that governs mastic response. At the engineering level, two clays and two mineral fillers are evaluated in three binders— PG 64-22 pavement test facility binder and SHRP sol- and gel-type asphalts—using Bending Beam Rheometer, Double-Edge-Notched Tension, Delta Tc, and brittleness metrics. Complementary screening with the Asphalt Binder Test is used to characterize filler-induced stiffening and improve mastic assessment. For SMA, conventional drain-down testing is paired with novel Dongre Workability Test approach, in which the slope of DWT Index versus temperature is used to identify additive type and dosage needed to control drain-down while preserving workability. Mixture-level implications are assessed using Hamburg Wheel Tracking and related tests, providing a practical framework to optimize fines selection for durable, deformation-resistant asphalt mixtures under demanding production and field service conditions.

Clarifying MSCR and AASHTO M332: What the Parameters Really Tell Us About Modified Binder Performance

Speaker: Richard Blackwell

Authors: Richard Blackwell (Kraton Corporation)

Abstract: The Multiple Stress Creep Recovery (MSCR) test has been a tool in the binder analysis portfolio for over a decade. Specifications qualifying binders based on non-recoverable creep compliance (Jnr) at the grade temperature have been incorporated into AASHTO M332 since 2014. MSCR %R is used by some agencies as a PG+ specification, sometimes referencing the R92 curve. However, there is still resistance to implementing MSCR and AASTHO M332 across many agencies, with 23 states still primarily using M320 for all grades. Confusion persists as to what additional information MSCR actually provides, why it is preferable to traditional elastic recovery, and how the various parameters extracted from an MSCR measurement should be interpreted. This paper describes the benefits of MSCR analysis, particularly for modified binders, including an explanation of the MSCR

parameters and a discussion of the relevance of the R92 curve. We will dive deeper into the data behind the numbers and evaluate the influence of polymer modification on resistance to deformation, or strain tolerance, and assess whether this behavior is adequately captured by the Jnr-diff parameter.

Beyond Scalar Aging Indices: A Trajectory-Based Analysis of Asphalt Binder Master Curves

Speaker: Bradley Seats

Authors: Bradley Seats, Evelyn Malakowski, Aly Romero, Md Islam, and Saqib Gulzar

Abstract: Oxidative aging significantly alters the rheological response of asphalt binders, yet conventional characterization methods typically rely on a limited set of scalar indices derived from master curves, such as crossover frequency or stiffness-based parameters. While these metrics provide useful summaries of aging severity, they do not fully capture the evolution of viscoelastic behavior across the entire frequency spectrum. This study introduces a trajectory-based framework for analyzing binder aging using temperature–frequency sweep data, treating each binder as a dynamic system evolving through rheological state space under progressive aging. Temperature–frequency sweep data were obtained for twenty asphalt binders with similar performance grades. Master curves of complex modulus and phase angle were developed at four aging states: original, RTFO, PAV 20-hour, and PAV 40-hour conditions. The quality of time–temperature superposition (TTSP) was evaluated to assess thermorheological simplicity, and functional descriptors representing the full master curve shape were extracted. Aging progression was quantified using a novel metric termed Rheological Aging Distance (RAD), defined as the integrated difference between master curves across aging states. Results show that binders with similar performance grades exhibit distinctly different aging trajectories, supporting a trajectory-based framework for evaluating aging susceptibility using standard rheological testing.

Material Properties of Asphalt Mixtures Using Agricultural Waste Plastic

Speaker: Kenichi SATO

Authors: Kenichi SATO, Takuro Fujikawa, Chikashi Koga and Riku Yotsumoto (Fukuoka University)

Abstract: In recent years, the volume of waste plastics generated has been decreasing annually due to environmentally conscious initiatives. However, agricultural waste plastics, which require cleaning and other treatments, are mostly disposed of through landfilling or incineration, and their generation volume remains high. Consequently, finding new utilization methods has become a key challenge, and in recent years, technologies for incorporating waste plastics into asphalt mixtures have been developed. Therefore, this study aims to develop a new asphalt mixture utilizing agricultural waste plastics. This report presents the results of an investigation into the material properties, water resistance, and fatigue resistance of asphalt mixtures containing three different combinations of two types of agricultural waste plastics.

Mechanical Behavior of High-Reclaimed Asphalt Pavement Cold Mixes with Fly Ash and Plant-Based Rejuvenators

Speaker: Bruno Tiago Angelo da Silva

Authors: Bruno Tiago Angelo da Silva (Federal University of Ceará), Suelly Helena de Araújo Barroso (Federal University of Ceará), R. Christopher Williams (Iowa State University)

Abstract: This study investigates circular economy strategies in pavement engineering through the intensive reuse of Reclaimed Asphalt Pavement (RAP) in cold mix asphalt mixtures incorporating plant-based rejuvenators. The research evaluates the effectiveness of SESO and BioMAG in restoring the physicochemical and rheological properties of aged asphalt binders, aiming to enable high RAP contents while maintaining adequate mechanical performance. The experimental program included RAP and binder characterization, mixture production with up to 100% RAP, and mechanical evaluation. A slow-setting asphalt emulsion was used as the primary binder, while fly ash filler was incorporated to improve mixture cohesion. The bio-binders were added individually at a dosage of 1.6% using a mechanical mixer instead of a colloid mill. Preliminary results showed that mixtures with 100% RAP and fly ash filler exhibited low indirect tensile strength, ranging from 11.4 to 82.8 kPa, indicating limited strength. Despite this, the addition of bio-based rejuvenators improved binder dispersion and interaction within the mixture. These findings highlight the challenges of achieving adequate strength in high-RAP cold mix asphalt mixtures with fly ash filler and slow-setting emulsions, while also demonstrating the potential of plant-based additives to enhance binder activity. Further optimization of mixture design is required to improve mechanical performance.

Investigating Tree Shade Effect on Pavement Temperature

Speaker: Zifeng Zhao

Authors: Zifeng Zhao, Ethan Rossow, Nahum Yelizarov, Xue Feng, Mihai Marasteanu

Abstract: One of the most significant factors affecting the rate of oxidation of asphalt binders during the pavement service life is the pavement temperature, in particular the pavement surface temperature. Roadside tree canopy can substantially modify pavement surface heating by reducing incoming solar radiation. A one-dimensional heat transfer model was developed that incorporates a shade factor into the shortwave radiation term to quantify the thermal influence of roadside trees. The model was initially calibrated using temperature data collected at MnROAD facility, where embedded sensors measured pavement temperature at the surface and at depths of 6 cm and 30 cm. After calibration of thermal conductivity and volumetric heat capacity, these parameters were fixed and applied to shaded sites, where only the shade factor was optimized. The model reproduced measured pavement temperatures well, under both full-sun and shaded conditions, indicating that the model can reliably represent pavement thermal response using a physically interpretable shade parameter. Road Doctor Survey Van measurements further showed that shaded pavement remained noticeably cooler than nearby full-sun pavement. The estimated shade factor showed clear differences by season and tree type, with pine generally producing the largest and most persistent shading effect. Overall, the results support the inclusion of roadside shade effects in pavement thermal modeling and asphalt binders rate of oxidation models.

Evaluation of Hamburg Wheel Tracking Test Analytical Methods Against TSR for Moisture Susceptibility Characterization of Asphalt Mixtures

Speaker: Anneliese Jakisa Owor

Authors: Anneliese Jakisa Owor (University of Missouri-Columbia), Punyaslok Rath, Ph.D. (University of Missouri-Columbia), William G. Buttlar, Ph.D., P.E. (University of Missouri-Columbia)

Abstract: Moisture damage in asphalt mixtures, commonly referred to as stripping, is a critical distress addressed during mixture design. AASHTO T283 has been used to measure moisture susceptibility through the Tensile Strength Ratio (TSR) with an acceptance threshold of 80%. However, research has shown a poor correlation between TSR results and field stripping performance. More recently, the Hamburg Wheel Tracking Test (HWTT), conducted with specimens submerged at 50°C, has been adopted to evaluate moisture susceptibility through the Stripping Inflection Point (SIP) and Stripping Number (SN) parameters. This study compares TSR and HWTT parameters derived using the Iowa-method and Francken-model for asphalt mixtures from Missouri and Illinois using a composite ranking framework. Three key findings emerge. First, TSR and SIP rankings diverge for most mixtures: field performance data from Missouri showed better correlation with SIP than TSR. Illinois mixtures showed similar divergence across dense-graded and SMA mixtures. Second, the Iowa method consistently produced lower SIP values than the Francken model by roughly 30%, confirming it as the more conservative framework. Third, the Francken model failed to detect stripping in several mixtures where the Iowa method did, yielding different classifications for borderline cases. These results support multiparameter HWTT evaluation and standardized SIP calculation protocols.

Monetizing the Bottom of the Barrel: Reactive Bio-Oil Upgrading of Solvent-Deasphalting Pitch to Paving-Grade Asphalt Binder While Increasing DAO Recovery

Speaker: Eric Cochran

Authors: R. Chris Williams (SoyLei Innovations), Baker Kuehl (SoyLei Innovations), Michael Forrester (SoyLei Innovations)

Abstract: Solvent deasphalting (SDA) improves refinery liquid yields by extracting deasphalted oil (DAO), but it leaves an asphaltene-rich pitch that is often too stiff for paving-grade binder without high paraffinic cutter treat rates. This work evaluates a semi-epoxidized soybean oil (SIP-1111) as a reactive, low-dose approach to convert SDA pitch and stiff vacuum resid streams into paving-grade asphalt while preserving high-temperature performance. Laboratory blends of SDA pitch were prepared using (i) SIP-1111 at 2% by binder mass and (ii) conventional paraffinic and aromatic diluents at representative treat rates. Binders were characterized using performance-related rheology (DSR and BBR), MSCR response, and aging sensitivity; select mixes were screened with cracking and rutting indicators (CT Index and Hamburg wheel tracking). Relative to paraffinic dilution, SIP-1111 achieved target paving-grade consistency at substantially lower addition rate, improved low-temperature cracking indicators (ΔTc trend), and maintained rutting resistance. The results support a refinery-to-pavement pathway where increased SDA severity can be paired with reactive pitch upgrading to deliver saleable paving binder while freeing valuable cutter streams for fuels and lubes.

Techno-Economic and Environmental Assessment of Grape Pomace Valorization as a Bio-modifier in Asphalt Pavements

Speaker: Yuefeng Zhu

Authors: Yuefeng Zhu (Department of Civil Engineering, California State University, Chico), Tirupathireddy Dodda (College of Engineering, Lamar University), Samuel Paul Lowenhar (Department of Food Science and Technology, University of California, Davis), Clayton S. Jeffryes (College of Engineering, Lamar University), Selina C. Wang (Department of Food Science and Technology, University of California, Davis), Jian Fang (College of Engineering, Lamar University) , Liv M Haselbach(College of Engineering, Lamar University), Kun Zhang (Department of Civil Engineering, California State University, Chico)

Abstract: The valorization of biomass as an additive in construction materials is one of the approachable pathways to sequester biogenic carbon to neutralize greenhouse gas emissions. This study integrated techno-economic and environmental assessments to repurpose grape pomace (GP) as an exemplary bio-modifier for asphalt paving materials. Comprehensive assessments were conducted to characterize the functioning bioactivities of GP, engineering performance of GP-modified asphalt binders and mixtures, and economic and environmental evaluations via the process modeling for energy use, carbon emission, and cost estimation. The results showed that both red GP and white GP, especially the GP seed fraction, exhibited antioxidant capabilities to slow down asphalt oxidation, which will retard oxidation-induced cracking to reduce maintenance frequency and cost. The process model results showed that the initial moisture content in GP is a critical factor influencing energy use and cost for processing GP. The use of GP additive could offset carbon emissions by 30% for raw construction materials acquisition by biogenic carbon sequestration, and the extra cost would be 1% or less of the cost price of asphalt mixtures. The techno-economic and environmental assessment framework and methodologies used in this study can be extended for other bio-based materials in asphalt pavements.

Thick Lift Paving

Speaker: Moises Saca

Authors: Bryan Wilson, Moises Saca, and Darlene Goehl

Abstract: Thick-lift paving, which is the placement of asphalt concrete in a lift greater than the allowable maximum, offers potential benefits including streamlining operations and eliminating the bond interface in multi-lift layers. However, it also presents challenges such as potential for inadequate compaction and lower ride quality. Asphalt concrete design and construction specifications from 19 state Departments of Transportation were reviewed. In the field, 28 thick-paving test sections were constructed with different lift thicknesses (3 to 10 inches), two mix designs, different paving screed settings, and different rolling patterns. All pavers were equipped with tamper bar screeds. During construction, the researchers monitored asphalt cooldown time and mat density. After construction, the ride quality of each section was measured, and cores were tested for air voids content. Acceptable mat compaction was achieved in all test sections, with additional roller passes having the most significant effect on compaction. One-lift layers yielded better and more uniform compaction than two-lift layers. Thicker lifts had significantly longer cool down times and potentially increased roughness. Recommendations included the possible use of tamper bar screeds and the addition of two roller passes to improve compaction. Scenarios that are suitable for thick-lift paving were identified.

Multi-Stage Fatigue Testing (MSFT) for Asphalt Mixtures: Dual-Mode Stress- and Displacement-Controlled SCB Characterization

Speaker: Ahmed Oda

Authors: Ahmed Oda (University of Idaho), Emad Kassem (Civil Engineering Department- University of Idaho)

Abstract: Fatigue cracking is a major distress limiting asphalt pavement performance. IDT, SCB, and IDEAL-CT capture only single-stage responses and don't represent the progressive damage caused by repeated traffic loading. This study introduces an integrated framework that combines the Multi-Stage Stress-Controlled (MSSD) and the Multi-Stage Displacement-Controlled (MSDD) to characterize stiffness loss, dissipated energy, and crack progression. SCB specimens (D=150mm, t=50mm, notch=15mm) were at multiple stress or deformation stages. The experimental matrix included mixtures varying in air voids (4%, 7%, 10%), binder content ((OBC–1%), OBC, (OBC+1%)), binder grades (PG58-34, PG76-22, HiMA PG76-34), and high-RAP blends containing 70%RAP with and without rejuvenators (Rj1 and Rj5). MSSD provided stage-wise stiffness and Damage Index (DI), while MSDD produced DE, DCA, and DEC. Results showed clear performance contrasts. Mixtures with 4% AV and OBC+1% binder achieved approximately 190% and 365% higher DE, respectively, compared to the control, while 10% AV showed about 60% lower DE, indicating brittleness. Modified binders enhanced fatigue resistance, with HiMA and PG 76-22 increasing DE by roughly 270% and 60%, respectively. Rejuvenated RAP mixtures showed partial recovery, with Rj2 improving DE by 140%. The framework provides a robust, mechanistic basis for mixture ranking and supports advancements in Balanced Mix Design and performance-based specifications

A Practical Oven Aging Protocol for Evaluating Long-Term Cracking Performance of Asphalt Mixtures in Arizona

Speaker: Awais Zahid

Authors: Awais Zahid (Arizona State University), Hasan Ozer (Arizona State University)

Abstract: A practical test-based long-term aging (LTA) protocol is developed to evaluate the cracking performance of asphalt mixtures under extreme climatic conditions in Arizona. The study focuses on establishing efficient laboratory aging durations while maintaining reliable characterization of material behavior. A baseline aging response is first established using a polymer-modified binder aged at 135 °C for 10, 20, and 30 hours and evaluated using dynamic shear rheometer (DSR), IDEAL-CT, and semicircular bend (SCB) tests. Subsequently, asphalt mixtures produced with five different binders (modified and unmodified) are evaluated using test-specific aging durations. Based on performance sensitivity, 6 hours at 135 °C is adopted for intermediate-temperature cracking tests (IDEAL-CT and I-FIT), while 15 hours is used for low-temperature fracture tests (SCB/DCT-CMOD). The proposed LTA protocol is validated using plant-produced mixtures with 5% and 7% air void contents. Results demonstrate that the test-based aging durations provide consistent differentiation in stiffness and cracking resistance across binder types while significantly reducing conditioning time compared to conventional protocols. Significant relation between binder-level and mixture-level AC performance testing responses confirms the applicability of the research study. The proposed approach provides a practical and scalable method for evaluating long-term cracking performance of asphalt mixtures in hot climates.

Current Methodologies for Ensuring Acceptable Friction Performance During Asphalt Mix Desing Validation in Texas, Their Gaps, And Ways to Improve Them

Speaker: Moises Saca

Authors: Moises Saca (Presenting) Darlene Goehl, and Bryan Wilson

Abstract: Adequate friction performance is essential for asphalt pavements under wet conditions. Even when a pavement exhibits low post-construction roughness and excellent resistance to rutting and cracking over time, insufficient friction can compromise safety. In Texas, the Surface Aggregate Classification (SAC) system is used to specify minimum aggregate quality requirements in asphalt mix design, helping ensure a baseline level of friction performance. While SAC has been effective in achieving this goal, opportunities exist to further improve friction prediction and verification. This study evaluates alternative laboratory tests for both aggregates and hot mix asphalt that directly measure friction and surface texture. The laboratory results are compared with field friction measurements collected at highway speeds using a locked-wheel skid trailer. Findings indicate that these alternative tests provide improved correlation with in-service pavement friction and show promise for implementation as part of a mix design validation framework.

Do similar PG binders and mixtures show similar pavement cracking performance? Think again!

Speaker: Yogesh Kumbargeri & Seth Bassham

Authors: Yogesh Kumbargeri, Jeramie Adams, Phil Blankenship (BATTlab), Zack McKay (BATTlab), Alex Literati; Didier Lesueur, Seth Bassham

Abstract: The Superpave Performance-Grade (PG) system often fails to distinguish field performance variations among binders with identical grades due to increased modern refining and formulation variability. This study evaluates five PG 64-22 and three PG 58-28 asphalt binders to identify advanced chemistry and rheology parameters that accurately predict cracking performance. Asphalt mixtures were tested using the IDEAL-CT method, confirming distinct cracking behaviors within identical PG grades. Unaged and long-term aged binders underwent comprehensive chemical fractionation via SAR-AD, molecular weight profiling using Size Exclusion Chromatography (SEC), and rheological testing via a 4mm Dynamic Shear Rheometer (DSR) from -30°C to 60°C. Results demonstrate that SAR-AD instability indices (Maltene and Enhanced Colloidal) successfully capture compositional impacts on the CT Index. SEC molecular weight distributions effectively differentiate the best and worst-performing binders. For rheology, the crossover temperature and phase angle at G*=10 MPa show the highest effectiveness in ranking cracking performance, strongly aligning with mixture test outcomes. Overall, specific chemistry and rheology-based parameters provide an effective methodology to characterize and link binder properties to mixture cracking performance, overcoming traditional PG system limitations in a rapidly changing material landscape.

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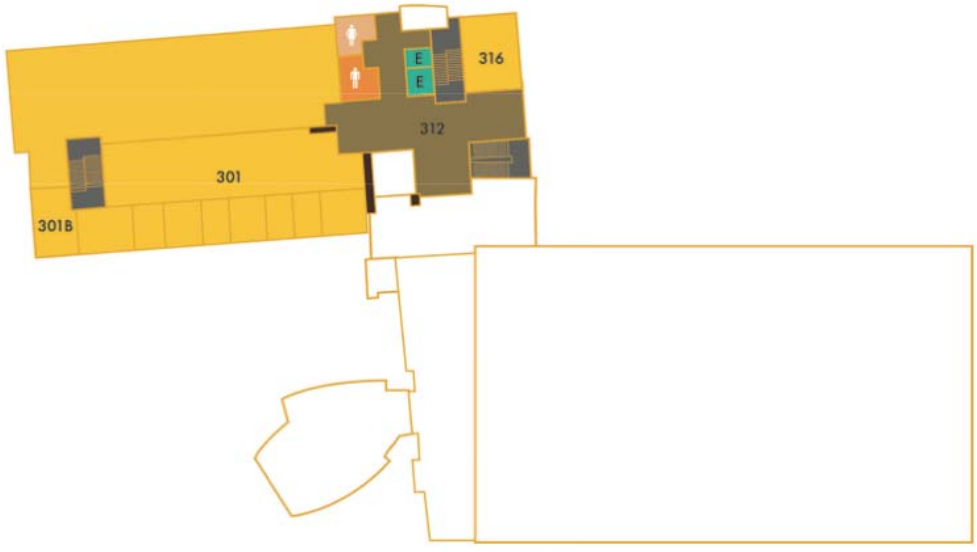

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