62ND

PETERSEN ASPHALT RESEARCH CONFERENCE 2025

PROGRAM

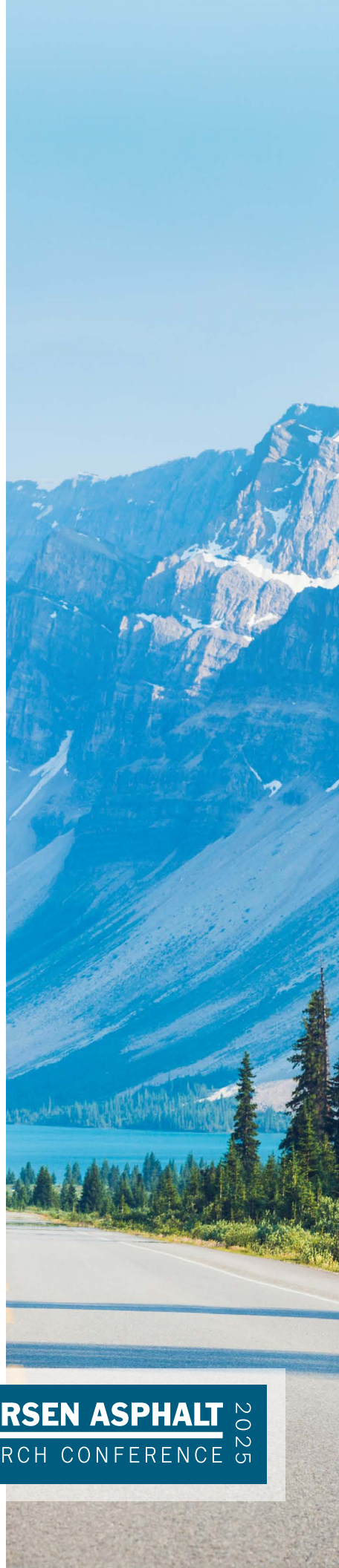
JULY 14-17, 2025

LARAMIE, WYOMING

Western Research INSTITUTE

PETERSENASPHALTCONFERENCE.ORG

TABLE OF CONTENTS



62ND PETERSEN ASPHALT RESEARCH CONFERENCE 2025

Still your **A-team** Now by another name

Husky Asphalt is now Cenovus Asphalt

In 2021, Husky and Cenovus Energy combined to create a stronger, more resilient Canadian energy company. As a result, our Asphalt "A-team" is better than ever. Whether you're working with our dedicated researchers, quality control specialists or responsive sales team, we are committed to building better roads and strengthening relationships.

cenovus ENERGY | Asphalt

Visit: **CenovusAsphalt.com**

Request more information: **asphalt.inquiries@cenovus.com**

Husky is now part of the Cenovus group of companies.

WELCOME

Once again, we are delighted to welcome you to Laramie, the Gem City of the Plains, host of PARC 2025, the 62nd Petersen Asphalt Research Conference!

From the wealth of abstracts submitted, the number and quality of participants, sponsors, and exhibitors who registered, we are confident that this 62nd edition will be another great one. 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 2025, just like the 61 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 2025 will be again very rich and international. To show how serious we are about networking, all attendees are welcome to start the conference by gathering during the Welcome Reception on the evening of Monday July 14th. Then, the show will open on Tuesday July 15th with a special keynote session entitled "Is there enough flexibility in the future of asphalt?". This opening session will give you an overview of the global supply issues facing the asphalt industry. 4 more sessions will be held the same day, covering "Rheology, Mixture Physical Characterization, & Specifications", "Alternative Binders", "Artificial Intelligence in Asphalt" and "Case studies & field performance". It will be followed by the poster session with 15 selected works. A nice opportunity to interact with other participants, which is, again, the whole purpose of PARC!

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. We will then continue with sessions on "Asphalt chemistry" and "Asphalt Additives". It will thus be good to relax afterwards, and we have prepared an evening banquet at Black Fox on Welsh, to give you a feel of that famous Western hospitality unique to Laramie.

For Thursday morning, we have scheduled more sessions that resonate with Dr. Claine Petersen's motto "Chemistry Matters", which remains the guiding philosophy behind PARC. So, we will first discuss "Asphalt aging" and then close the scientific program on the pressing topic of "Recycling & Rejuvenation".

Before you leave Laramie, we want to give you an opportunity to visit our facilities in the North of the city. So, 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 the least, we want to make sure you experience the beautiful western outdoors. So, the last afternoon will be partly dedicated to outdoor outings to some nearby mountains – weather dependent. This year, the plan is to visit Vedauwoo and hike the Turtle Tock Trail. Register for it, it's free, easy and you won't regret it! You will enjoy walking around these awesome rock formations and the landscape surrounding them.

Don't forget also that we value your feedback: please be sure to answer the brief survey that you will receive after the conference so that PARC 2025, the 63rd will reach another height.

We cannot leave before thanking all sponsors and exhibitors who are helping to make PARC 2025 possible!

We look forward to interacting with you during PARC 62nd! Thank you again for attending and enjoy the conference!

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

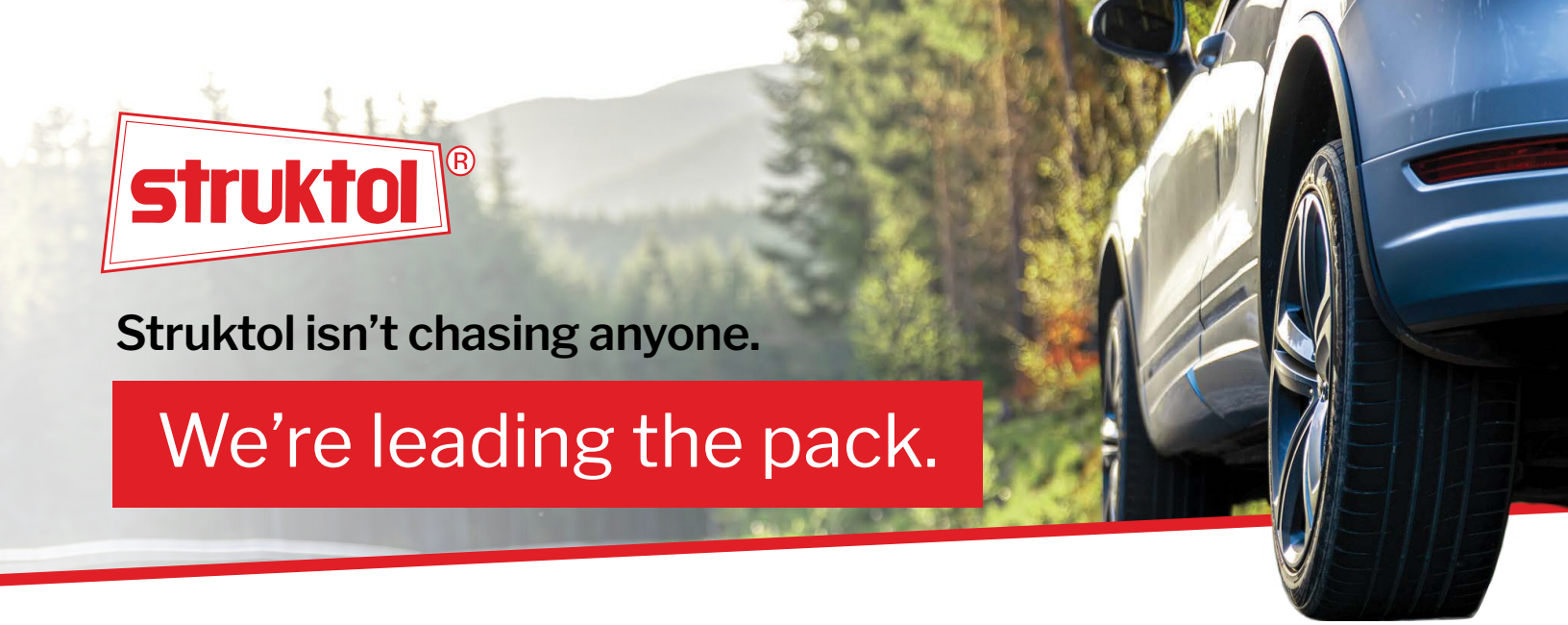
cenovus
ENERGY

Thanks

TO OUR STEIN SPONSOR

OWENS CORNING®

struktol®



struktol®

Struktol isn't chasing anyone.

We're leading the pack.

The Struktol tech team's proprietary solutions help you tackle and conquer these KPI challenges:

- Production efficiency
- Cycle time
- Quality control
- Capacity utilization
- Scrap rate
- Delivery performance

Contact the leaders of the pack.

Struktol.com | 800.327.8649

Always Made in the USA | Meet Sustainability Demands

TO OUR SILVER SPONSORS

paragon technical services, inc.

Ergon Asphalt & Emulsions

AND BRONZE SPONSOR

BATT BLANKENSHIP ASPHALT TECH & TRAINING

SOPREMA Building for Life


Thanks
TO OUR
LANYARD
SPONSOR
KRATON

Thank you

TO OUR

EXHIBITORS

Anton Paar

VISIT LARAMIE

BASF
We create chemistry
B2Last®

UW School of Energy Resources

NETZSCH
infraTest USA

AMAP
Association of Modified Asphalt Producers

ChemCo Systems

LASTRADA PARTNERS
Upgrade to Proven Software Solutions

Western Research INSTITUTE

Thank you

TO OUR

ROOFING SPECIAL SESSION SPONSORS

GAF

OWENS CORNING

SURFACE TECH™ RCA
ARAMID REINFORCED COMPOSITE ASPHALT

certainteed
SAINT-GOBAIN

Malarkey Roofing Products®

TAMKO
BUILDING PRODUCTS INC


Thanks!
FOR SPONSORING OUR WELCOME RECEPTION
BASF
We create chemistry
B2Last®
NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

Thanks!

FOR SPONSORING OUR POSTER RECEPTION

HUNT REFINING COMPANY

2025 CONFERENCE AGENDA

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

MONDAY, JULY 14

6:00PM	Welcome Reception (with drinks and appetizers) & Registration	

TUESDAY, JULY 15

7:00AM	Registration/Check-in	
8:00AM	Opening Remarks	
8:20AM	KEYNOTE SESSION: Is there enough flexibility in the future of asphalt: past, present, and future of the asphalt industry in light of the energy transition?	Morerator: Richard Taylor *Varadigm Ltd*
8:20AM	Analyzing the Petroleum Asphalt Binder Supply-Chain under Energy Transition Scenarios	Chait Bhat *Asphalt Institute*
8:45AM	A global perspective on the future of asphalt in light of the energy transition – issues, opportunities and solutions	John Read *Bentley Bitumen Ltd*
9:10AM	Q&A and Panel Discussion	
9:30AM	Break	
10:00AM	SESSION 1: Rheology, Mixture Physical Characterization, & Specifications	Morerator: Deb Mishra *Oklahoma State University*
10:00AM	Developing a specification for asphalt binders using the DSR to determine high stiffness properties in place of the BBR	Geoff Rowe *Abatech Inc.*
10:30AM	Streamlining Performance Testing Using the Asphalt Mixture Performance Tester (AMPT)	Michael Elwardany *Florida State University*

11:00AM	Novel Approach to Compare Performance of Conventional and Polymer Modified Microsurface Emulsions with a Scuffing Device	**Phillip Blankenship** *Blankenship Asphalt Tech and Training, PLLC*
11:30AM	A Review of Variations in Laboratory Performance Test Results for Asphalt Concrete: Lab/Plant/Field	**Mansour Solaimanian** *Penn State University*
11:50AM	Lunch	
1:00PM	SESSION 2: Alternative Binders	Morerator: **Michael Elwardany** *Florida State University*
1:00PM	Performance of low carbon binders made with modified biomaterials	**Mark Cannatelli** *Puma Energy*
1:30PM	Developments in Biobased Road Construction Materials at the Nottingham Transportation Engineering Centre (NTEC)	**Anand Sreeram** *University of Nottingham*
2:00PM	SESSION 3: Artificial Intelligence in Asphalt	Morerator: **Ramez Hajj** *University of Illinois*
2:00PM	AI in Asphalt Research: Reliable Predictions, Practical Applications, and Real-World Impacts	**Raj Dongre** *Dongre Laboratory Services Inc. (DLSI)*
2:30PM	Using A.I. Driven Rheology as a Tool for Designing, Analyzing and Optimizing Asphalt Emulsions	**John Casola** *Fast Formulators*
3:00PM	A Machine Learning Approach for Rheological Property Prediction of Asphalt Binders Using FTIR Data	**Tianhao Yan** *Federal Highway Administration, Turner-Fairbank Highway Research Center*
3:30PM	Break	
4:00PM	SESSION 4: Case Studies & Field Performance	Morerator: **Ann Baranov** *Infratest USA Inc.*
4:00PM	Field Feedback and Impact of Biobased Binders on Formulation Methods: The Case of Biophalt	**Flavien Geisler** *EIFFAGE*
4:30PM	Performance of Polymer-Modified Asphalt: Insights from FHWA's New Pavement Testing Facility	**Aaron Leavitt** *FHWA*
5:00PM	Poster Session with drinks and appetizers	
7:00PM	Dinner on your own	

WEDNESDAY, JULY 16

8:00AM	PARC 2025 Special Roofing Session	Moderator: **Aaron Phillips** *Asphalt Roofing Manufacturers Association*
8:00AM	Contractor Perspectives on RAS: Lessons Learned and Opportunities	**Jean-Paul Fort** *National Asphalt Pavement Association (NAPA)*
8:25AM	Deconstruction and Recycling of Post Consumer Shingles to Drive Circularity in Roofing Materials	**Shane Gillies** *Owens Corning*
8:50AM	Balancing Performance and Sustainability: LCA Insights on Polymer modified and Oxidized Roof Coating Asphalts	**Saleh Yousefi** *Crafco*
9:15AM	Pelletizing Technology Improves Recycled Asphalt Shingles for HMA	**Maure Creager** *CertainTeed*
9:40AM	Break	
10:00AM	Use of High Asphalt Content RAS Powder in Industrial Applications	**Adam Willett** *GAF*
10:25AM	Balanced Mix Design and Life Cycle Assessment of Asphalt Mixtures with Recycled Asphalt Shingles	**Suri Gatiganti** *National Center for Asphalt Technology (NCAT)*
10:50AM	Q&A and Panel Discussion	
11:20AM	SESSION 5: Asphalt Chemistry	Moderator: **Jeramie Adams** *Western Research Institute*
11:20AM	Applying Non-Aqueous Electrochemistry to Asphalt	**Robert O'Leary** *Owens Corning Science and Technology*
11:50AM	Lunch	
1:00PM	Gel Formation and Oil Exudation in Asphalt Binders: Risks, Detection Methods, and Implications for Cold-Climate Pavement Performance	**Jianmin Ma** *Queen's University*
1:30PM	Understanding the emulsification mechanism by interfacial tension: application to alternative binders	**Bérénice Tonnel** *Université Gustave Eiffel*

2:00PM	Efficient HSP Determination for Asphalt Binders Using a Three-Solvent Titration Approach	Yudi Wang *University of Illinois, Urbana-Champaign*
2:30PM	Development of an Automated FTIR Analysis Framework for Asphalt Binders Using Asymmetric Least Squares Smoothing and Deconvolution	S. Farhad Abdollahi *Genex Systems*
3:00PM	Break	
3:30PM	SESSION 6: Asphalt Additives	Moderator: Aaron Leavitt *Federal Highway Administration*
3:30PM	Genable Pavement Development of a Graphene-Polymer Composite for Asphalt Mixes	Eytan Mazor *Universal Matter Inc.*
4:00PM	Sustainable Pathways: Integrating Alberta Agriculture with Enhanced Asphalt	Brett Lambden *Cenovus Energy*
4:30PM	Investigation of the Reactivity in Epoxy Modified Asphalt for Durable Open-Graded Friction Course	Sumedha Ghattuwar *Florida State University*
5:00PM	Development and Characterization of High-Performance Polymer Modified Binders for Sustainable Asphalt Pavement	Victor Chatterjee *TotalEnergies OneTech France*
5:30PM	Dismiss, rest, and drive to Banquet Venue: *Black Fox on Welsh* *1000 Welsh Ln, Laramie, WY 82070* *Note: Attendees are encouraged to carpool to the banquet venue due to limited parking availability*	
6:00PM	Drinks and Banquet	

THURSDAY, JULY 17

8:00AM	VTAE/REOB Production, Chemistry, and Impact on Asphalt Binder	**Abdel Mekhhal** *Safety-Kleen/ Clean Harbors*
8:30AM	SESSION 7: Asphalt aging	Moderator: **Saqib Gulzar** *Colorado State University, Pueblo*
8:30AM	Effect of hydrated lime on delaying oxidation in asphalt mastics	**Ramez Hajj** *University of Illinois Urbana-Champaign*
9:00AM	An Overview of the Qualification of the Durability of Bituminous Asphalt Mixes	**Fayçal Lahjiri** *Vinci Construction SP*
9:30AM	Antioxidant benefits and potential pitfalls when blending with SBS polymer	**Jeramie Adams** *Western Research Institute*
10:00AM	Break	
10:15AM	SESSION 8: Recycling and Rejuvenation	Moderator: **Geoff Rowe** *Abatech Inc.*
10:15AM	Maximizing the Environmental Benefits of Recycled Asphalt Shingles in Stone Mastic Asphalt While Ensuring Performance through Balanced Mix Design	**Deb Mishra** *Oklahoma State University*
10:45AM	Effect of Rejuvenators on Highly Polymer Modified Asphalt Shingle Coatings that Contain Recycled Asphalt Shingles (RAS)	**Luke Henderson** *Malarkey Roofing*
11:15AM	Nonlinear viscoelastic, thixotropic, damage, and healing characterization of recycled asphalt binder blends containing recycling agents	**Saqib Gulzar** *Colorado State University Pueblo*
11:45AM	Asphalt Mix Workability Test (AMWT) – RA Optimization	**Raj Dongre** *Dongre Laboratory Services Inc.*
12:15PM	Closing remarks	
12:30PM	Box Lunch	
1:30PM	WRI tour	
2:45PM	Outdoor Hike Activity start: *Turtle Rock Trail*	

POSTER PRESENTATIONS

Poster session: Tuesday July 15th, 5PM-7PM

Author & Affiliation	Title of Poster Presentation
Geoff Rowe *Abatech Inc.*	**Application of the MSCR test to complex materials and use of simple stress dependency** *Geoffrey M. Rowe (Abatech Inc.), Alison R. Schultz (Owens Corning), Wesley G. Cooper (Asphalt Institute), Lorena Garcia Cucalon (Kraton), Gaylon Baumgardner (Ergon)*
Raj Shah *Koehler Instrument Company Inc.*	**Predicting and Mitigating Heat-Induced Deposition and Coke Formation in Asphalt Binder Refining Using Automated Flocculation Titrimetry and the WRI Coking Index** *Angelina Precilla, Raj Shah, Mojan Jafaripour , Lei Andre Delores (Koehler Instrument Company); Jeramie Adams, Yogesh Kumbargeri (Western Research Institute)*
Aaron Leavitt *FHWA*	**Simulating Asphalt Binder Aging During Mixture Production, Storage, and Hauling Through Recovered Binder Testing at Different Oven Aging Times** *Adrian Andriescu(1), Aaron Leavitt(2), Behnam Jahanagiri(1), Seyed Farhad Abdollahi(1), David J. Mensching(2) 1 Genex Systems, Turner-Fairbank Highway Research Center (TFHRC) 2 Federal Highway Administration (FHWA)*
Nitish Bastola *University of Nebraska-Lincoln*	**Efficacy of Antioxidants in Enhancing Long-term Performance of High-RAP Binders and Mixtures Modified with Triglycerides and Fatty Acids** *Nitish Bastola (University of Nebraska-Lincoln), Dr. Hamzeh Haghshenas Fatmehsari (Transportation Research Board, National Academies of Sciences, Engineering, and Medicine), and Dr. Jamilla Teixeira (University of Nebraska-Lincoln)*
Behnam Jahangiri *Genex Systems, Turner-Fairbank Highway Research Center (TFHRC)*	**Mitigating Asphalt Aging: Cracking Performance Evaluation of ZDEC-Modified Binders and Mixtures** *Behnam Jahanagiri (1), Seyed Farhad Abdollahi (1), Adrian Andriescu (1), Hamzeh Haghshenas (2), Aaron Leavitt (3), and David J. Mensching (3) 1-Genex Systems, 2-Transportation Research Board (TRB), 3-Federal Highway Administration (FHWA)*
Arthur DELABOISSIERE *Vinci Construction SP*	**Assessing Long-term Aging of Asphalt Binders: Challenges and Prospects** *Arthur Delaboissiere, Thomas Lebarbe, Frédéric Delfosse, Fayçal Lahjiri*
Szymon Malinowski *Politechnika Lubelska*	**Simultaneous foaming and enhancement of bitumen anti-ageing resistance with two-component zeolite-oxide composite** *Szymon Malinowski, Agnieszka Woszuk*

Richard Sudduth *Materials Research & Processing, LLC*	**A New Approach to Optimizing Aggregates in Asphalt - Evaluated Using Physical Properties Measured in the Goode and Lufsey Study** *Richard Sudduth*
S. Farhad Abdollahi *Genex Systems | Turner-Fairbank Highway Research Center*	**Evaluating the Rutting Performance of Asphalt Mixtures in TFHRC Pavement Testing Facility (PTF)** *S. Farhad Abdollahi (Genex Systems | TFHRC); Behnam Jahangiri (Genex Systems | TFHRC); Aaron Leavitt (FHWA); David Mensching (FHWA)*
Saqib Gulzar *Colorado State University Pueblo*	**Mapping aging dynamics across recycled asphalt binder and mixture scales containing recycling agents** *Saqib Gulzar (Former PhD Student, North Carolina State University); Jaime Preciado (Former PhD Student, North Carolina State University); Andrew Fried (Former PhD Student, North Carolina State University); Cassie Castorena (Professor, North Carolina State University); Shane Underwood (Professor, North Carolina State University); Jhony Habbouche (Western US Regional Engineer, Asphalt Institute); Ilker Boz (Research Scientist, Virginia Transportation Research Council)*
Saqib Gulzar *Colorado State University Pueblo*	**Physics-Informed Neural Networks for Enhanced Prediction of Dynamic Modulus in Asphalt Mixtures** *Hannah Grossman (Student, Colorado State University Pueblo); Saqib Gulzar (SCITT Assistant Professor, Colorado State University Pueblo); Md Rashad Islam (Associate Professor, Colorado State University Pueblo)*
Cheng-Yen Pan *Western Research Institute*	**Update on Coal to Asphalt project** *Cheng-Yen Pan, Jeramie Adams, Louis C. Muller, Ryan Miller, Yogesh Kumbargeri, Jenny Loveridge, Chris Seago, Trina Pfeiffer, Paul Behrens, Stefan Holberg, Justin Martin*
Seth Bassham *Western Research Institute*	**Innovative lignin to asphalt technology** *Seth Bassham, Jeramie Adams, Yogesh Kumbargeri*
Yogesh Kumbargeri *Western Research Institute*	**Effective characterization of recycling agents for well-performing recycled asphalt pavements** *Yogesh Kumbargeri, Jeramie Adams, Alex Literati, Didier Lesueur, Seth Bassham*

Banquet

WEDNESDAY, JULY 16 | 6-9:00PM

BLACK FOX
on Welsh

Join us at Black Fox and enjoy one of the best Laramie locations

1000 WELSH LANE | LARAMIE, WY | 82070

Catered by:

BOND'S BREWING COMPANY

ANDALE RAPIDO
FAMILY MEXICAN RESTAURANT

Note: Attendees are encouraged to carpool to the banquet venue due to limited parking availability

Better Asphalt with B2Last®

B2Last meets AASHTO M320, M332 specifications

B2Last reduces total formulation costs allowing you to bid your modified asphalt material projects more aggressively

Ongoing NCAT performance testing of B2Last is underway with multiple state DOT approvals

B2Last is manufactured in the United States at our Geismar, Louisiana site

Contact your local B2Last team today for a complimentary economic and material assessment of your asphalt binder.

www.b2last.com

BASF
We create chemistry

KEYNOTE SESSION

Is there enough flexibility in the future of asphalt: past, present, and future of the asphalt industry in light of the energy transition?

Richard Taylor:

Richard has more than thirty-five years of experience in civil engineering materials, specialising in bitumen and asphalt materials. Over the last decade he was responsible has been responsible for Shell's bitumen and asphalt research & development program and has developed, patented and launched many novel technologies for asphalt pavements during that period. Richard is an Honorary Professor at the University of Nottingham School of Civil Engineering, and a Fellow of The Institute of Asphalt Technology.

Richard has developed a significant knowledge of sustainable development, carbon accounting and circular economy. He was the chair of Eurobitume's Sustainability Steering Group from 2022-2024, and a member of the Lifecyle and EPD taskforces in Eurobitume and a member of the recent asphalt binder EPD task force of the Asphalt Institute. Richard is a Fellow of the Institute of Environmental Management and Assessment and a Chartered Environmentalist (Society for the Environment).

Chait Bhat:

Chait graduated with a Ph.D. in Civil and Environmental engineering from Michigan Technological University in Fall 2020 and is also a certified Life Cycle Assessment Practitioner by the American Center for Life Cycle Assessment. Chait is the Head of Sustainability Engineering and Research at the Asphalt Institute (AI).

As part of his work with the Asphalt Institute, Chait is currently chairing the Product Category Rule (PCR) committee which is drafting the rules to develop Environmental Product Declarations (EPDs) for asphalt binder. Chait also leads strategic sustainability efforts under the Asphalt institute Foundation. A recent example of this work is a collaboration with Wood Mackenzie on an AIF project titled "Analyzing the Petroleum Asphalt Binder Supply-Chain under Energy Transition Scenarios".

John Read:

Professor John Read has worked in the Bitumen and Sulphur Industry for nearly 40 years, initially for a consultant testing house, then for an Asphalt Supplier and more recently for Shell in various roles. He retired from Shell at the end of 2024 as the Global Head of Technology for Shell Specialities (Bitumen and Sulphur) where his principle accountabilities were directly leading a team of more than 70 technical specialists to deliver R&D and technical service to customers around the world as well as serving as a member of the Leadership Teams of the Specialities (Bitumen & Sulphur) business and the Global Commercial Technology organisation (Bitumen, Sulphur, Lubricants and Aviation). John also sat as the Subject Matter Expert on Trade Controls for the Specialities business.

Following his retirement from Shell John has set up an Industrial Bitumen manufacturing business, BituCore Inc., based in Texas and his own personal consultancy, Bentley Bitumen Ltd., where he provides expert services on bitumen, asphalt and pavement engineering.

During his career John has delivered more than 150 public presentations at conferences, Industry associations, Universities and Industry training days and has published more than 100 papers, articles and technical brochures, including the internationally renowned Shell Bitumen Handbook (5th and 6th Editions).

John has also held 2 terms as the Vice-President of Eurobitume, served as Shell's Primary Director on the Asphalt Institute (US) for 20 years and sat on the Council of the Institute of Asphalt Technology in the UK.

SPECIAL ROOFING SESSION

Aaron Phillips:

Aaron R. Phillips, ARMA Vice President of Technical Services, has been involved in the asphalt roofing industry since 1988. His career began with TAMKO Building Products LLC, where he focused on product and process development and enhancement for the first seventeen years. In 2005, he transitioned into a technical product support role, assuming departmental leadership with responsibility for technical support of all product lines in 2009. Throughout his career, Aaron has been active in various industry associations and standards development organizations, including nearly thirty years of service as a volunteer with ARMA. In 2020, he accepted a position at ARMA with responsibility for association's technical activities.

Jean-Paul Fort:

Jean-Paul Fort, Director of Pavement Engineering & Innovation at NAPA, has 30+ years in the asphalt industry. Formerly Technical Director at COLAS USA, he established and led their Technical Center. He has been involved in field operations support and technical development, from pavement preservation to large highway projects, in the US and internationally.

Shane Gillies:

Shane Gillies is an Asphalt R&D Leader for Owens Corning's Asphalt Roofing Research & Development team where his responsibilities include leading asphalt supply security and formulations to lab management to technical customer support. He is currently a member of the Asphalt Institute Roofing Technical Advisory Committee. In the 9 years that he has been with Owens Corning, Shane has been working on Shingle Recycling to find innovative solutions to the problem. Prior to Owens Corning, Shane worked for the Department of Homeland Security. He has a Master's degree in Molecular Genetics from DePaul University. He currently lives in Chicago, Illinois.

Saleh Yousefi:

Saleh Yousefi, PhD is the product development manager at Crafco, specializing in polymer modified asphalt binder and pavement preservation materials. With overall 16 years of experience in research and development through industry and academia, Saleh has led innovation in roofing coatings and development of multiple specifications in asphalt pavement preservation material such as mastic and crack sealants.

Maure Creager:

Maure Creager is a recognized leader in sustainable building materials and circular economy solutions, with over 20 years of experience in engineering, product stewardship, strategy, and business development. A registered LEED AP BD+C professional, she leverages her technical expertise and strategic vision to drive innovations in recycling asphalt shingles and paving materials. Her passion for sustainability, rooted in her South Dakota upbringing, extends into her personal life, where she enjoys outdoor adventures and supporting her daughters' activities.

Adam Willett:

Adam Willett supports the development and execution of GAF's long-term business strategies, with a particular focus on building product circularity through a robust Recycled Asphalt Shingle program and optimizing GAF's asphalt supply chain. Adam joined GAF in 2021 from McKinsey & Company, where he specialized in large-scale operations transformations. Before that, Adam spent 7 years as head chemist and technical director for a growing chemical manufacturer in Los Angeles.

Suri Gatiganti:

Dr. Suri Gatiganti is an assistant research professor at the National Center for Asphalt Technology at Auburn University, with eight years of experience in asphalt materials, pavement design, thermal modeling, and life cycle assessment. He earned his Ph.D. from Auburn University in 2021. After graduation, he worked as a postdoc fellow and research engineer at NCAT, where he was involved in research focusing on Life Cycle Assessment, sustainable pavement materials, and perpetual pavement design.

Anton Paar

Spanning the Asphalt Mix / Binder Rheology Spectrum

SmartPave Series

Performance grading according to AASHTO T315 / T350 / ASTM D7175 / D7405

Viscosity determination of asphalt binder according to AASHTO T316 / ASTM D4402

Rheological property determination of ground tire rubber (GTR) modified asphalt binders

DSR models to meet routine QC and R&D requirements as well as emerging needs for state-of-the-art asphalt and bitumen analysis

LASTRADA™:

The world's most advanced asphalt binder QC software

Proud to Be Trusted in the U.S. and Beyond

All States Materials Group

HF Sinclair

Idaho Asphalt Supply, Inc.

Interstate Testing. LLC

Mathy Construction Company

Pike Industries

Superior Bowen

Texas Materials

Walbec Group

Wiregrass Construction Co.

How Does LASTRADA™ QC Software Save You Time and Money?

Efficient QC: Integrates testing data analysis and reporting for streamlined quality control.

Instant Data: Provides real-time access to test results for quick decision-making.

Compliance: Ensures adherence to industry standards and regulations.

Centralized Data: Simplifies data management and reduces errors.

Custom Reports: Offers customizable reports to meet specific needs.

Learn More About LASTRADA™ and LASTRADA Partners

Download a complete features guide and list of tests at www.lastradapartners.com/asphalt-binder-management

Watch our How-To and Feature Demo videos. Search LASTRADA Partners on Youtube.

Visit our blog to read our contributions in AsphaltPro Magazine and Texas Asphalt Magazine.

Learn more about LASTRADA's purpose built binder testing software and quality management system.

Phone: (855) 747-8254 **Email: info@lastradapartners.com**

Kinexus Prime DSR

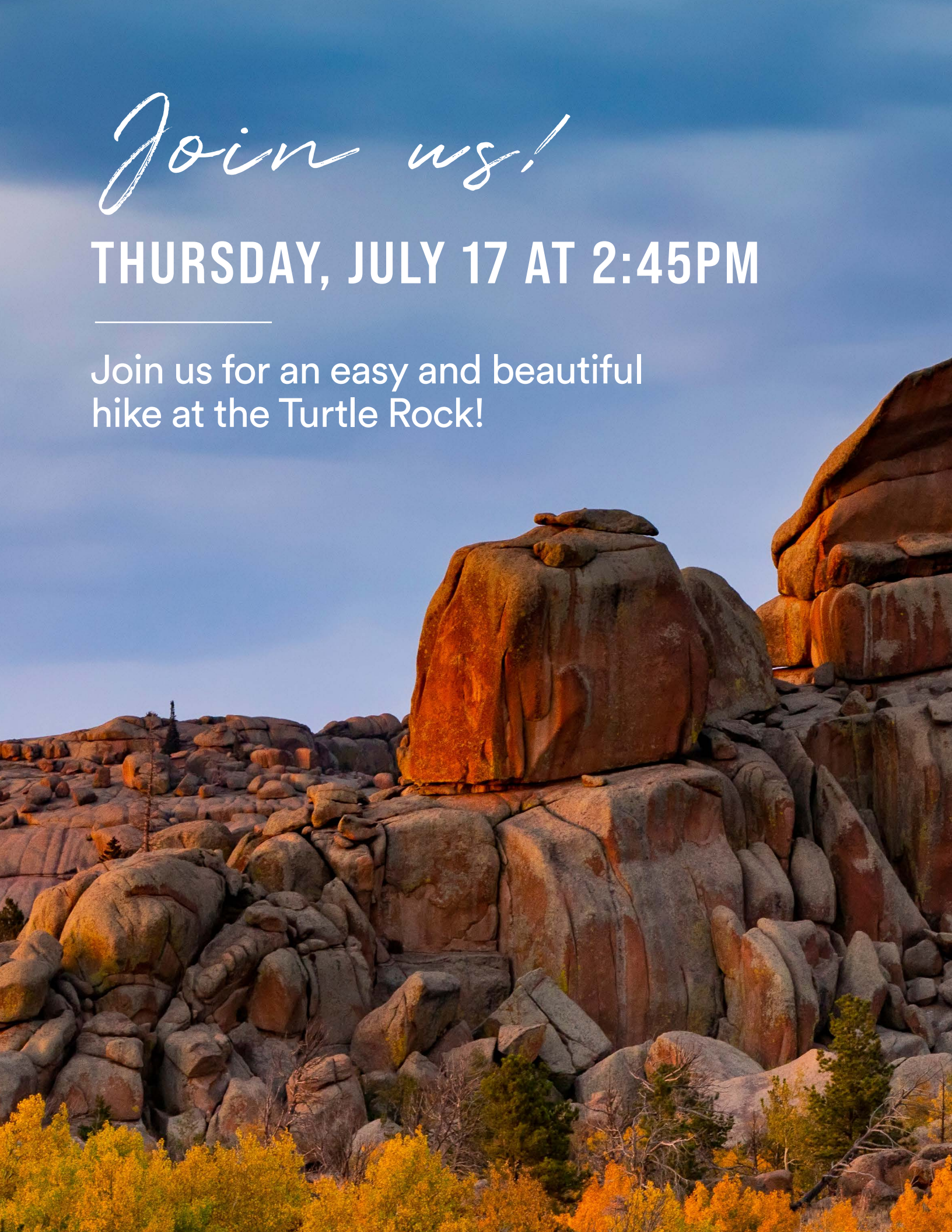
The Leader in Advanced Asphalt Analysis

Learn More:

NETZSCH

Proven Excellence.

Netzsch Instruments North America
129 Middlesex Turnpike Burlington MA 01803
1-781-272-5353


Join us!
THURSDAY, JULY 17 AT 2:45PM
Join us for an easy and beautiful hike at the Turtle Rock!

University of Wyoming

School of Energy Resources
Center for Carbon Capture and Conversion

RenuMAT
Western Research Institute

COphalt

Carbon Ore, Coal-derived Asphalt

A green alternative to petroleum-based asphalt.

Cradle-to-gate, COphalt from Powder River Basin coal emits less than 1/3 the amount of CO_2 emitted from asphalt produced from conventional crude oil.

Any CO_2 emitted can be capture for storage or usage making COphalt carbon negative.

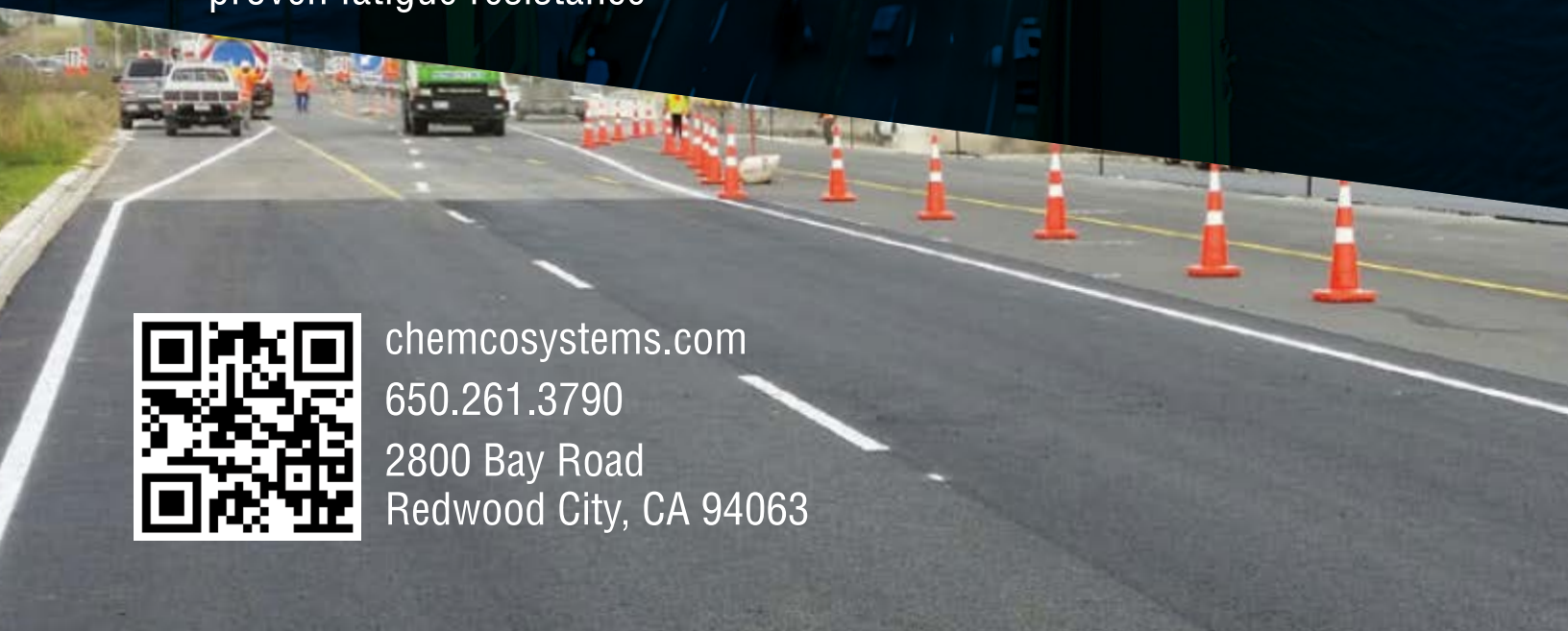
ChemCo Systems

A Legacy of Proven Expertise

EPOXY ASPHALT SOLUTIONS

That Go the Distance

- **Sustainable Innovation** – Reactive epoxy asphalt modifier made with renewable materials
- **Unmatched Durability** – Resists moisture, chemicals, and fatigue cracking
- **Stronger Bond** – Superior adhesion to aggregates and substrates
- **Extended Lifespan** – Quadruples pavement and chipseal service life
- **Bridge-Ready** – Lightweight, waterproof system with proven fatigue resistance



chemcosystems.com
650.261.3790
2800 Bay Road
Redwood City, CA 94063

ABSTRACTS

KEYNOTE SESSION: Is there enough flexibility in the future of asphalt: past, present, and future of the asphalt industry in light of the energy transition?

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

SESSION 1: Rheology, Mixture Physical Characterization, & Specifications

Developing a specification for asphalt binders using the DSR to determine high stiffness properties in place of the BBR

Speaker: Geoffrey Rowe

Authors: Geoffrey M. Rowe (Abatech Inc.) , Walaa S. Mogawer (University of Massachusetts Dartmouth) and Wes Cooper (Asphalt Institute)

Abstract: The Superpave specifications currently rely on the Bending Beam Rheometer (BBR) to determine the low-temperature performance grade of asphalt binders. Originally adapted from the plastics industry during the Strategic Highway Research Program (SHRP), BBR testing requires additional aging in the pressure aging vessel (PAV) beyond what is necessary for dynamic shear rheometer (DSR) testing. Advances in DSR technology, however, now allow for effective characterization of low-temperature properties in asphalt binders, suggesting a potential alternative to BBR for cold-temperature grading and assessment. This study analyzed over 100 asphalt binders to explore correlations between BBR and DSR data through master curve analysis, ultimately developing a simplified DSR-based procedure. This paper presents data comparisons to evaluate the DSR method as a viable surrogate for AASHTO T313, including ΔTc (delta Tc) calculations, using both a comprehensive dataset and a secondary dataset tested with the abbreviated method. This approach simplifies Superpave implementation by eliminating the need for the BBR, a valuable advantage in regions with limited testing resources. In the United States, this method also provides formulators and Departments of Transportation with a faster, more economical testing alternative, reducing both time and costs.

Streamlining Performance Testing Using the Asphalt Mixture Performance Tester (AMPT)

Speaker: Michael Elwardany

Authors: Ahmed Hassanien (Florida State University), M. Emin Kutay (Michigan State University), Poornachandra Vaddy (Michigan State University), and Rob Custer (Engineering & Software Consultants, LLC)

Abstract: Performance testing using the small cylindrical specimen geometry is a more efficient approach to test as-built asphalt layers since it could be extracted horizontally from field cores and four specimens could be extracted from the same gyratory compacted specimen (GCS) in the laboratory. Currently, four specimens with a 110-mm length and 38-mm diameter are cored from the inner 100-mm diameter of the GCS and then used for dynamic modulus |E*| and uniaxial cyclic fatigue testing. This research aims to streamline performance tests through multiple steps. Firstly, coring five instead of four specimens from the GCS would give practitioners a higher rate of success in completing dynamic modulus and fatigue tests without the need to compact additional specimens, which would be time and resource-intensive. Secondly, a technology patented by the research team will be used to streamline the uniaxial cyclic fatigue test method by using a collet-chuck clamping system on cylindrical specimens to run the test in tension, in comparison to the standard glued endplate test setup. Knowing that the standard glued specimens require the use of expensive two-part epoxy, time for epoxy curing, and introduce challenges while cutting and gluing the specimens.

Novel Approach to Compare Performance of Conventional and Polymer Modified Microsurface Emulsions with a Scuffing Device

Speaker: Phillip Blankenship

Authors: Zachary McKay, Phillip Blankenship (Blankenship Asphalt Tech and Training)

Abstract: Current performance-based mix testing of microsurface designs are limited to tests such as wet track abrasion and loaded wheel devices. This study introduces a new method using a scuff testing unit to evaluate two microsurface emulsions formulations. The objective of this evaluation was to compare the performance characteristics of conventional CSS-1HP microsurface emulsion with the eFlex brand polymer modified microsurface emulsion, with focus on curing time and resilience under scuff testing. The methodology involved conditioning samples in different environments and oven settings, followed by scuff testing using the Darmstadt Scuffing Device to simulate traffic loads. The work was performed in two phases. Phase One included external environmental curing and a 16-hour oven curing at 60°C, while Phase Two involved oven curing at 60°C for durations of 2, 8, 16, 24, and 48 hours. The samples were subjected to scuff testing under 100 N and 500 N loads, and the mass loss of each sample was measured to assess their wear resistance. The results indicated that both emulsions showed similar curing times under both environmental and oven conditions. The eFlex brand polymer modified microsurface emulsion demonstrated slightly better performance as compared to a traditional latex-modified asphalt emulsion in terms of lower substance loss during scuff testing, which may indicate better durability. However, eFlex brand emulsion may cure slightly slower than the traditional microsurfacing emulsions and which could affect the return to traffic.

A Review of Variations in Laboratory Performance Test Results for Asphalt Concrete: Lab/Plant/Field

Speaker: Mansour Solaimanian

Authors: Mansour Solaimanian (Penn State University)

Abstract: Various states are at different stages of including asphalt concrete laboratory performance testing in their specifications for mix design. Some are also considering or have included these tests in their specifications for quality control during mix production. The major challenge with these tests is establishing a reliable threshold for passing or failing the mix. Many factors contribute to this important matter including the traffic level, pavement structure, and climate. To add to this complexity is the issue of differences in results among lab produced mixes, plant produced mixes, and field cores as well as difference between long-term and short-term aged asphalt mixtures. This work presents how the results compare among three of these lab performance tests: Hamburg Wheel Tracking (HWT), Indirect Tensile Asphalt Cracking Test (IDEAL-CT), and Semi-circular bend (SCB) test. In addition, the differences between long-term aged and short-term aged materials are investigated. The study indicates large difference among the results indicating the importance of ensuring the established thresholds for each test are related to the specific type of the mix in terms of the source of production and the level of aging. This study signifies the thresholds established for one case (for example lab-produced mixes) cannot and must not be applied to the results obtained from another source (for example, plant produced mixes or field cores).

SESSION 2: Alternative Binders

Performance of low carbon binders made with modified biomaterials

Speaker: Mark Cannatelli

Authors: Mark Cannatelli (Puma Energy), Erik Denneman (Puma Energy)

Abstract: To mitigate the effects of climate change, the asphalt paving industry has been in search of alternative lower carbon footprint materials to be used in road construction. In line with these efforts, Puma Energy has developed a range of reduced greenhouse gas emission binders, marketed under the trade name CarbonBind. CarbonBind binders incorporate a plant-derived component modified using a patent-pending technology. The modified plant-derived material offers advantages,

including having a significantly higher viscosity (>100x) compared to typical bio-oils, thereby allowing for high dosage levels of this strongly carbon negative component into bituminous binders. As a result, CarbonBind binders have a markedly reduced carbon footprint compared to conventional binders. This work presents case studies comparing the product specifications of CarbonBind binders against conventional binders for both polymer-modified and normal paving grade binders. Also discussed are results from long-term environmental aging studies as well as laboratory asphalt testing. Finally, examples of the use of CarbonBind binders in field demonstrations will be presented. This work demonstrates the technical feasibility of utilizing waste plant material to generate a lower carbon solution for binders used in road construction.

Developments in Biobased Road Construction Materials at the Nottingham Transportation Engineering Centre (NTEC)

Speaker: Anand Sreeram

Authors: Anand Sreeram, Gordon Airey, Yongping Hu, Ali Alghamdi, Hebah Jahan (University of Nottingham)

Abstract: This talk presents recent advancements at the Nottingham Transportation Engineering Centre (NTEC) in developing a comprehensive analytical framework to assess biobased materials as sustainable alternatives in asphalt pavements. Asphalt, a composite of mineral aggregates and bitumen, remains the dominant material in road construction. However, its dependence on non-renewable resources raises concerns regarding cost, environmental impact, and long-term sustainability. To address these challenges, NTEC researchers are exploring renewable, bio-derived materials—such as lignin and biochar—that can partially or fully substitute bitumen in pavement applications. A key barrier to the widespread adoption of these biobased alternatives is the variability in their chemical composition, which depends heavily on feedstock source and processing methods. These variations can significantly influence the compatibility, mechanical performance, and durability of asphalt mixtures. To support the selection and optimisation of these materials, our work integrates techniques such as solubility science and other advanced material characterisation methods to evaluate the physicochemical compatibility between bitumen and biobased modifiers. In particular, the talk will highlight work on investigating chemical interactions between various additives and bitumen (and its subfractions), using Hansen Solubility Parameters (HSP). The insights gained from this approach will ultimately contribute to the design of more sustainable, high-performance asphalt systems and provide a scientific basis for the effective integration of biobased materials into road infrastructure.

SESSION 3: Artificial Intelligence in Asphalt

AI in Asphalt Research: Reliable Predictions, Practical Applications, and Real-World Impacts

Speaker: Rajendra Dongre

Authors: Raj Dongre, Ph.D. (Dongre Laboratory Services Inc. [DLSI])

Abstract: At the 61st Annual Peterson Asphalt Research Conference, we introduced Large Language Models (LLMs) such as ChatGPT, along with Physics-Informed Neural Networks (PINNs), showcasing their transformative potential for asphalt research. Building upon this foundation, our presentation at the 62nd Annual Conference explores the tangible impacts AI technologies have begun to demonstrate in the asphalt research community. We highlight significant methodological advances, including improved predictive accuracy, accelerated data analysis, and enhanced dissemination of research findings. Critically addressing concerns raised in Arvind Narayanan and Sayash Kapoor's book "AI Snake Oil," we distinguish between the limitations of AI predictions in uncertain fields—such as social, medical, or geopolitical forecasts—and the superior reliability of scientific predictions in asphalt research. Scientific predictions benefit from causal relationships and consistent historical data gathered under controlled testing and known environmental conditions, thus minimizing uncertainties related to unpredictable future events. Finally, we provide an engaging demonstration of AI Agents

transforming traditional asphalt research reports into interactive chatbots, referencing our innovative chemo-mechanics platform. This approach exemplifies how AI can practically enhance asphalt research, augment industry expertise, and facilitate effective knowledge transfer.

Using A.I. Driven Rheology as a Tool for Designing, Analyzing and Optimizing Asphalt Emulsions

Speaker: John Casola

Authors: John Casola (Fast Formulator), Dr. Samiul Amin (University of Miami)

Abstract: Designing smarter, more sustainable, tailored products simply with smart rheological testing and applied artificial intelligence (A.I.) to currently meet performance targets for many industries, including: pharmaceuticals, foods, coatings, consumer and personal care products, will be applied to asphalt emulsions. For formulators, the complexities to optimize their emulsions for both performance and stability can be challenging. Even small variations in raw materials or concentration can affect product properties from batch to batch. This presentation will discuss and show how to use rheology to provide formulators with performance properties that relate to key design characteristics to provide formulation stability. A.I. will be utilizing expert formulation science, with applied advanced characterization techniques to provide anticipated results to variations in formulation. The use of A.I. will be discussed and shown to be an invaluable tool to the formulators and quality assurance by providing insight to enhance a formulation's optimization and product stability; investigate effects of changes of ingredients or use of alternate raw materials.

A Machine Learning Approach for Rheological Property Prediction of Asphalt Binders Using FTIR Data

Speaker: Tianhao Yan

Authors: Tianhao Yan 1, Maryam S. Sakhaeifar 1, Seyed Farhad Abdollahi 2, Aaron Leavitt 1, Behnam Jahangiri 2. 1 Federal Highway Administration (FHWA), Turner-Fairbank Highway Research Center (TFHRC). 2 Genex Systems, Turner-Fairbank Highway Research Center (TFHRC)

Abstract: Please contact respective authors/presenters for more information related to abstract and content of the presentation.

SESSION 4: Case Studies & Field Performance

Field Feedback and Impact of Biobased Binders on Formulation Methods: The Case of Biophalt

Speaker: Flavien Geisler

Authors: Flavien Geisler, Simon Pouget, Florent Schrevel, Julien Van Rompu (EIFFAGE)

Abstract: Biobased binders, incorporating renewable raw materials, represent a significant step towards more sustainable road infrastructures. However, their adoption require a deep understanding

of their specific behaviours and an adaptation of traditional formulation methods. Field feedback and the impact of using biobased binders on formulation methods will be the focus, highlighting the work done on Biophalt®. The results of field experiments detailing the practical aspects of implementing Biophalt mixes are presented. Data on pavements are discussed, highlighting environmental benefits and technical challenges. Attention is given to the BioRepavation project, where formulation studies were conducted in the laboratory, and durability was tested on-site through an experiment on the fatigue carrousel at Gustave Eiffel University. Already, investigations were necessary to understand differences between laboratory- and construction site results. Retrospective field experiences have led to a revaluation of the Biophalt binder's application domain, as aging mechanisms linked to the combined action of UV, temperature, and water remain still not well understood. Practical recommendations for optimizing formulations and tests are provided, based on research results, offering insights for professionals to integrate biobased binders and promote sustainable practices.

Performance of Polymer-Modified Asphalt: Insights from FHWA's New Pavement Testing Facility

Speaker: Aaron Leavitt

Authors: Aaron Leavitt1, Behnam Jahangiri2, Adrian Andriescu2, Seyed Farhad Abdollahi2, David J. Mensching1 1 Federal Highway Administration (FHWA) 2 Genex Systems, Turner-Fairbank Highway Research Center (TFHRC)

Abstract: Please contact respective authors/presenters for more information related to abstract and content of the presentation.

PARC 2025 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 Chemistry

Applying Non-Aqueous Electrochemistry to Asphalt

Speaker: Robert OLeary

Authors: Robert J. O'Leary (Owens Corning)

Abstract: Electrochemical methods such as cyclic voltammetry are a very sensitive quantitative way to measure the redox reactivity of chemical species in a system. This information can lead to an understanding of the number and reactivity of functional groups in asphalt. This knowledge can lead to an understanding of the rheological behavior of asphalt. Most of the time electrochemistry is performed in conductive aqueous electrolytes where the compound in question is soluble in water. Asphalt is not readily soluble in aqueous systems. This renders the need for the untapped opportunity with nonaqueous electrolytic cell setup specific to this study. Additionally, aqueous systems have

relatively small limits on the potential window of study. In this study a non-aqueous electrolyte was developed that can dissolve significant amounts of asphalt and at the same time contains a stable, ionic, dissociated liquid. In this study it was found that asphalts from different sources can have a wide range of charge densities. Charge density is directly related to the number and reactivity of functional groups. In addition, the chemical mimics that were analyzed showed peak potentials that were coincidental to the peak potentials of the asphalt.

Gel Formation and Oil Exudation in Asphalt Binders: Risks, Detection Methods, and Implications for Cold-Climate Pavement Performance

Speaker: Jianmin Ma

Authors: Jianmin Ma, Jerron Zhang, Hanwalle C. Nawarathna, Simon A.M. Hesp (Queen's University)

Abstract: Gel formation and subsequent oil exudation from asphalt binders can significantly impact pavement durability. Gel-type binders, often seen with high polymer modification, oxidative aging, or reclaimed asphalt pavement (RAP) addition, lack tackiness. This can lead to premature distress in the form of stripping, raveling, moisture damage, and cracking. Current specifications, such as AASHTO M320, lack an upper limit on the grade span, inadvertently encouraging the use of highly modified binders that are inclined to gel. Simultaneously, the incorporation of oil-based compatibilizers in high RAP mixtures and high polymer systems raise concerns regarding oil exudation, potentially exacerbating adhesive failure and cracking. This study evaluates binder susceptibility to gel formation and oil exudation through extensive analysis, including Accelerated Oil Exudation (AOE) testing followed by detailed rheological assessment. A wide variety of asphalt samples sourced from the SHRP Materials Reference Library, laboratory-prepared blends, trial sections, and commercial sources were evaluated. Findings reveal that excessive polymer modification and incompatible RAP systems significantly increase gel formation and oil exudation. It is recommended that specifications include firm upper limits on grade span and assess RAP compatibility through AOE testing, thereby restoring and enhancing pavement performance and durability.

Understanding the emulsification mechanism by interfacial tension: application to alternative binders

Speaker: Bérénice Tonnel

Authors: Tonnel Bérénice (1 *), Cantot Justine (1), Gaudefroy Vincent (1), Mangiafico Salvatore (2), Sauzeat Cédric (2), Williams R. Chris (3), Chailleux Emmanuel (1) 1 Gustave Eiffel University, France, 2 ENTPE, France, 3 Department of Civil, Construction and Environmental Engineering, Iowa state university, USA, * Corresponding author

Abstract: In France, about 6% of asphalt mixes are manufactured using emulsions referred to as cold mixes, despite being an effective method to reduce energy consumption and greenhouse gas emissions compared to hot processes due to the production and placement of hot or warm mix asphalt. France aims to increase cold mix usage to 20% by 2030 to help decarbonize road construction, without compromising roadway performance and life. Additionally, some road emulsions can partially or fully replace petroleum-derived oil with plant-based products, such as tall oil resin from the paper industry and non-food sourced modified vegetable oils. However, the use of plant-based

binders is limited due to incomplete understanding of emulsion formulation, emulsification processes, and stability. To address these challenges, it is important to better understand the chemical and physical mechanisms involved in plant-based emulsion design. This research aims to elucidate the relationships between constituent properties and emulsion stability, assessed through tensiometry to determine interfacial tension between oil and water phases. Preliminary results involving various water/oil systems will be presented that further demonstrate the value and performance proposition of emulsions using plant derived molecules.

Efficient HSP Determination for Asphalt Binders Using a Three-Solvent Titration Approach

Speaker: Yudi Wang

Authors: Yudi Wang (Ramez Hajj University of Illinois, Urbana-Champaign)

Abstract: The Environmental Protection Agency (EPA) recently proposed to ban trichloroethylene (TCE), a widely used solvent in asphalt extraction and recovery. To identify TCE alternatives, Hansen Solubility Parameters (HSP) offer a promising approach for defining a three-dimensional solubility space for asphalt binders. Substances with HSP within this space are potential solvents. Traditional methods for constructing this solubility space involve testing 30–40 chemicals, which is time-consuming, costly, and poses safety risks to operators. To address these limitations, this study proposes an efficient method using only three solvents to establish the HSP sphere. The approach involves titrating three selected solvents into a binder-toluene mixture to identify fluctuation points. Two key parameters, $FRmax$ and $Cmin$, are derived from the titration results: $FRmax$ represents sphere surface point between titrant and toluene, $Cmin$ represents the ratio of distance from the titrant to the nearest sphere surface point to distance from that point to the sphere center. Using three titrants, six constraints are optimized via the least_squares method in Python to determine the sphere center and radius. This method achieves an average accuracy of over 99% compared to traditional multi-chemical approaches, significantly reducing time, cost, and safety concerns while maintaining high precision.

Development of an Automated FTIR Analysis Framework for Asphalt Binders Using Asymmetric Least Squares Smoothing and Deconvolution

Speaker: S. Farhad Abdollahi

Authors: S. Farhad Abdollahi (Genex Systems | TFHRC); Behnam Jahangiri (Genex Systems | TFHRC); Adrian Anderiescu (Genex Systems | TFHRC); Aaron Leavitt (FHWA); David Mensching (FHWA)

Abstract: Please contact respective authors/presenters for more information related to abstract and content of the presentation.

SESSION 6: Asphalt Additives

Genable Pavement Development of a Graphene-Polymer Composite for Asphalt Mixes

Speaker: Eytan Mazor

Authors: Eytan Mazor (Universal Matter Inc.)

Abstract: Graphene is a material that is 200 times stronger than steel but has properties like rubber that can stretch up to 25% of its original length. It has commercial applications across many industries, including concrete, asphalt, rubber, coatings, adhesives, lubricants and clothing. However, producing high-quality graphene on a large scale at a low cost continues to be challenging for many industries. Universal Matter Inc. (UMI) is look-ing to change that with its new patented process that utilizes various carbon-based feedstock materials, including recycled plastics and biomass. This paper will outline the product development of graphene material to its final form as a graphene-polymer composite in asphalt – a product called GenableTM Pavement. The common PGAC tests have been conducted including asphalt mix performance testing for rutting resistance, thermal cracking, and fatigue resistance that will help understand its long-term durability and performance. It will also describe field trials at the asphalt cement terminal, asphalt plant, and paving stage to better understand how the product reacts and performs to create an optimal and cost-efficient composite.

Sustainable Pathways: Integrating Alberta Agriculture with Enhanced Asphalt

Speaker: Brett Lambden

Authors: Roxanne Jenkins (Dow); Brett Lambden (Cenovus); Darren Anweiler (Cenovus) Martin Jasso (University of Calgary)

Abstract: Recent research has explored using waste plastics as plastomeric modifiers in asphalt for more sustainable pavements. Their use offers economic, environmental, and engineering benefits, but challenges include phase separation, lack of elastic properties, and increased cracking susceptibility. Only plastics with melting points below asphalt processing temperatures can be used. Reactive elastomeric terpolymers (RET) are effective compatibilizers for polyethylene-rich (PE) post-consumer recycled (PCR) plastics, addressing these issues and allowing homogenization with asphalt binder. Dow and Cenovus present findings on using post-agricultural PE-based materials in asphalt production enabled by ELVALOY™ RET. As part of Dow's Path2Zero project, Alberta's post-agricultural plastics, such as used silage and grain bags, have been utilized as asphalt feedstocks. Lab and field studies show the asphalt system with RET and post-agricultural PE met AASHTO M320 specifications. Indirect tension testing at the University of Calgary was used to determine the effect of PCR and PCR in combination with ELVALOY™ RET on low-temperature properties of the asphalt mix. This initiative upcycled approximately 13,000 kg of plastic waste, equivalent to 2.5 million grocery bags, from landfill to high-value feedstock. This asphalt project marks the first recycled polymer modified asphalt application in Alberta and one of the most extreme cold environment applications to date.

Investigation of the Reactivity in Epoxy Modified Asphalt for Durable Open-Graded Friction Course

Speaker: Sumedha Ghattuwar

Authors: Sumedha Ghattuwar (Florida State University); Michael Elwardany (Florida State University)

Abstract: Several highway agencies in various countries are interested in utilizing Open-Graded Friction Courses (OGFC) as surface layers for various safety and environmental benefits. The Epoxy-Modified Asphalt (EMA) technology is an alternative paving material that provides an opportunity to enhance the durability of OGFC. Although the use of Epoxy-Modified OGFC in New Zealand and the Netherlands has shown superior resistance to raveling, one of the major challenges for wider implementation is the lack of a comprehensive understanding of the reactivity between epoxy components and the reactive compounds in base binders. This study investigates the base-binder dependency of epoxy reactivity, effectiveness, and performance. To this end, eight SHRP Core asphalt binders from various crude sources were selected to represent different chemistry and potential reactivity with epoxy modifiers, were modified with a dosage of 10% by binder weight, and tested using dynamic shear rheometer, differential scanning calorimetry, thermogravimetric analysis, and Fourier-transform infrared spectroscopy. The proposed framework showed effectiveness in observing reactivity in EMA, optimizing epoxy dosages, and linking observations to base binder chemistry and composition from historical data on SHRP Core asphalts. This study is part of a larger effort to advance the knowledge of reactive polymers for successful implementation in the USA.

Development and Characterization of High-Performance Polymer Modified Binders for Sustainable Asphalt Pavement

Speaker: Victor Avisek Chatterjee

Authors: Victor Avisek Chatterjee (TotalEnergies Onetech, Centre de Recherche Solaize)

Abstract: This study explores the development of high-performance binders, such as polymer modified bitumen (PMB) and clear binders, with a focus on reducing their carbon footprint and enhancing durability. The research aims to design a PMB that can be effectively used with Recycled Asphalt Pavement (RAP) at high recycle rates, without compromising performance properties and aiming to reduce the carbon footprint of the product. By incorporating a higher quantity of bio-based alternatives, such as bio-based clear binders intended to reduce the Urban Heat Island (UHI) effect, the study also addresses the unique degradation mechanisms of these bio-based binders, which differ from the oxidative degradation of conventional binders. Analytical techniques are proposed to characterize these changes, and the validation of these high-performance binders is demonstrated both in laboratory settings and at worksites.

VTAE/REOB Production, Chemistry, and Impact on Asphalt Binder

Speaker: Abdel Mekhhal

Authors: Abdel Mekhhal (Safety-Kleen/Clean Harbors)

Abstract: Vacuum Tower Asphalt Extender (VTAE), also known as Re-Refined Engine Oil Bottoms (REOB), is a byproduct of used oil re-refining and has been used in asphalt applications for over four

decades. It offers a sustainable and cost-effective alternative to virgin bitumen, making its chemistry and performance impact a key consideration for asphalt binder formulation, DOT engineers, and sustainability initiatives. This topic will explore: • The VTAE/REOB production process compared to asphalt binder production • Key chemical similarities and differences between VTAE/REOB and asphalt binder • The functional performance of VTAE-modified binders, focusing on durability, aging characteristics, and ΔTc as a measure of long-term binder performance • The sustainability benefits of VTAE, including its role in reducing greenhouse gas emissions and increasing RAP/RAS content VTAE/REOB is typically used at 5%–8% in asphalt binders to enhance low-temperature performance and increase RAP/RAS content. Research confirms that VTAE: • Does not significantly alter asphalt's chemical composition or aging characteristics • Maintains binder properties within standard performance parameters • Exhibits comparable ΔTc values to polymer-modified asphalt binders As a highly refined, consistent, and non-toxic material, VTAE offers economic and environmental advantages for the asphalt industry By presenting this topic, PARC 2025 will provide attendees with valuable technical education on an important widely used material, promoting a data-driven, sustainable approach to asphalt binder modification.

SESSION 7: Asphalt aging

Effect of hydrated lime on delaying oxidation in asphalt mastics

Speaker: Ramez Hajj

Authors: Ramez Hajj (UIUC), Bibek Regmi (UIUC)

Abstract: Hydrated lime has been used in asphalt mixtures as an active mineral filler over the last few decades for several purposed, including improving the resistance of the mix to rutting, and delaying oxidation of the binder. In principle, this has been shown to relate to acid-base reactions between acidic components of asphalt binder and the basic hydrated lime particles. However, there is still a lack of modern literature relating these factors to performance and discovering at which state and conditions these properties have some effect. The present study consists of mastic- and mixture-scale studies of anti-aging performance of hydrated lime. First, mastic-level study was done using the dynamic shear rheometer and poker chip test. The testing revealed the importance of selecting appropriate test conditions and filler/binder ratios for achieving good resistance to oxidation. The next scale of testing involved mixture-scale testing using performance tests and longer-term fatigue tests. These tests demonstrate the impact of hydrated lime overall on moisture and fatigue resistance, and mixture long term aging demonstrates the extent to which hydrated lime can delay aging through its chemical interactions with asphalt binder.

An Overview of the Qualification of the Durability of Bituminous Asphalt Mixes

Speaker: Fayçal Lahjiri

Authors: Fayçal Lahjiri(Vinci Construction SP), Frédéric Delfosse (Vinci Construction SP), Arthur Delaboissiere (Vinci Construction SP), Thomas Lebarbe (Vinci Construction SP)

Abstract: One of the key challenges in evaluating bituminous materials is accurately assessing their durability. Precise Life Cycle Assessments require effective methods for measuring durability,

which depend on the type and composition of the asphalt mix, including binder thickness and volumetric parameters. Aging behaviors differ between field-aged and laboratory-aged materials. This presentation will highlight how structural and rheological properties are affected and stress the need for new laboratory tests that simulate real aging conditions, such as thermo-photooxidation and environmental factors like water. Modern asphalt mix designs are becoming increasingly sophisticated, incorporating a variety of raw materials beyond the traditional asphalt binder and aggregates. The inclusion of Reclaimed Asphalt Pavement (RAP) is widely accepted for enhancing local resources in high-performance mixes. However, several durability concerns need to be addressed, such as the quality and homogeneity of RAP stockpiles and the blending level between old and new binders. Additionally, materials like bioadditives or plastic waste are sometimes included in asphalt mixes, despite potential issues with acidity, oxidation sensitivity, or chemical compatibility with hydrophobic asphalt. This presentation will provide examples of unsuitable materials for road use that could compromise durability and discuss methods to measure it.

Antioxidant benefits and potential pitfalls when blending with SBS polymer

Speaker: Jeramie Adams

Authors: Jeramie Adams, Cheng-Yen Pan, Yogesh Kumbargeri (Western Research Institute)

Abstract: Treating asphalt with antioxidants has shown a resurgence in popularity as a way to improve asphalt durability. Recent internation interlaboratory studies have shown significant antioxidant effects are possible with well established antioxidant chemistries. These concepts are not new, as field trials with antioxidants were previously performed in the 1990s with mixed results. We have recently come to understand that the incorporation and storage of antioxidants into asphalt is important to maintaining the activity of antioxidants. In this presentation the benefits of antioxidants in asphalt will be demonstrated, along with synergies with SBS modification, and how the antioxidant can become deactivated through reactions with the asphalt binder. A chemometric approach with multiple levels of aging will be demonstrated as a holistic approach to assess the effective formulation of antioxidants in asphalt binder.

SESSION 8: Recycling and Rejuvenation

Maximizing the Environmental Benefits of Recycled Asphalt Shingles in Stone Mastic Asphalt While Ensuring Performance through Balanced Mix Design

Speaker: Deb Mishra

Authors: Gbolahan Oladiji, Adeoluwa Gbolade, and Debakanta Mishra (Oklahoma State University), Natalie Pramounmat and Courtney Rice (Owens Corning)

Abstract: Recycled Asphalt Shingles (RAS), when incorporated into asphalt mixtures, offer significant environmental benefits, including reduced greenhouse gas emissions, conservation of natural resources, and reduced landfill waste. However, inconsistent performance outcomes from past applications have led several state agencies to limit RAS use in asphalt mixtures. This study addresses

these concerns by exploring the possibility of integrating RAS into Stone Mastic Asphalt (SMA) mixes through a performance-based approach using Balanced Mix Design (BMD). Laboratory testing is being conducted to evaluate the effects of incorporating varying RAS contents (2%, 3%, and 5%) on critical mix performance metrics. Key assessments include the IDEAL Cracking Test for cracking resistance and the Hamburg Wheel Tracking Test for rutting performance. Additionally, a Life Cycle Assessment (LCA) will quantify the environmental benefits of RAS integration into SMA. This work aims to address longstanding challenges, such as increased mix stiffness and material variability, associated with RAS integration into asphalt mixtures. This paper will highlight the study findings, and will provide practical, sustainable recommendations for integrating RAS into SMA applications without adversely affecting pavement performance.

Effect of Rejuvenators on Highly Polymer Modified Asphalt Shingle Coatings that Contain Recycled Asphalt Shingles (RAS)

Speaker: Luke Henderson

Authors: Luke Henderson, Cuda Baird (Malarkey)

Abstract: Recycled Asphalt Shingle (RAS) use has become an increasingly important topic. In the asphalt roofing industry, there is a goal to reduce landfill disposal of asphalt-based roofing materials to 50% by 2035 and to approach 0% by 2050. To fully understand both the short- and long-term effects, we need to know how adding RAS impacts polymer-modified asphalt (PMA) shingle coatings. This presentation analyzes the impact of three rejuvenators on the properties of a highly polymer-modified shingle coating that contains RAS. Lab generated PMA & RAS were combined with three different rejuvenators at various dosages. The material performance was analyzed before and after 20-hour pressure aging vessel (PAV) aging, using empirical and rheological testing. Results showed that RAS predictably stiffens the PMA coating. While the rejuvenators lessened this effect, rheological evaluation revealed that the selected rejuvenators likely softened the material rather than rejuvenating it, as indicated by analysis in a Black Space diagram. A quantitative method for determining whether an isotherm indicates softening or rejuvenating will be discussed. While our tests didn't provide clear evidence that these specific rejuvenators rejuvenated the material, the stiffening effect can be counteracted by using an optimal rejuvenator dosage.

Nonlinear viscoelastic, thixotropic, damage, and healing characterization of recycled asphalt binder blends containing recycling agents

Speaker: Saqib Gulzar

Authors: Saqib Gulzar (Former PhD Student, North Carolina State University); Shane Underwood (Professor, North Carolina State University)

Abstract: In this study, the nonlinear viscoelastic, thixotropic, damage, and healing behavior of recycled asphalt binder blends containing recycling agents (RAs) is studied. The Simplified-Viscoelastic Continuum Damage (S-VECD) framework has been used to conduct these characterizations. Further, an S-VECD based healing model along with the time-temperature superposition principle is used to develop healing master curves. The impact of virgin binder and recycled asphalt binder types on the

healing performance of recycled binder blends is studied. Further, the impact of recycling agents on the healing performance is modeled. Results indicate that healing is affected by the type of virgin binder, recycled binder, and their proportions in the recycled binder blends. The use of RAs improved the healing performance across all the studied recycled binder blends. The enhanced performance of recycled binder blends can be attributed to the synergistic microstructural composition and rheological characteristics of the binders. The combination of stiff recycled binders and flexible virgin binders with RAs results in a binder blend that better balances stiffness and healing properties. These findings highlight the potential of RAs to improve pavement performance, aligning with sustainability goals and promoting the reuse of pavement materials while meeting performance requirements.

Asphalt Mix Workability Test (AMWT) – RA Optimization

Speaker: Rajendra Dongre

Authors: Raj Dongre, Ph.D.; Adrian Andriescu, Ph.D.; and Behnam Jahangiri, Ph.D. (FHWA/Genex Systems); Aaron Leavitt, M.S., David Mensching, Ph.D., and Jack Youtcheff, Ph.D. (FHWA)

Abstract: Please contact respective authors/presenters for more information related to abstract and content of the presentation.

AMAP
Association of Modified Asphalt Producers

2025 AMAP ANNUAL CONFERENCE & WORKSHOP

14-16
OCTOBER 2025

Hyatt Regency
Lexington

Join AMAP for our Annual Conference & Workshop at the Hyatt Regency Lexington in Lexington, Kentucky. This event will be a great opportunity to network with other companies and individuals in the industry, and to learn more during the educational sessions given by industry experts.

Full Details & Registration

630.403.6887
www.modifiedasphalt.org

POSTER ABSTRACTS

Application of the MSCR test to complex materials and use of simple stress dependency

Speaker: Geoffrey Rowe

Authors: Geoffrey M. Rowe (Abatech Inc.), Alison R. Schultz (Owens Corning), Wesley G. Cooper (Asphalt Institute), Lorena Garcia Cucalon (Kraton), Gaylon Baumgardner (Ergon)

Abstract: The Multi-Stress Creep and Recovery (MSCR) test was introduced around 15-years ago into specifications in the USA to better capture the performance of materials with regard to permanent deformation at high temperatures. In particular, it was noted that with certain binders, such as those modified with polymers and/or other materials, would have differing performance over a range of different stress conditions. The stress level of 3,200 Pa was selected to represent heavy tuck traffic in the USA which is generally the major cause of rutting on our highways. This value of stress has sometimes been questioned by the industry and in different values have been previously proposed over the years since implementation. The stress sensitivity of materials has been extensively discussed in rheology over the years. A simple way to examine the stress sensitive nature is to use the Ostwald-DeWaele power law, the parameters of which can be deduced from the MSCR test. This approach has been applied to test results from various products such as joint materials/sealants, highly modified binders and roofing products. The importance of non-linear behavior in the high temperature region will be discussed and the impact of understanding of parameters from this type of analysis on the extension of MSCR data.

Predicting and Mitigating Heat-Induced Deposition and Coke Formation in Asphalt Binder Refining Using Automated Flocculation Titrimetry and the WRI Coking Index

Speaker: Raj Shah

Authors: Angelina Precilla, Raj Shah, Mojan Jafaripour , Lei Andre Delores (Koehler Instrument Company); Jeramie Adams, Yogesh Kumbargeri (Western Research Institute)

Abstract: Heat-induced deposition and coke formation are significant challenges in the refining industry, particularly during thermal processes at temperatures exceeding 340 °C. These conditions trigger pyrolysis, leading to the breakdown of the solvation cell and intermediate polarity materials, resulting in fouling and operational inefficiencies. Traditional mitigation strategies, such as early distillation termination and reduced heating profiles, often lead to economic losses due to downtime. This study explores the application of the Automated Flocculation Titrimeter (AFT) as a predictive tool for coke formation, integrated with the Western Research Institute (WRI) Coking Index. The WRI Coking Index provides a quantitative measure of the proximity to coke formation, enabling refiners to optimize heating profiles and minimize fouling. By leveraging AFT data, this approach offers a proactive solution to reduce heat-induced deposition and coke formation, enhancing process efficiency and sustainability in asphalt binder production.

Simulating Asphalt Binder Aging During Mixture Production, Storage, and Hauling Through Recovered Binder Testing at Different Oven Aging Times

Speaker: Aaron Leavitt

Authors: Adrian Andriescu(1), Aaron Leavitt(2), Behnam Jahanagiri(1), Seyed Farhad Abdollahi(1), David J. Mensching(2) 1 Genex Systems, Turner-Fairbank Highway Research Center (TFHRC) 2 Federal Highway Administration (FHWA)

Abstract: Please contact respective authors/presenters for more information related to abstract and content of the presentation.

Efficacy of Antioxidants in Enhancing Long-term Performance of High-RAP Binders and Mixtures Modified with Triglycerides and Fatty Acids

Speaker: Nitish Bastola

Authors: Nitish Bastola (University of Nebraska-Lincoln), Dr. Hamzeh Haghshenas Fatmehsari (Transportation Research Board, National Academies of Sciences, Engineering, and Medicine), and Dr. Jamilla Teixeira (University of Nebraska-Lincoln)

Abstract: Concerning the oxidative aging in Triglycerides and Fatty Acids (TF) based recycling agent derived from vegetable oil, this study investigates the simultaneous use of antioxidants on TF-modified high reclaimed asphalt pavement (RAP) binders and mixtures. High-RAP binder blends were modified with five antioxidants—Zinc diethyldithiocarbamate (ZnDEC), Dilauryl thiodipropionate (DLTDP), Irganox, Lignin, and Curcumin. These antioxidants were primarily chosen based on their types (primary or secondary) and sources (chemical or plants products). Rheological tests were conducted under unaged and rolling thin film oven (RTFO) combined with pressure aging vessel (PAV) aging conditions, at high, mid, and sub-zero temperatures. Results showed that TF enhanced high-temperature rutting and mid-temperature cracking indices of asphalt binders but negatively impacted low-temperature cracking indices. ZnDEC and Irganox proved effective in preventing oxidative aging when combined with TF in high-RAP binder. At mixture level, cracking performance was evaluated using the Illinois Flexibility Index Test (I-FIT) at mid-temperature. The load-displacement relationship showed that TF softened high-RAP mixtures under short-term aging conditions of AASHTO R30, but no significant improvement in cracking resistance was observed in flexibility index. Moreover, TF's efficacy wasn't noticeable in NCHRP 09-54 long-term aged mixtures. ZnDEC demonstrated superior resistance to aging in high-RAP mixtures modified with TF.

Mitigating Asphalt Aging: Cracking Performance Evaluation of ZDEC-Modified Binders and Mixtures

Speaker: Behnam Jahangiri

Authors: Behnam Jahanagiri (1), Seyed Farhad Abdollahi (1), Adrian Andriescu (1), Hamzeh Haghshenas (2), Aaron Leavitt (3), and David J. Mensching (3) 1-Genex Systems, 2-Transportation Research Board (TRB), 3-Federal Highway Administration (FHWA)

Abstract: Please contact respective authors/presenters for more information related to abstract and content of the presentation.

Assessing Long-term Aging of Asphalt Binders: Challenges and Prospects

Speaker: Arthur Delaboissiere

Authors: Arthur Delaboissiere, Thomas Lebarbe, Frédéric Delfosse, Fayçal Lahjiri

Abstract: The lifespan of pavements is becoming increasingly important in the context of recycling with higher rates of reclaimed asphalt pavement (RAP). These recycled materials are sometimes in an advanced state of degradation and oxidation, complicating their recycling. Asphalt in the next generation of roads will largely come from the asphalt binder initially present in the pavement, meaning we must understand and control its aging to ensure good-quality resources for long-term recycling. In the laboratory, conventional long-term aging simulation tests (PAV, RILEM…) are only focus on thermo-oxidative aging, while other parameters have a significant influence in real in-situ conditions: asphalt mix design (film thickness around aggregates, binder and void content…), sunlight/UV irradiation, temperature gradient, rain, frost … This study first presents the limits of conventional long-term aging lab tests by comparing them with real in-situ samples taken from old roads. To address these limits, a new long-term aging methodology was developed in Vinci Construction Research Centre using solar simulation and water immersion. Finally, this new methodology was also applied to unconventional binders such as bio-binders. The conclusions are very different compared to conventional methods and conventional binders.

Simultaneous foaming and enhancement of bitumen anti-ageing resistance with two-component zeolite-oxide composite

Speaker: Szymon Malinowsk

Authors: Szymon Malinowski, Agnieszka Woszuk

Abstract: The bitumen ageing process is an integral phenomenon occurring during the production and usage of asphalt mixtures. In an era of increasing environmental awareness, road development trends are directed towards extending the life of pavements by inhibiting ageing processes. Therefore, a study was conducted to evaluate the ageing inhibition performance of bitumen binders by additives composed of a zeolite matrix (NaX and NaP1) and metal oxide nanoparticles (ZnO, CuO and TiO2). Therefore, a series of zeolite-oxide composites were obtained and characterised in terms of chemical and mineralogical composition and microstructure using analytical techniques, i.e. XRF, XRD, FTIR, nitrogen adsorption/desorption and SEM. The foaming process of 35/50 road asphalt was then carried out using them and the resulting foamed bitumen binders were simulated for short- and long-term ageing. The quantitative analysis of the ageing process included the determination of indices based on the measurement of penetration (according to EN 1426), softening temperature (according to EN 1427) and dynamic viscosity (according to ASTM D 4402). In parallel, the oxidation and aromatisation reactions of bitumen binder components were evaluated based on the carbonyl index, sulfoxide index and aromaticity degree determined by FTIR analysis. Founding: This research was funded by the National Centre for Research and Development of Poland grant number INNOGLOBO/I/95/NZeolOx/2022.

A New Approach to Optimizing Aggregates in Asphalt - Evaluated Using Physical Properties Measured in the Goode and Lufsey Study

Speaker: Richard Sudduth

Authors: Richard Sudduth

Abstract: The new Percent Packing Efficiency described in this study was developed from the particle packing fraction analysis included as a component of a previously published suspension viscosity model. The Percent Packing Efficiency was applied to all 24 aggregated gradations from the original Goode and Lufsey study. The Percent Packing Efficiency was found to successfully separate all 24 different gradation mixtures generated by Goode and Lufsey into five clearly defined separate groups and each group formed an approximate straight line with Gradation number. Gradation 3 within Group A did yield a maximum Percent Packing Efficiency and this gradation was also the same one identified by Goode and Lufsey as the standard for their recommended maximum density line. A property analysis of the Goode and Lufsey study data found that the minimums for the Mineral Voids and the Air Voids corresponded with the maximums for Percent Packing Efficiency as well as the maximums of the Bulk Specific Density. These results confirmed that the Percent Packing Efficiency appears to be a significant measure of the efficiency of particle packing for aggregate blends. In addition, the Percent Packing Efficiency may also be able to predict potentially unstable asphalt/aggregate applications.

Evaluating the Rutting Performance of Asphalt Mixtures in TFHRC Pavement Testing Facility (PTF)

Speaker: S. Farhad Abdollahi

Authors: S. Farhad Abdollahi (Genex Systems | TFHRC); Behnam Jahangiri (Genex Systems | TFHRC); Aaron Leavitt (FHWA); David Mensching (FHWA)

Abstract: Please contact respective authors/presenters for more information related to abstract and content of the presentation.

Mapping aging dynamics across recycled asphalt binder and mixture scales containing recycling agents

Speaker: Saqib Gulzar

Authors: Saqib Gulzar (Former PhD Student, North Carolina State University); Jaime Preciado (Former PhD Student, North Carolina State University); Andrew Fried (Former PhD Student, North Carolina State University); Cassie Castorena (Professor, North Carolina State University); Shane Underwood (Professor, North Carolina State University); Jhony Habbouche (Western US Regional Engineer, Asphalt Institute); Ilker Boz (Research Scientist, Virginia Transportation Research Council)

Abstract: This study investigates the aging dynamics and performance implications of recycled asphalt binders and mixtures containing recycling agents (RAs) through cross-scale analysis. Due to increased environmental and economic considerations, the incorporation of reclaimed asphalt

pavement (RAP) materials has become standard practice. However, their inherent aging can negatively impact pavement durability. To address this issue, RAs have been introduced to enhance ductility and mitigate stiffness. This research assesses the viscoelastic and cracking properties of recycled asphalt with RAs under controlled short- and long-term aging conditions, across the binder and mixture scales. The results reveal that while RAs initially improve performance, their effectiveness may diminish over time. The Linear Viscoelastic (LVE) aging index is shown to track aging-induced performance changes, correlating strongly with mixture cracking resistance captured by Indirect tensile cracking test. Furthermore, chemo-rheological analysis indicated a clear relationship between oxidation severity and reduced cracking resistance. This study emphasizes the importance of optimizing aging protocols to improve predictive capabilities and inform balanced mix design, paving the way for more sustainable, resilient pavement solutions.

Physics-Informed Neural Networks for Enhanced Prediction of Dynamic Modulus in Asphalt Mixtures

Speaker: Saqib Gulzar

Authors: Hannah Grossman (Student, Colorado State University Pueblo); Saqib Gulzar (SCITT Assistant Professor, Colorado State University Pueblo); Md Rashad Islam (Associate Professor, Colorado State University Pueblo)

Abstract: This study introduces a novel approach utilizing physics-informed neural networks (PiNNs) to enhance the prediction of dynamic modulus (|E*|) in asphalt mixtures. Conventional empirical prediction models, such as the Hirsch model and Witczak equation, primarily rely on mixture volumetric properties, often showing limited accuracy under varying temperatures, loading frequencies, and mixture compositions. These limitations can lead to inaccurate predictions in practical pavement engineering applications. To overcome these challenges, the presented PiNN model integrates physics-based mechanistic understanding with advanced machine learning techniques, leveraging experimental data collected across a wide range of temperatures and loading conditions. The model incorporates the time-temperature superposition principle and viscoelastic behavior, using mixture volumetric properties as input features. The PiNN model uniquely captures complex, nonlinear interactions within asphalt mixture components, improving prediction accuracy, especially under conditions poorly handled by empirical models. Preliminary findings demonstrate that the PiNN approach consistently outperforms existing predictive models like the Witczak and Hirsch equations, offering improved extrapolation capabilities beyond experimentally measured ranges.

Update on Coal to Asphalt project

Speaker: Cheng-Yen Pan

Authors: Jeramie Adams, Cheng-Yen Pan, Louis C. Muller, Ryan Miller, Yogesh Kumbargeri, Jenny Loveridge, Chris Seago, Trina Pfeiffer, Paul Behrens, Stefan Holberg, Justin Martin

Abstract: Coal-based asphalt, derived from Wyoming Powder River Basin (PRB) subbituminous coal—and renewable vegetable oil-based solvents—produces novel paving materials that have the potential for a low, or possibly negative, carbon footprint. Coal-based asphalt production is being scaled up at the university of Wyoming in a continuous pilot plant. Scale up of the process at the pilot plant will

provide the necessary information for detailed engineering that is needed for the demonstration plant which has been funded by the state of Wyoming.

Innovative lignin to asphalt technology

Speaker: Seth Bassham

Authors: Jeramie Adams, Seth Bassham, Yogesh Kumbargeri (Western Research Institute)

Abstract: Several bio-based feedstocks can be liquified with renewable bio-based solvents to produce various viscoelastic materials. These bio-based feedstocks can be lignocellulosic feedstocks which are typically difficult to valorize with a high level of conversion. Certain lignin feedstocks are readily liquified and modified in the same solvent to produce viscoelastic binders with rheological properties that are similar to a petroleum asphalt binder. The process to produce lignin based asphalt will be shown and the Black space diagram and other rheological properties will be compared to a similar grade petroleum asphalt.

Effective characterization of recycling agents for well-performing recycled asphalt pavements

Speaker: Yogesh Kumbargeri

Authors: Yogesh Kumbargeri, Jeramie Adams, Alex Literati, Didier Lesueur, Seth Bassham (Western Research Institute)

Abstract: Use of Recycled Asphalt Pavements (RAP) has been on the rise in the United States, which is not only beneficial with respect to cost savings but also to the environment. There has been lot of encouragement by industry and government for developing ways to construct pavements with high RAP and ultra-high RAP dosages. But to achieve this objective, recycling agents (RA) need to be added to the mix. Recycling agents help restore the maltene fractions, mitigate effects of the increase in asphaltenes in RAP and enable the longevity of the pavements. Given the rising demand and growth forecast of the Recycling Agents (RA) market, different types of RAs are being introduced, encompassing various sources and chemistries. Not all RAs are created equal and there need to be "blind" and effective approaches of evaluating and comparing these RAs, especially with respect to long-term aging performance. WRI has developed a toolkit to effectively evaluate the performance of recycling agents for asphalt pavements. It consists of a holistic approach linking fundamental asphalt chemistry related aspects to physical, rheological and performance related parameters which help evaluate the effectiveness of a particular RA, with special focus on long-term aging performance. This approach consists of parameters developed from chemical methods such as SAR-AD as well as a mix of traditional and newer rheological (easy to compute) parameters from DSR. The approach not only includes characterization of the RAP+RA blends but also an appropriate diagnosis of the aging trajectory of the RA material by itself.

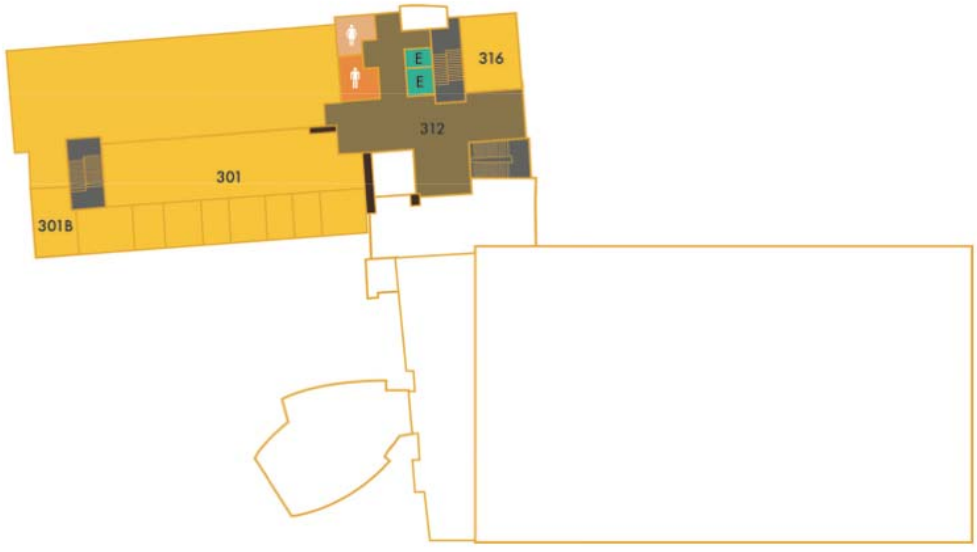
MARIAN H. ROCHELLE
GATEWAY CENTER

1ST FLOOR

101 - Alumni Offices
107 - Blalock Family Room
116 - Tomé Student Admissions Center
120 - Facility Manager
122 - Cowboy Call Center
132 - Cline President's Room
134 - Event Center
135 - McMurry Foundation UW Legacy Hall

2ND FLOOR

203 - Boyd Conference Room
212 - Hartman Reception Area
216 - Rile Training Center
217 - Walters Corporate Reception Area
219 - Dyekman Conference Room
222-231 - Career Recruiting Rooms
232 - First Interstate Bank Conference Room



3RD FLOOR

301 - UW Foundation Offices
301B - Clay Conference Room
312 - Mendicino Reception Area
316 - Guthrie Conference Room

- Stairs
- Elevators

Western Research
INSTITUTE

From lab-scale to pilot units

RenuMAT
Renewable Upcycling Materials &
Asphalt Technologies

- Team specialized in lab-scale chemistry
- **Hydrocarbons beyond combustion** (products: asphalt binders, additives, mesophase pitch, carbon fibers… / feedstocks: coal, oil refining by-products, wastes…), **waste upcycling & circular economy** (asphalt, plastics, composites, biomass,…), **formulation, analytical chemistry & rheology**

SET
Sustainable Emerging Technologies

- Team specialized in pilot-scale units
- **Hydrocarbon beyond combustion, waste upcycling, refining/distillation, oil partial upgrading & Solvent DeAsphalting (SDA), catalyst development/testing, pilot/demonstration-scale plants**

Engineering

Research

Chemistry

To learn more, scan this code!

www.westernresearch.org