

STAR *symposium* REPORT

MAY 16-18, 2022

Atlanta, Georgia



STRATEGIC ASPHALT RESEARCH SYMPOSIUM REPORT

May 16-18, 2022
Atlanta, Georgia

The mission of the Asphalt Institute Foundation is to conduct strategic research and educational activities that are designed to advance and improve the liquid asphalt industry.

Printed in USA
ISBN 978-0-9996238-1-7
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INTRODUCTION

This document represents the report of the Asphalt Institute Foundation (AIF) STAR Symposium held May 16-18, 2022, in Atlanta, Georgia at the Hotel Midtown. The 2022 STAR Symposium was originally slated for May 2021, but as it was intended to host an international audience, it was delayed in light of the global health situation at the time. It was the second event of its name/type with the inaugural event taking place in May 2017.

Recognizing the importance of interaction in the breakout sessions, the number of participants was intentionally limited by making the symposium an invited event. The initial round of nominations was opened in 2020 with the option of self-nomination or nomination of one or more other individuals. After the decision to postpone the symposium until 2022 the nomination portal was re-opened in 2021. The AIF STAR Symposium Task Force met late in 2021 and prioritized the initial invitation list from the nominees.

Approximately 100 people were invited to attend the symposium representing diversity in geography (North America, Europe, Asia), career experience, principal job responsibilities, and employment sector relative to the asphalt industry (i.e., agency, industry, association, end-user).

The main elements of the symposium were the breakout sessions where attendees could share their ideas on four general topics: Human Needs (Workforce Development), Environmental Sustainability, Performance (Durability), and Economics (Infrastructure Policy And Funding). Each topic was introduced through a presentation by expert speakers. The presentation set the stage for the following breakout session.

In each breakout session, there were six separate discussion spaces in which the participants could share thoughts on a specific subtopic of the general topic. Participation followed the World Café model in which participants discussed, in order, problems, root causes, goals, and strategies – rotating to another discussion space after a set time. The last rotation of each high-level topic was an exercise for the participants to prioritize goals and strategies. A professional facilitation team assisted the participants in reaching the prioritized list for each subtopic.

The content generated during the breakout sessions was captured using a digital whiteboard collaboration system called MURAL. AIF staff members served as the scribes at each discussion space recording ideas from participants on the digital whiteboard using color-coded “sticky notes” to represent notes on problems (gray), root causes (red), goals (blue), and strategies (orange). Comments (yellow) could also be added.

The body of this report is focused on the breakout sessions with approximately one page devoted to each subtopic within each of the high-level topics. The information presented in these pages represents the participant-prioritized ideas. The color scheme is maintained from the digital whiteboard with the prioritized goals and strategies identified by blue and orange headers, respectively.

The prioritized goals and strategies are not the only great ideas that were generated; they may just not have been seen by the participants as the top focus for the asphalt industry. All the ideas generated were preserved in the MURAL and are available in the supplement to this report.



This second STrategic Asphalt Research Symposium (STAR) continued the Foundation's commitment to identifying and building solutions for the betterment of the asphalt binder industry's future.

A MESSAGE FROM THE 2022 AIF CHAIR

This second STrategic Asphalt Research Symposium (STAR) continued the Foundation's commitment to identifying and building solutions for the betterment of the asphalt binder industry's future. Following the lofty achievements of the first STAR held in Colorado Springs in 2017, this Atlanta-based event incorporated design elements to improve idea collaboration and development.

The global COVID-19 pandemic caused us to delay the STAR one year until May of 2022 and our STAR Task Force used the time wisely to advance our preparation efforts. I want to thank Steve Buckner of Flint Hills Resources – our TF Chair as well as the entire TF for their work to plan and execute an event of this magnitude. This event is like no other in our industry.

While we readily identify and conduct research to solve near to mid-range problems, there is no

other forum in which strategic industry issues are identified and addressed. This is the whole purpose of the STAR, and our invited participants, representing a global diversity of perspectives from all facets of the industry all contributed to the dialog. The enthusiasm, energy, and excitement of all present was in itself inspiring.

The Foundation is committed to taking the results of this STAR and

using them as further catalysts to identify needed research for our industry. This is the critical part of the journey, and one that holds a bright promise. We are making progress towards that future.

Our STAR Symposium and report sponsors deserve a special word of thanks. Their financial contributions enabled us to deliver a top-quality event which supported the participant's commitment to contribute their insights for a successful STAR. We could not have delivered to the degree we did without their help. Thank you.

The STAR Symposium is the seminal event for the Foundation and the work of our committees through their volunteers and that of our committee leadership was instrumental in our success as well. The degree to which all rallied to ensure its success cannot be overstated. Thank you for your hard work.

Many of us find the discussion themes from the STAR infectious – unleashing a collaborative energy that is remarkable. We'll have another STAR Symposium to be sure. Until then, let's put our energy and efforts into working on our ultimate goal – a bright future for the asphalt binder industry.

HAROLD (CHIP) RAY

Chair
Asphalt Institute Foundation





A MESSAGE FROM THE 2022 STAR SYMPOSIUM CHAIR

I am greatly honored and humbled to have participated in the second STAR Symposium in May 2022 as the Symposium Chair. I previously served as the Asphalt Institute Foundation Chair and participated in the May 2017 STAR Symposium in that capacity.

This symposium is a unique opportunity in the asphalt industry where innovative, passionate industry experts from around the world gather together with the challenge of defining key long term, over the horizon, strategic needs of the industry and identify the knowledge and research gaps the Asphalt Institute Foundation should pursue in order to meet those strategic needs.



Many participants represented decades of asphalt experience while others were fresher faces to the industry. All joined in active, facilitated conversation sharing and debating to capture the strategic challenges and further the work from the inaugural STAR.

The strategic challenges to the asphalt industry are varied, significant, and changing in dynamic fashion. For the industry to remain successful and to thrive well into the future, it needs the combined focus and vision that the STAR Symposium delivers. It is critical to join forces every few years

to rethink and redirect strategic research based on the evolving needs of our world and the unique roles asphalt products play.

I would like to congratulate the 2022 STAR Symposium participants for being chosen to represent the asphalt industry at this important, prestigious event and for sharing your guidance on the industry's strategic needs. In doing so, each of you are a valued asset to the industry beyond measure. The Asphalt Institute Foundation will use the results to continue pursuing important strategic research that will add value to the industry in the decades to come.

I applaud the Asphalt Institute Foundation Board of Directors, the STAR Symposium Task Force, and AI staff for your vision and dedication to successfully deliver this one of kind, impactful event. Job well done!

A handwritten signature in black ink that reads "Ralph Shirts". The signature is fluid and cursive, with the first and last names being more prominent.

RALPH SHIRTS

2022 Strategic Asphalt Research Symposium Chair
ExxonMobil - Retired
Asphalt Institute Emeritus



STAR SYMPOSIUM KEYNOTE



JEFF DEGRAFF

Professor, Ross School of Business, University of Michigan

Jeff's teaching, research and writing focuses on leading innovation and creativity. Called the "Dean of Innovation" because of his influence on the field, Jeff's life mission is to democratize innovation. He is co-author of several books, written syndicated columns for popular magazines, has been the host of national PBS program, and an NPR segment. He has consulted with hundreds of the world's most prominent organizations at the most senior levels to help them successfully build innovation competencies, cultures, and ecosystems. Dr. DeGraff founded a leading innovation institute, Innovatrium. You can learn more about Jeff at jeffdegraff.com/.

Jeff DeGraff, Professor at the Ross School of Business at the University of Michigan, delivered the Strategic Asphalt Research Symposium's keynote address. Aptly heralded as the "Dean of Innovation" DeGraff launched his rapid-fire opening with examples of successful enterprises which appeared to succeed as they were gaining market share. A saddle-maker continued to gain market share in a declining market as the industrial revolution transformed mobility at the turn of the 20th century. What happened to the print film industry?

Jeff asserted that innovation creates a positive tension. This isn't bad, in fact it is essential for innovation to occur. The opposite is apathy.

Innovation is a form of deviance from the norm and a result of constructive conflict.

Two key elements in innovation are magnitude and momentum. With greater magnitude, the risk goes up while momentum or speed indicates the pace of change.

DeGraff introduced the topic of how the very people we need in our innovation circles have opted out – a changing of the guard if you will. While there are a lot of attributable factors for this, we can overcome single-mindset

thinking by being deliberate in how we innovate. How we innovate is what we'll innovate.

If you start with a vision, perhaps a radical idea, and apply an innovation framework called the Innovation Code, you can successfully innovate. The Code recognizes four forces of innovation across three levels; universal – where we have little ability to influence, the communal – our organization or team, and the personal level. At a personal level, the four forces form four dominant worldviews including 1) sage, 2) engineer, 3) athlete, and 4) artist. Each brings attributes to the innovation process and through effective synthesis, we can create even better hybrid solutions to our problems.

DeGraff noted that the US is an event driven culture, for example, 9-11, and not a policy driven one. He also feels that innovation moves from the outside in, a down-cycle phenomenon, noting that the seeds of our undoing occur at the pinnacle of success, think GM in the 1970's.

He left us with the urge to teach people how to think, not what to think. Focus on speed to scale for your ideas, and importantly, listen and respect all while challenging ideas.



SYMPOSIUM SESSIONS & WORLD CAFÉ

The focus of the symposium was on the breakout sessions where a free-flowing exchange of ideas was promoted. To achieve this the professional facilitation team suggested that the participants follow a process known as “World Café.” In this model, the same process was followed for each of the four general topics: Human Needs (Workforce Development), Environmental Sustainability, Performance (Durability), and Economics (Infrastructure Policy And Funding).

Each topic was first introduced through a presentation by expert speakers. The presentation set the stage for the following breakout session which followed.

Participants started at one of six discussion areas in which specific subtopics related to the high-level topic would be discussed. The session started with one of the participants designated as the “keeper”, whose job was to identify the subtopic and start the group discussing the subtopic’s **problem** – what is/are the underlying problem(s) or issue(s)? As ideas were shared, the “scribe” (an AIF staff member) recorded the ideas and comments using a digital whiteboard collaboration system called MURAL that appeared on a large display for all attendees in the discussion space to see.

After approximately 15 minutes, the facilitation team called for a rotation. All participants in a discussion space, except for the keeper and scribe, then moved to a different discussion space to provide input on a different subtopic and its **root causes** – what are the challenges the asphalt industry must address and what is its impact? The keeper from the previous rotation stayed to brief the incoming participants on the subtopic **problems** identified by the previous group. A new keeper was then identified

who would stay and brief the next group in a similar manner. The scribe stayed in their discussion space to serve as a recorder and maintain continuity between rotations.

The rotations continued after approximately 15 minutes when the participants moved to a different discussion space to provide input on a different subtopic and its **goals** – what does the asphalt industry want to achieve in the longer term?

After the discussion of goals, the participants rotated again to a different discussion space to provide input on a different subtopic and its **strategies** – how does the asphalt industry achieve the longer term goals?

After the final rotation, participants were asked to prioritize **goals** and **strategies**. The professional facilitation team assisted the participants in reaching the prioritized list for each subtopic. The top 1-3 **goals** and 3-5 **strategies** were then elevated to be a focus of the high-level topic.

The purpose of the World Café process was to:

- Allow participants to have a conversation in smaller groups about the subtopic. This permits maximum participation with all participants having an equal opportunity to share ideas. The nature of the process discourages one or two outspoken individuals from dominating the discussion.
- Encourage “anything goes” innovation in discussions.
- Promote cross-pollination of ideas. Problems identified by one discussion group could spark ideas for goals by another discussion group and strategies by yet another discussion group.
- Encourage participants to focus on the subtopic and innovation, discovering what is possible.



Dr. Richard Willis, National Asphalt Pavement Association (NAPA), started the discussion on human needs by sharing what NAPA had been doing recently to assist its members and the asphalt industry in developing its workforce. Recruiting and retention were identified as challenges for almost 75% of members. The main problem is one of perception by the general public and educators in understanding what the asphalt industry is and what opportunities are available for those interested in being a part of the industry. The challenge is to change the perception of the asphalt industry as a dangerous, dirty, labor-intensive industry relying on old technology. Key messaging has helped to improve that perception by focusing on finances – financial security, growth/opportunity, diversity/equal pay, career without college debt – as well as innovation, safety, and the chance to contribute to the community. Ongoing efforts are needed as the challenges of workforce development continue.

HUMAN NEEDS (WORKFORCE DEVELOPMENT)

The challenge of attracting and retaining excellent employees is shared by all businesses and has been magnified as a consequence of the recent global health situation. The asphalt industry must adapt to the workforce that is available, learning how to improve the work environment for its current employees to increase the likelihood of retention and growth, while addressing initiatives needed to attract and retain a diverse workforce in the future. This breakout session addressed five subtopics, described below, and included an “Other” category to allow the STAR attendees to expand on thoughts that may not have been addressed as part of the subtopic discussions.

ADAPTING TO THE WORKFORCE

- How can the industry adapt to the modern and evolving workforce that is available?

NEEDED SKILLS

- What new skills or expertise will the asphalt industry need to address the challenges, technologies, and innovations of the future?

WORKPLACE ENVIRONMENT

- How can the asphalt industry improve the workplace environment for employees to increase the likelihood of retention and growth?

WORKFORCE DIVERSITY

- What does diversity include in the workplace? What steps are needed to attract and retain a diverse workforce in the future?

WORKPLACE AUTOMATION

- What role will automation have in the industry and how will that impact the human workforce?

The following are some recurring themes for goals that appeared to emerge from the breakout session discussion:

- We need to promote generational and cultural diversity in our workforce.
 - Better corporate culture and societal perception can be achieved through diversity and inclusivity
- We want to provide employees with a safe, flexible work environment.
 - Providing a safe work environment that recognizes the need for flexibility in work schedules and training opportunities is important for attracting future employees and retaining valuable current employees
- We want to prudently use automation to help employees diversify their skills.

The following subsections recap the discussion that ensued for each of the subtopics, highlighting these goals as well as other goals and strategies.

ADAPTING TO THE WORKFORCE

How can the industry adapt to the modern and evolving workforce that is available?

Problems

- Asphalt industry image is not appealing to the younger generation compared to other industries causing struggle to recruit new talent
- Asphalt industry is perceived as “low-tech” creating challenge for recruiting talent
- Evolving expectations of new workforce that prioritizes more flexibility, better benefits, and a defined career path
- Poor job of communicating opportunities and benefits of working in the asphalt industry

Root Causes

- Asphalt industry has done a poor job at advertising available jobs/positions and most people view them as tough and/or dirty jobs
- Failing to attract younger people and therefore we are not targeting the right people
- Older employees, for fear of job security, can be reluctant to mentor new employees
- Asphalt industry needs a better mechanism for knowledge transfer between experienced staff and new employees
- Expectations and demands for entry-level jobs have substantially evolved from past



Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – We will tailor our message to our future employees to recruit the best-talented workforce
- **GOAL 2** – Improve onsite working conditions through better communication and creating a flexible working environment

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Share the vision of where current and future employees can be in ten years with a defined career path
- Implement an employee recognition plan to make them feel valued
- Increase employee diversity training

STRATEGIES to ACHIEVE GOAL 2

- To ensure that we recruit and retain the best talent, our industry will allow for the option of a four-day work week, not a mandatory 9 a.m. – 5 p.m. job, therefore increasing flexible workplace options compared to what other industries offer
- To boost morale, companies should have a pool of employees so that they are not running lean
- Implement a cross-generational employee training program to foster better communication and understanding in the workplace

NEEDED SKILLS

What new skills or expertise will the asphalt industry need to address the challenges, technologies and innovations of the future?

Problems

- Lack of big picture perspective on the overall objective
- Lack of prediction capability for future skill sets
- Lack of mindset to highlight green Initiatives
- Missing remediation to fulfill fundamental gaps

Root Causes

- Lack of flexible work schedule
- Profitability prioritized over employee interest
- Non-Attractive overall packages (insurance, family inclusive benefits)
- No competitive pay

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Attract young and future audience
- **GOAL 2** – Move towards automation and innovative technology
- **GOAL 3** – Adaptable/Flexible work environment

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Organize workshops to listen to young audiences
- Education program about career starting at a young age

STRATEGIES to ACHIEVE GOAL 2

- Form a consortium focused on future workforce skills with new technology

STRATEGIES to ACHIEVE GOAL 3

- Develop mentoring program within industry to promote vertical education



WORKPLACE ENVIRONMENT

How can the asphalt industry improve the workplace environment for its employees to increase the likelihood of retention and growth?

Problems

- The workplace environment does not accommodate the modern family
- The workplace environment can be unsafe for our workers
- Corporate/industry culture has not adapted to an increasingly diverse workforce

Root Causes

- The cost of making changes to the work zone in a low bid environment
- The stress of the work, which often includes long hours, rigid timing, and night work
- The demands to keep traffic moving through a work zone
- The attitude of the public that sees work zones as an annoyance
- Older management that maintains status quo and resists change



Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Increase the pool of applicants by creating a safe, comfortable, convenient work environment
- **GOAL 2** – Provide opportunities for a career with workforce policies and diversity in balance with the population

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Provide cooling stations / water / toilet / rest areas in work zones with women in mind.
- Multilingual signs / paperwork
- Leverage technology toward employee safety
- Have cool room to operate equipment remotely
- Develop mechanical aids (e.g. exoskeleton) for physical activities
- Create virtual gaming tool to teach construction tools – make it fun

STRATEGIES to ACHIEVE GOAL 2

- Create employee-driven continuous improvement program
- Create a leadership development platform for future leadership
- Intentionally communicate with workforce to identify issues with work environment
- Better publicly celebrate successes

WORKFORCE DIVERSITY

*What does diversity include in the workplace?
What steps are needed to attract and retain a diverse workforce in the future?*

Problems

- The asphalt industry suffers from lack of diversity in our industry (An example of this is generational gap – too many old folks, not enough youth)
- Our industry does not do enough to expose potential applicants to what we do, resulting in a lack of interest and available applicants
- There is a perceived lack of balance in our current workforce demographics

Root Causes

- The younger generation has a negative bias about our industry from stereotypes
- Too many companies in our industry have a fixed mindset on hiring practices

- Poor outreach in recruitment of workers to the asphalt industry and lack of social media engagement

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Develop a playbook around more diverse workforce - be flexible
- **GOAL 2** – Display the value of our industry to society
- **GOAL 3** – Develop hybrid (in-person/virtual) academic/trade programming dedicated to our industry





Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Benchmark against competing industries so we can recruit
- Find trusted messengers to reach target audience
- Define diversity to understand who we are trying to reach
- Adopt a practical approach to diversity
- Match benefits to incoming generation expectations
- Outreach programs

STRATEGIES to ACHIEVE GOAL 2

- Craft a message of value to the community to improve our image
- Promote the value of the industry to the community

STRATEGIES to ACHIEVE GOAL 3

- Create both academic and trade oriented curriculum - integrated to reach more people
- Deploy grass roots efforts to reach the young
- Recruit in new areas to reach a more diverse audience
- Internships and active training to build a path forward
- Use all modes (classroom, lab, field)

“Adapting to a dynamic operating environment will be a continuing challenge for the asphalt industry. Associated Asphalt, along with other industry leaders, is committed to identifying and developing the best and brightest talent for the asphalt industry. New and diverse leadership is constantly emerging and will be foundational in shaping our future with the STAR Report representing an excellent resource.”

JOHN JANES

CEO & President, Associated Asphalt



WORKPLACE AUTOMATION

What role will automation have in the industry and how will that impact the human workforce?

Problems

- Lack of certainty related to the benefits of automation
- Lack of workforce expertise to support automation
- Challenges with acceptance of automation by employees
- Cost of implementation of automation and the quality of automation unknown

Root Causes

- With new technology there's usually a lack of experience initially
- Degree/possibility of automation is bigger than we know
- Technology doesn't exist everywhere or for everyone
- Stipulations inhibit innovation
- Unknown cost to invest in the technology needed for automation
- Lack of integration of other disciplines (i.e., IT, chemical engineering, robotics, etc.)



Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Attract young and future audience
- **GOAL 2** – Move towards automation and innovative technology
- **GOAL 3** – Develop an adaptable/flexible work environment

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Organize workshops to listen to young audiences and their career/life goals
- Develop educational programs about careers in the asphalt industry targeting youth

STRATEGIES to ACHIEVE GOAL 2

- Form a consortium focused on future workforce skills with new technology

STRATEGIES to ACHIEVE GOAL 3

- Develop training program within the industry to promote vertical education

OTHER HUMAN NEEDS

Problems

- Society in general does not understand what the asphalt industry does - jobs in the field are perceived as “low tech” and unappealing
- The asphalt industry suffers from a homogeneous culture and lack of awareness of how a more diverse cultural work force would be beneficial
- Job conditions (i.e., night work) and family responsibilities (i.e., paternity/maternity leave, daycare) can lead to increased stress and mental health challenges

Root Causes

- Asphalt industry does not have a good strategy to recruit against the “low tech” perception
- Generational and cultural disconnect between management and production workers that leads to a less inclusive workspace
- Work zone traffic restrictions are established by the owners with the principal goals being less traffic in the work zone for safety and mitigation of user delays

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Have fewer people exposed within a work zone on the road
- **GOAL 2** – Create a positive perception of the asphalt industry
- **GOAL 3** – Create an industry that appeals to the next generation of workers that is part of a global solution, more inclusive, with a less toxic corporate culture

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Develop automation to improve the safety of asphalt industry workers
- Use advances in automation to expose fewer people to the dangers of an active work zone. Collaborate with the automated vehicle community to partner on minimizing risk

STRATEGIES to ACHIEVE GOAL 2

- Improve the safety and health of asphalt industry workers
- For all asphalt industry workers, establish strict rules on healthy shift times and sequences
- Lower operating temperatures for asphalt mixtures – producing real warm mixes – and roofs to reduce worker exposure to asphalt products at elevated temperatures
- Specific to roads, work with user agencies to change their established position on work zones to allow for full-lane, daytime closures

STRATEGIES to ACHIEVE GOAL 3

- Understand the perception of society about the asphalt industry
- Define the impact of the asphalt industry on society and develop a strategy to educate and promote the industry

The concept of sustainable materials includes more than just a focus on the environmental impact of the product, but that is often a key consideration for producers and users. The topic was the subject of much discussion at the 2017 STAR Symposium, leading to an AIF-funded research project.

Dr. Steve Muench, University of Washington and the Principal Investigator of the research, and Dr. Ben Ciavola, Trisight Engineering and research partner, presented their findings and set the stage for the breakout session. The focus of the research was to define and articulate sustainability as a strategic direction for the asphalt industry such that it can address the topic in a proactive manner that results in better understanding, thoughtful execution of impactful sustainability research/marketing/work, and actions that contribute to the long-term sustainability of the liquid asphalt industry.

ENVIRONMENTAL SUSTAINABILITY

Achieving a sustainable future for the asphalt industry depends in part on engaging the principles of sustainable materials management, which includes materials, manufacturing/distribution, usage/performance, and end-of-life management. Considering the global movement toward a circular economy, the STAR attendees were challenged to understand the environmental sustainability of asphalt products and how the asphalt industry should be positioned so that asphalt materials are preferentially selected for use in pavements and roofing. This breakout session addressed five subtopics, described below, and included an “Other” category additional ideas that may not have been addressed as part of the subtopic discussions.

NET NEUTRAL CARBON

- In a circular economy, what is needed for asphalt to achieve a net neutral carbon footprint and be positioned for preferential use in pavements and roofing?

IMPACT OF ADDITIVES

- What role will asphalt additives and modifiers play in the future and how might they affect the environmental impact of asphalt materials?

RECYCLED MATERIALS

- How will the use of recycled materials impact the sustainability of asphalt used in paving and roofing?

COOL ROOFS/COMMUNITIES

- How can asphalt be best positioned for use in the future in locations where initiatives such as cool roofs/cool communities may be active?

EMISSIONS AND ODORS

- What can be done to reduce or eliminate emissions and odor from asphalt products to make it less noticeable?

The following are some recurring themes for goals that appeared to emerge from the breakout session discussion:

- The asphalt community needs a better understanding of PCR (Product Category Rule), EPD (Environmental Product Declaration), and LCA (Life Cycle Assessment) for asphalt products.
 - A single set of PCRs will assist with better carbon accounting for the industry.
- Asphalt roads and roofs will be used to harness energy and capture carbon dioxide (CO₂).
- Better understanding of recycled materials and their impacts on performance will lead to greater use.
 - Equal or better performance is needed.
 - Roads can be built using 100% recycled materials that never leave the job site, thus eliminating transportation impacts.

The following subsections recap the discussion that ensued for each of the subtopics, highlighting these goals as well as other goals and strategies.

NET NEUTRAL CARBON

In a circular economy, what is needed for asphalt to achieve a net neutral carbon footprint and be positioned for preferential use in pavements and roofing?

Problems

- Production of asphalt needs intensive energy (specifically from fossil fuels)
- Climate change considered a political topic and not completely accepted
- Different objectives throughout the supply chain irrespective of geography
- Lack of standardized definition of Net Neutral Carbon
- Lack of comprehensive scope (e.g., full life cycle of a pavement)

Root Causes

- Perception of industry that production requires hydrocarbons
- Lack of clear and simple path to net zero
- Sustainability is not a priority for pavement owners and industry
- Perception that reducing carbon will affect business
- Use of high carbon energy sources

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Develop/Adapt “Low-Carbon” commercially viable technologies: Path similar to low carbon fuel standards
- **GOAL 2** – Specifications for performance aligned with specifications for net zero: data science integration for scalability
- **GOAL 3** – Create one set of product category rules/carbon accounting rules for the industry

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Reduce energy consumption through production processes to reduce carbon
- FHWA incentives to lower carbon emissions
- Innovate and implement cold technology with equal performance
- Collaborate with universities/research institutes/external stakeholders to develop long lasting binders, carbon capture sequestration

STRATEGIES to ACHIEVE GOAL 2

- Increase service life of end product
- Create sustainability tools to assess and choose best solution

STRATEGIES to ACHIEVE GOAL 3

- Collaborate with supply chain stakeholders across the globe to develop PCR/carbon accounting standards

IMPACT OF ADDITIVES

What role will asphalt additives and modifiers play in the future and how might they affect the environmental impact of asphalt materials?

Problems

- The proprietary nature of many additives
- The lack of product category rules (PCR) and full, transparent life cycle assessment (LCA) data
- Unknown potential impacts of additives on recyclability
- Limited use of additives by DOTs to improve sustainability through improved performance

Root Causes

- The propriety nature of the additive industry
- Agencies not used to quantifying long-term performance for better understanding of the benefits
- No established programs to look at additives from cradle to grave
- Lack of coordination between suppliers on PCRs
- A negative, prior experience with an additive tends to inhibit future use/trials of any additive

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Educate and incentivize DOTs to use additives in asphalt
- **GOAL 2** – Perform real cradle to grave analysis to create clear PCRs for developing EPDs
- **GOAL 3** – Develop new testing that is blind to modification

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Provide education on life cycle considerations on procurement and proper use of additives to create more informed policy and technology decisions
- Look at countries that have established performance or LCA-based incentives for procurement to bring environmental impact into bidding decisions

STRATEGIES to ACHIEVE GOAL 2

- Find a way to develop additive PCRs
- Develop whole-pavement life cycle tools and implement them to quantify unintended and intended negative and positive consequences.

STRATEGIES to ACHIEVE GOAL 3

- Develop a suitable method and equipment to evaluate additive performance, sustainability, and health and safety on a laboratory scale, that simulates field performance
- Identify environmental and other co-benefits of making and producing additives where applicable to identify additional opportunities for new additives and to communicate full life cycle

RECYCLED MATERIALS

How will the use of recycled materials impact the sustainability of asphalt used in paving and roofing?

Problems

- Poor performance and high variability associated with using high amounts of recycled material will hold back this practice
- Public perception is more recycled content is better, with disregard to how it hinders performance
- Legislative mandates, before a technology is ready for



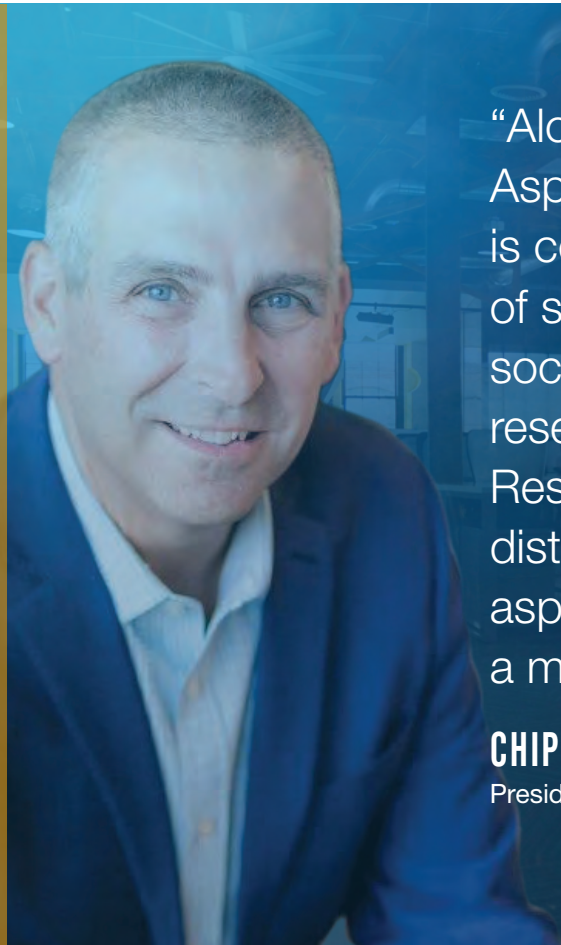
implementation, is a real concern.

- We saw this in the early 1990s with the federal mandate on using crumb tire rubber, before it was ultimately rescinded

- False perception that all recycled material is the same. For instance, recycled asphalt shingles from tear offs has much more aged binder compared to recycled asphalt pavement
- Lack of clarity by agencies on HSE implications of using secondary materials

Root Causes

- Too many failed roads with recycled material
- System should be more innovation friendly and allow failure as means of learning – lack of tracking performance well on these recycled sections
- Recycling driven by environmental pressures with disregard to performance will ultimately hinder progress of utilizing recycled materials in a truly sustainable way



“Alongside our industry partners at The Asphalt Institute, Asphalt Materials, Inc. is committed to supporting all three pillars of sustainable infrastructure — economic, social and environmental. From our research and development at The Heritage Research Group to the manufacturing and distribution of our products, we believe asphalt plays an important role in creating a more sustainable future.”

CHIP RAY

President, Asphalt Materials, Inc.

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Equal or improved performance with recycled material
- **GOAL 2** – Increased use of 100% recycled materials where materials never leave jobsite
- **GOAL 3** – Develop tests, tools, requirements to assess the full life cycle impact with new technologies

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Make pavements/shingles last longer with recycled material for improved performance
- Develop true performance tests blind to recycled materials
- Recognize high performing recycled material applications
- Build roads to last 50 years

STRATEGIES to ACHIEVE GOAL 2

- Work with equipment manufacturers to improve 100% RAP
- FHWA policy: use recycled material first (EEE) to increase use
- Decrease paving train of CIR to make it smaller and more agile

STRATEGIES to ACHIEVE GOAL 3

- Create insurance to allow failures
- Implement technology to track and inventory in-place recycled material to track performance
- Change NCHRP research approach to focus on production, construction, and implementation



COOL ROOFS / COMMUNITIES

How can asphalt be best positioned for use in the future in locations where initiatives such as cool roofs/cool communities may be active?

Problems

- Asphalt is black – it absorbs heat, but we don't understand our impact to heat island effect
- We don't have cool roads
- Cool roofs initiatives only in Southern California – need to expand use
- Energy collected by roofs/roads are not captured for other purposes
- People don't understand the benefits of asphalt roofs over alternatives
- Asphalt shingles aren't currently recyclable

Root Causes

- Lack of regulations and incentives to make cool roofs/roads
- Insufficient advertising of value of solutions and lack of public acceptance/awareness
- Roads are public and homes are private in terms of energy
- We are refusing to make change without incentives
- We're not engineering to reduce heat island effect
- We assume asphalt must be black



Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Have environmentally friendly roofs and roads
- **GOAL 2** – Communities will understand the total science, benefits, and value of cool communities
- **GOAL 3** – Harness the energy from roofs and roads

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Educate and market environmental benefits of asphalt roofs and roads
- Work with urban planners to design communities

STRATEGIES to ACHIEVE GOAL 2

- Develop a roof and road to capture CO₂ out of the atmosphere
- Pursue sustainability research funding – engage with academia

STRATEGIES to ACHIEVE GOAL 3

- Develop a road or roof energy capture system and use it in a beneficial way

EMISSIONS AND ODORS

What can be done to reduce or eliminate emissions and odor from asphalt products to make it less noticeable?

Problems

- Perception that smells cause health issues leading to a negative visual perception of our industry
- What are the emissions from our products doing to the environment from an air quality perspective - particulate, NOx and SOx, etc?
- No technology developed to control emissions from the field, however, emissions from manufacturing can be controlled with technology
- Poor job as an industry educating the public and failure to deliver clear, concise messaging about our operations/products
- Emissions and odors are and will continue to impact our business

Root Causes

- Emissions that can be seen are not solely attributed to our industry, heavy trucks are big emitters, and these are not involved in asphalt production - emissions capture technology is expensive
- Asphalt industry is asking for high product temperature at delivery due to “old school mentality” of higher temperatures yielding better products; compounding the issue is the current product specifications cause/allow high temperatures – higher temperatures are correlated with more emissions
- To be competitive, companies are continuing to use the same assets when there are more fuel-efficient options available
- We don’t know why our products smell
- Plants run hot which causes emissions and the vapors coming off are unconfined

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Our industry should use fact/science-based research to educate politicians and address community concerns
- **GOAL 2** – Improve technology at plants to reduce emissions and odors

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Our industry needs to compare our products to materials that people might more commonly use to alleviate environmental concerns, perhaps smaller/mobile plants in communities would also appease neighborhood activists
- Assess using technology from other industries in our industry to see if this will help
- We need to educate our lobbyists and raise roads higher on the political agenda

STRATEGIES to ACHIEVE GOAL 2

- Focus on making our industry proactive versus reactive and incentivize the end user to reduce odor and low temperature to ensure that our products meet certain emissions standards.
- Using alternative energy sources to heat our products would make our industry cleaner/green

OTHER ENVIRONMENTAL SUSTAINABILITY

Problems

- Low bid system in use in the United States does not allow the asphalt industry to consider the full life cycle of an asphalt road
- Lack of performance related specifications that are implemented in asphalt paving and roofing
- No viable aging test for asphalt roofing products, making assessment of performance difficult
- Asphalt roads and roofs are collectors of pollutants that can impact water quality (i.e., runoff)
- Lack of uniformity in EPD standards

Root Causes

- General lack of education in the asphalt community on PCR (Product Category Rule), EPD (Environmental Product Declaration), and LCA (Life Cycle Assessment)
- Lack of a consistent performance definition
- Insufficient funding to consistently address performance problems



Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – The asphalt industry is incentivized to advance environmental sustainability
- **GOAL 2** – Asphalt products are used to collect carbon dioxide from the atmosphere
- **GOAL 3** – The asphalt community (industry, user agencies) fully understands Life Cycle Assessment (LCA) and implements it uniformly. The asphalt community achieves a consensus definition of performance and becomes a trusted partner with the user agencies.

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Develop and implement a monetary system for carbon sustainability to incentivize asphalt industry change

STRATEGIES to ACHIEVE GOAL 2

- Develop systems to capture and utilize CO₂
- Drive carbon negative industry

STRATEGIES to ACHIEVE GOAL 3

- Develop unified approach on sustainability offering proactive messaging and implementation that drives social and political agendas

An important topic discussed extensively at the 2017 STAR Symposium, ultimately leading to another AIF-funded research project, was the durability of asphalt materials and their performance in roads and roofs. Dr. Hilde Soenen, Nynas, and Mr. Hanyu Zhang, Aston University, presented their findings from research designed to develop methodologies to evaluate asphalt durability over a much longer time scale (than current specification systems), without prior knowledge of composition and ingredients. The expectation is that the research findings will lead to a next-generation practical and implementable specification which predicts long-term performance of asphalt binder in pavements. The presentation by Dr. Soenen and Mr. Zhang helped prepare the attendees to discuss the goals and strategies needed to address the durability of asphalt materials.

PERFORMANCE (DURABILITY)

Once asphalt roads and roofs are built, they need to perform well through their expected service life to provide maximum value to the taxpayer or owner. This breakout session addressed five subtopics, described below, and included an “Other” category to allow the STAR attendees to expand on thoughts that may not have been addressed as part of the subtopic discussions.

PERFORMANCE REQUIREMENTS

- What do we need to understand to anticipate the increasing requirements of road and roof performance?

PERFORMANCE DRIVERS

- What are the drivers that will impact performance needs in the future?

RECYCLED MATERIALS

- How will recycled materials be effectively used to meet performance requirements?

FUTURE USE

- How will roads and roofs be used in the next thirty years? How can we position asphalt as a product of choice for performance in the future?

PREDICTIVE TESTING

- What methods will provide true performance predictive tests of road or roof extended life cycle? How can we advocate agencies to accept them for the durability benefits?

Although the focus of each subtopic was different, some consistent goals seemed to emerge from the breakout session discussion:

- We want to improve durability and achieve longer lasting asphalt roads and roofs.
 - Considering the impacts of aging is critical to improving the chances for durability and longer life.
 - Considering durability during the design phase of the asphalt pavement – not just in the materials selection – is important.
- We want to achieve a true circular economy for asphalt roads and roofs.
 - It is important to select proper materials and achieve durability, but also to have end-of-life plans for asphalt roads and roofs that will allow them to be used again in new installations.
- We want to promote industry innovation toward achieving performance while minimizing stakeholder risk.
 - Specifications that are material and process-based rather than truly performance-based often stifle innovation and breakthroughs in achieving long lasting performance.

The following subsections recap the discussion that ensued for each of the subtopics, highlighting these goals as well as other goals and strategies.

PERFORMANCE REQUIREMENTS

What do we need to understand to anticipate the increasing requirements of road and roof performance?

Problems

- There are no performance requirements for asphalt used in roofing
- Roofing warranty periods do not match the actual life cycle
- Laboratory tests are not necessarily reflective of field performance
- Geographic variability affects performance
- In the low bid system, there is little incentive to exceed minimum specifications
- Base quality and poor construction practices have greater influence on performance than proper mix design

Root Causes

- Focusing on cost over finished product performance
- Low bid system doesn't prioritize or verify performance
- Budget-based pavement thickness design
- Market-driven specifications
- Outdated specifications and specification creep

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Develop procurement methods to enable innovation that leads to better performance
- **GOAL 2** – Have roofing warranty periods that match actual life cycle
- **GOAL 3** – Move toward performance-based specifications and away from prescriptive specs

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Change all traditional bids to alternative procurement to allow innovation
- Create an environment that promotes innovation / greater risk tolerance by owner
- Allow flexible performance requirements to easily make adjustments
- Collaborate with other industries that will impact future traffic technologies (autonomous vehicles, smart cities, truck only toll roads, etc.)

STRATEGIES to ACHIEVE GOAL 2

- Develop a consumer product scale for shingles that predicts longevity

STRATEGIES to ACHIEVE GOAL 3

- Use and/or fund build-operate-maintain-transfer projects
- Develop performance and engineering requirements to address climate change and future traffic loadings and patterns

PERFORMANCE DRIVERS

What are the drivers that will impact performance needs in the future?

Problems

- Some additives age poorly or cause the binder/mixture to age poorly
- Specifically, some asphalt rejuvenators provide benefits that are short lived
- Waste materials can detrimentally affect performance, especially around durability
- Compatibility issues with some additives
- Shingle science is slow to advance

Root Causes

- The low bid system hinders performance and innovation
 - Why strive for better performance when you are not rewarded for exceeding the minimum specification requirements?

- Roofing manufacturers do not have an incentive to create a longer lasting shingle
- Asphalt binder ages, so when we keep recycling the binder in mixes, brittle mixes are produced
- Asphalt does not drive the refinery like the other lighter by-products

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Create flexible procurement system that includes all stakeholders and factors (economic, environmental, social)
- **GOAL 2** – Create additives and treatments that reduce aging
- **GOAL 3** – Build for future mobility



“Roofing performance demands will continue to be at the forefront of the asphalt shingle industry. Malarkey Roofing Products has a long history of leadership in roofing product performance and continues to innovate newer, long-lasting solutions. These priorities are echoed in the STAR Report and reaffirm our commitment to quality, sustainability, and performance.”

EILEEN DUTTON

Vice President, Product – Malarkey Roofing Products



Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Performance based bids, including incentives for long term performance
- Widespread acceptance on new user fee system
- Model performance spec adoption from successful examples
- Build accountability in procurement
- Explore different road ownership models (i.e., private)

STRATEGIES to ACHIEVE GOAL 2

- Relate performance of mix to binder parameters
- Identify testing conditions for pavement distress causes

STRATEGIES to ACHIEVE GOAL 3

- Design and evaluation system that accommodates future materials and user needs for mobility
- Build sensors into the road environment
- Segregate trucks and cars
- Figure out electric charge on the fly
- Make future binders more compatible for sensors



RECYCLED MATERIALS

How will recycled materials be effectively used to meet performance requirements?

Problems

- New approaches/tests must be developed to simulate how materials age and evaluate new materials performance properties
- Number of times we re-re-recycle these materials
- We don't understand our real impact on sustainability (i.e., GWP of various materials)
- We need to improve in-place recycling technologies
- DOTs control how much RAP and RAS can be recycled
- Asphalt mix production plants need to be optimized to recycle more

Root Causes

- Receiving, handling, and processing of recycled materials are not controlled
- Consistency of materials is unknown
- Lack of knowledge of materials, how they age, and compatibility of different materials
- Lack of measurement systems
- Low risk tolerance of owners – prescriptive regulations with no incentive for them to change
- Evolution of our production plants can't keep up with recycling needs
- Society pressure to do it now and long term

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Maximum flexibility to innovate while reducing agency risk
- **GOAL 2** – Communities will understand the total science, benefits, and value of cool communities

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Educate DOTs and help them develop specifications that include reliable predictive tests
- Quantify the percentage of RAP binder available to be part of an asphalt mix (Is RAP a black rock?)
- Define test procedures better to characterize recycled materials to make agencies more comfortable

STRATEGIES to ACHIEVE GOAL 2

- Develop economic upcycling opportunities for recycled materials
- Design for recyclability and incentivize with pay
- Set waste diversion goals – eliminate entire waste streams long term
- Partner with insurance carriers to acquire recycled materials
- Develop cradle-to-cradle strategies
- Use RAP and RAS to upgrade unpaved roads

FUTURE USE

How will roads & roofs be used in the next 30 years? How can we position asphalt as a product of choice for performance in the future?

Problems

- Future needs in connected highways and smart cities are changing so we need to determine how these needs will tie into roadways and if there will be a need/demand for roads and/or asphalt
- Trend seems to be that oil companies should become “greener” which has industry wide implications
- More will be expected of asphalt pavement such as incorporating stormwater management and electric vehicle charging capabilities – might impact the industry and how we design pavements
- The younger generation seems to be driving less so as an industry we will have to determine how our future roads be used as funding is possibly reduced
- Will there be a use for asphalt roads/highways if systems like the hyperloop are built?

- As we are shifting to greener more renewable fuels it seems like more solar energy will be used, will this be incorporated into asphalt shingles?

Root Causes

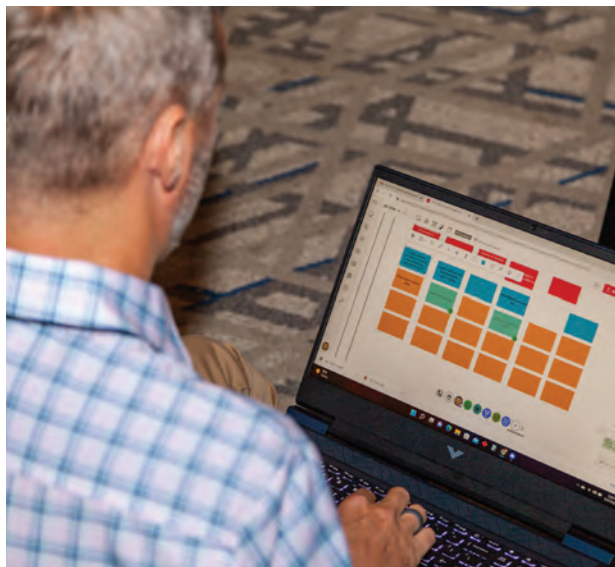
- The future generation drives less, therefore this could impact future funding for roads
- There is a lack of research funding to develop a newer asphalt or a new asphalt technology which makes our products cost-effective for future use
- Functionality of pavement ownership is siloed between different organizations
- Delivery system is geared for vehicles, not multifunctional pavements i.e. stormwater, etc.
- In an urban environment the trend seems to be to use roofs for roof gardens, therefore as roofs get smaller asphalt substitutes to get more affordable.



“Ergon Asphalt & Emulsions, Inc. plays a part in the asphalt industry by providing innovative binders that produce reliable pavements. The Star Symposium Report provides valuable information that will advance binders producing sustainable, long-lasting pavements. This is the ultimate definition of performance.”

PATRICK NATION

Senior Vice President
Ergon Asphalt & Emulsions, Inc.



Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Roads are built for autonomous vehicles and incorporate self-driving car technology to use roads optimally
- **GOAL 2** – Design a new low-carbon asphalt and use asphalt as a feedstock for new applications outside of paving and roofing

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Form new partnerships and engage stakeholders from the autonomous vehicle industry, this will help us understand what the autonomous vehicle industry needs when designing and building roads

STRATEGIES to ACHIEVE GOAL 2

- Fund new research to create a newer more cost-effective asphalt
- Develop a mechanism of technology transfer between other industries to develop new products

PREDICTIVE TESTING

What methods will provide true performance predictive tests of road or roof extended life cycle? How can we advocate agencies to accept them for the durability benefits?

Problems

- Predictive testing not universally accepted
- Failure to define performance with acceptable accuracy
- Aging not characterized properly
- Material properties not translated to pavement properties and the effects of construction
- Rely on lab specimens, jump to simplest surrogate

Root Causes

- Lack of Industry wide co-operation/agreement on standard testing
- Large datasets required are time-consuming and expensive to create
- Doubts around adequacy of existing predictive models
- Lack of communication between lab and field personnel
- Working in silos and non-availability of consistent data

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Pavements should last 100% longer
- **GOAL 2** – Real Time data collection, mining, and interpretation for the entire operation cycle through automation/an aggregated open-source publicly available model and data: materials, construction, monitoring
- **GOAL 3** – Knowledgeable personnel understanding the entire process

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Develop new predictive tests that evaluates performance after the placement
- Create tools to predict pavement service life
- Develop systems/promote/review for site investigation

STRATEGIES to ACHIEVE GOAL 2

- Collaborating with asset management team collaboration with global set of road owners, industry, academia for next generation testing
- Establish data governance standards: Promote altruistic, trustworthy and transparent data science models to predict performance

STRATEGIES to ACHIEVE GOAL 3

- Training and collaboration to ensure consistent results from all parties

OTHER PERFORMANCE

Problems

- How do we specify and bid for performance and set minimum acceptable criteria for performance?
- Current system provides incentives that do not necessarily drive quality and performance
- Need user agencies to understand and care about durability and impact on life cycle cost
- Challenge to maintain durability with finite amounts of quality local resources causing potential conflict between performance and environmental sustainability

Root Causes

- Operating in a low cost/low bid environment for asphalt pavements
- Reactive rather than proactive mindset to design of asphalt pavements
- Understanding of performance requires time and money that agencies do not have to monitor, measure, and follow-up on projects

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Maximize the flexibility for producers to innovate while minimizing the risk to user agencies and end users
- **GOAL 2** – Achieve a true circular economy for asphalt roofs and roads



Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Educate user agencies and help them develop specifications that use reliable predictive tests
- Settle the issue of whether recycled materials should be considered “black rock” or if they substantially combine with the virgin asphalt binder
- Define test procedures and properties to better characterize recycled materials, improving the knowledge and comfort level of user agencies

STRATEGIES to ACHIEVE GOAL 2

- Develop economic upcycling opportunities for recycled materials
- Encourage producers to design for recyclability and offer pay incentives for those efforts
- Set waste diversion goals with the long-term goal of completely eliminating entire waste streams
- Partner with home and business insurance carriers to acquire recycled materials for reuse
- Develop cradle-to-cradle strategies for asphalt materials
- Use RAP and RAS as a means to upgrade unpaved roads

Mr. Tony Kriech, Heritage Research Group, was the final speaker of the STAR Symposium, providing perspective on how the asphalt industry has changed over the course of the last 50 years and the challenges facing the industry in the future. Tony discussed how infrastructure impacted economy, noting that the economic strength of a country is built around how well goods and services are moved in an efficient, low-cost manner. In the United States roads are not currently funded appropriately to maintain their performance. As reliance on gas and diesel changes, a new funding mechanism will be needed that doesn't rely solely on gas/diesel tax money to build and maintain roads. He concluded by noting that the breakout session would be challenging, requiring the attendees to be innovative in their thinking.

ECONOMICS (INFRASTRUCTURE POLICY AND FUNDING)

Asphalt roads and roofs are vital parts of our nation's infrastructure. Policy can direct how capital is expended to build and maintain infrastructure, while funding is needed to ensure those policies can be implemented. Policy decisions are increasingly influenced by societal issues and a desire to use all resources in a sustainable manner. The discussion in this breakout session addressed five subtopics, described below, and included an "Other" category to allow attendees to generate and discuss ideas that may not have been addressed as part of the subtopic discussions.

INCENTIVIZE INNOVATION

- How might the asphalt industry influence policies in the future to incentivize innovation (i.e., moving towards performance-based specifications)?

ADVOCACY

- How do we anticipate and participate as a stakeholder in policy actions that could legislate the use of recycled materials or processes to meet environmental/societal goals without considering future recyclability or HSE impacts on roads and roofs?

INCENTIVIZE SUSTAINABILITY

- What best practices incentivize adoption of sustainable technologies in low bid contracting? What has been and can be learned from implementing incentives using LCA/EPD savings?

EDUCATE DECISION MAKERS

- How can we better educate legislators, their staffs, asset owners, and the public on the importance of preservation of our infrastructure assets (e.g., roads, roofs)?

BEST PRACTICES

- What creative funding, bidding or construction practices could benefit how our infrastructure is built and maintained to produce better performing long term products?

The following are some recurring themes that appeared to emerge from the breakout session discussions:

- Communication to industry stakeholders and the general public is critical to the future of the asphalt industry.
 - The general public needs to understand the impact that infrastructure can have on economic stability and how the asphalt industry fills that need.
 - Improved communication through a unified message creates transparency and trust.
- Innovation allows for improved performance, sustainability, and safety.
 - The culture of sustainability needs to be as ingrained in the asphalt industry as the culture of safety.
 - Performance and sustainability should both be integral parts of the decision in awarding contracts.

INCENTIVIZE INNOVATION

How might the asphalt industry influence policies in the future to incentivize innovation (i.e., moving towards performance-based specifications)?

Problems

- DOTs are risk adverse and have no playbook for innovation
- DOTs won't use any other contractual process other than low bid
- Contractual limitations around long-term bonding prevents more long-term warranties
- Our industry lacks a stated vision for innovation
- No conversation between industry and DOTs around the topic of innovation
- Financial risk for all parties around innovation (For agencies, there can be higher cost and perhaps undesirable results) (For industry, there are investment costs that may not be recouped)

Root Causes

- Specs are written around recipe and meeting minimum criteria
- DOTs are driven by low cost and meeting specs, performance is not part of the decision process
- There is no incentive or payback for innovation or for exceeding minimum spec limits
- At times, a lack of trust between interested parties holds back innovation
- Not enough of our industry is knowledgeable about real innovation
- The agencies (buyer) specify significantly less quality level than what the industry can produce

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – In the future, performance should be primary part of contracting documents
- **GOAL 2** – Innovation as a core value and expectation, with recognition and rewards

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Work with AASHTO leaders and FHWA to include performance in contracting methods
- Move toward more true performance parameters in specs
- Fund implementation of innovative research
- Create more value engineering opportunities

STRATEGIES to ACHIEVE GOAL 2

- Create culture of recognizing failure as part of innovation
- Build lease model where government leases land and contractor owns the road
- Determine how to change DOT culture of being risk adverse
- Have innovation included in DOT job descriptions



ADVOCACY

How do we anticipate and participate as a stakeholder in policy actions that could legislate the use of recycled materials or processes to meet environmental/societal goals without considering future recyclability or HSE impacts on roads and roofs?

Problems

- Lack of advocacy due to legal issues, and there's a reluctance to advocate
- Legislature often favors donors, not public needs
- Entire asphalt industry needs to deliver the same message, but one message doesn't fit everyone's needs
- Too focused on looking back instead of looking forward - We must be proactive
- We wait for the science because we need data, but time is not on our side
- Low-bid environment doesn't allow asphalt industry to shine

Root Causes

- Our broader industry doesn't want change because of cost and risk
- We don't communicate to the public in language they understand
- We are not proactive
- Public lacks basic knowledge about roads/ infrastructure and take it for granted unless there is a problem
- We need alignment on message between the different associations
- We've put ourselves in a "non-lobbying" box and leave advocacy to associations only



Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – General public that understands the impact of infrastructure on economic stability.
- **GOAL 2** – Provide unified message in the appropriate language that resonates with the various groups.

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Have more "asphalt days" with unified message to the public
- Asphalt Institute create an outreach position
- Public education on pavement distresses (i.e., potholes)
- Develop a strategy for educating the decision makers
- Gather a database of good roads to highlight to the public

STRATEGIES to ACHIEVE GOAL 2

- Social media campaign to promote asphalt industry
- Create a www.asphaltsustainability.com to share the messages
- Highlight asphalt industry successes using universities and high-profile individuals
- YouTube, TikTok, Instagram
- TV show about road construction

INCENTIVIZE SUSTAINABILITY

What best practices incentivize adoption of sustainable technologies in low bid contracting? What has been and can be learned from implementing incentives using LCA/EPD savings?

Problems

- Sustainability/EPDs not a priority in a low-bid system/specifications
- Goals within sustainability not specifically defined, value not defined properly
- Government/political standpoint preventing sustainability funding
- Lack of consensus on measuring carbon/sustainability metrics
- No standardized data model/format to quantify sustainability

Root Causes

- Industry stuck in its own paradigms - Looking backwards not proactive/ Lack of personal ownership
- Misconception on being green inversely related to cost
- No unified front from both top-down and bottom-up within the industry leading to zero implementation
- Politics around sustainability are sensitive to political climate
- Lack of accountability around sustainability

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Sustainability culture is as strong as safety culture
- **GOAL 2** – All tenders include sustainability value component that can determine awarding of contract
- **GOAL 3** – Industry sustainability vision clearly defined

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Create a coalition to develop strategies and advocate for changes in decision making

STRATEGIES to ACHIEVE GOAL 2

- Establish a validation program for sustainability

STRATEGIES to ACHIEVE GOAL 3

- Create a coalition to develop strategies and advocate for changes in decision making
- Create and share clear message defined by trade associations, adapt the message to the audience



EDUCATE DECISION MAKERS

How can we better educate legislators and their staff, asset owners, and the public on the importance of preservation of our infrastructure assets (e.g., roads, roofs)?

Problems

- Total infrastructure budget is pushing for other transportation options and therefore our industry is not considered a priority by legislators
- Gas tax and pavement funding are shifting from budgets to use elsewhere
- Competing products are doing a better job with greater sustainability claims, therefore, favoring their products versus products developed by our industry
- Decision makers are not fully educated on the effect their decisions have on the pavement network and the true cost of not properly funding asphalt pavements can have catastrophic consequences.
- Need to increase lobbying efforts (political education is important) and local lobbying needed to improve and build better relationships
- Asphalt industry lacks a unified voice, a common message, and we don't know how to get our message out to the public or voters

Root Causes

- Political division - legislators only respond to money and public outcry and there is no proactive political support for change
- Consumers do not know what to ask for when it comes to transportation and infrastructure needs as the younger generation does not mind paying more tax for better infrastructure
- States are hesitant to work together - DOT and FHWA
- Shifting to toll roads or fear of switching to a per-mile fee

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Get in front of decision-makers and provide examples of our successes/innovations using our products and we need to become a trusted resource for decision-makers
- **GOAL 2** – Provide a unified message that resonates with legislators and one that educates the general public on the value of asphalt roads and roofs

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- We must lobby decision-makers to create a different funding mechanism for policy changes
- Host an education seminar/workshop for DOT/FHWA to provide them with good information so they can approach legislators

STRATEGIES to ACHIEVE GOAL 2

- We need to do a better job of promoting our industry
- Asphalt Roads and roofs are important as they are used every day to transport people and keep people safe and dry
- We need to have effective relationships to promote our products i.e. insurance companies, contractors, and other industries such as transporters.

BEST PRACTICES

What creative funding, bidding or construction practices could benefit how our infrastructure is built and maintained to produce better performing long term products?

Problems

- Lack of education for political decision-makers, local agencies, and the public
- Design and maintenance rarely collaborate
- Lack of early maintenance / proactive preventive maintenance
- Each state wants to evaluate new technology independently
- No best practices in roofing industry / keeping secrets
- Total life cost of a pavement not part of initial planning / consideration
- Too many competing decision-making groups

Root Causes

- Lack of single voice unanimously accepted
- Systemic / organizational resistance to change
- Fear of losing business because of novel innovations making pavements last longer
- Lack of understanding of proper communication channels
- Lack of trust between groups (engineers/politicians/public, etc.)
- Concern about new costs to innovate / making current capital obsolete

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Create loud, clear, consistent voice to communicate our message
- **GOAL 2** – Incentivize industry sharing of best practices
- **GOAL 3** – Be more strategic / future-thinking in discussions

Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Make sharing of best practices a priority for asphalt pavement associations to encourage public understanding for funding
- Create social media campaigns to educate general public about what is possible with proper design / maintenance (radio, internet, virtual reality, etc.)

STRATEGIES to ACHIEVE GOAL 2

- Implement similar strategic planning symposiums to identify points of alignment
- Encourage user/producer groups to prioritize sharing of best practices

STRATEGIES to ACHIEVE GOAL 3

- Develop leadership certification for innovation
- Use Oculus / virtual reality for training /to bring users to jobsite / investigations
- Create an innovation department within each DOT / organization

OTHER ECONOMICS

Problems

- Lack of creativity inherent in a low-bid system
- Political involvement impacts infrastructure decisions and the asphalt industry is politically naïve in general
- Many different perspectives on what constitutes performance, which leads to specification proliferation
- There is a broad misunderstanding by the asphalt community about maintenance principles

Root Causes

- Maintenance costs are high and there is little political incentive to fund until the road reaches a critical state
- The short election cycle in the United States causes political will to be focused on short-term issues
- User agencies are risk-averse leading to an aversion to alternative procurement processes
- Limited taxpayer dollars available meaning no funding is dedicated to innovation

Goals

The discussion led to several goals and strategies with the top goals identified by the group:

- **GOAL 1** – Funding mechanisms that incentivize innovation
- **GOAL 2** – Establish strategic partnerships with stakeholders to improve infrastructure
- **GOAL 3** – Change public perception about the road industry through outreach efforts



Strategies

Some strategies identified to achieve those goals:

STRATEGIES to ACHIEVE GOAL 1

- Conduct pilot projects using the concepts of reliability centered maintenance (RCM) and backfilled reliability centered maintenance (B-RCM) to prove and incentivize the value of performance-based maintenance
- Explore alternative funding mechanisms based on movement of goods
- Redefine the structure of funding to agencies (i.e., provide a more holistic view)

STRATEGIES to ACHIEVE GOAL 2

- Partner with other industries to communicate value; consider other stakeholders who value the importance of infrastructure (e.g. Amazon)
- Build dedicated truck lanes

STRATEGIES to ACHIEVE GOAL 3

- Establish consistent messaging and strategy to build and maintain relationships with stakeholders and the general public
- Develop a summary of different mechanisms to implement strategies
- Develop a course on infrastructure and how we pay for infrastructure that can be presented in schools

SUPPLEMENTAL MATERIALS

As noted in the introduction there is a summary of notes generated from the symposium available as a supplement to this report on the Asphalt Institute Foundation website. This visual summary is intended to mimic the look of the MURAL digital whiteboard used to collect ideas from the attendees of the symposium.

Together with the content in the body of this report, the supplemental materials represent the totality of ideas generated from the breakout sessions.

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The Asphalt Institute Foundation is a 501c3 public charity. Since 2014, the foundation annually conducts strategic research and educational activities that are designed to advance and improve both the liquid asphalt industry and the welfare of the general public. The STAR Symposium is the culmination of effort by many industry leaders.

The Asphalt Institute Foundation is grateful to these individuals who offered their service and leadership.

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