RESEARCH PROJECT SUMMARY

January 2017

NAPA

NATIONAL ASPHALT PAVEMENT ASSOCIATION

ASPHALT. AMERICA RIDES ON US.

Why Research?

Dear NAPA Member,

Over the past four years, NAPA has lead a comprehensive effort to quantify, clarify, and promote the advantages of asphalt pavements. This builds on what NAPA has always done – foster innovation, improve education, and strengthen our industry. The current effort combines engineering research, marketing initiatives, legislative engagement, and deployment activities to keep pace with the changing needs and desires of our customers and the driving public.

Under the leadership of NAPA members an in partnerships with state asphalt pavement associations, programs have been conceived, built, and implemented to quantify and communicate asphalt's competitive advantages to our customers and the driving public. We have credible, compelling messages and materials based in engineering science and research, guided by comprehensive market research, and channeled into an effective deployment strategy to authoritatively and convincingly sell our product.

In order to be successful, businesses must cater to and look after its customers. We as an industry have consistently worked to enhance our product while reducing costs – from real-world science at the National Center for Asphalt Technology to the rapid implementation of warm-mix asphalt – this industry has a long track record of supporting product research and improvements. The industry's drive to innovate has allowed us to build knowledge about asphalt mixture performance and asphalt technologies, solve challenges, and make improvements that ultimately lead to superior products and performance.

While NAPA is driving these efforts forward, we are not acting alone. We have fostered cooperative partnerships with industry and with the State Asphalt Pavement Associations, who play a vital role in the work of the Pavement Economics Committee and who help drive our messages forward in a unified manner.

We continue to research and improve, as you will see in this booklet; many exciting advances are occurring, so get involved, stay up to date, and ask questions. We are all geared up for another exciting year!

All NAPA's efforts combine to create a better product for our customers and the driving public while helping us as producers to improve our businesses. For the public and for the industry, we will continue to lead with integrity, intelligence, and dependability.

John J. Keating
Chairman of the Marketing Council

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The National Center for Asphalt Technology

The asphalt industry's premiere research facility

The National Center for Asphalt Technology (NCAT) is a cooperative venture between NAPA and Auburn University. Founded in 1986, NCAT was created to ensure the asphalt paving industry is able to adapt to the changing needs of America's highway infrastructure. NCAT's mission is to provide innovative, relevant, and implementable research, technology development, and education that advances safe, durable, and sustainable asphalt pavements.

NCAT's main 40,000-square-foot facility is designed for complete testing of asphalt binders and mixtures with state-of-the-art equipment. Its training space with hands-on laboratories accommodates classes for up to 40 people. NCAT conducts trainings for more than 800 asphalt technicians each year and reaches thousands more industry professionals worldwide through workshops, webinars, and conference presentations.

The world-renowned NCAT Test Track is located on a 309-acre site in Opelika, Ala., where research is conducted on experimental asphalt pavements. This 1.7-mile oval track consists of 46 test sections sponsored on three-year cycles. The test track is a unique real-world laboratory allowing for cutting-edge pavement experimentation while avoiding the risk of failure on actual roadways. The sixth research cycle of Test Track operation began in 2015 and features experiments to validate top-down cracking tests and determine appropriate criteria that can be implemented as part of mix design and quality assurance testing during project construction.

Also in 2015, NCAT expanded its work on assessing the benefits of pavement preservation

treatments by adding 40 experimental test sections to a nearby U.S. highway, complimenting previously built treatment test sections on a local county road. NCAT has also partnered with the Minnesota Department of Transportation to conduct full-scale pavement testing at its Minnesota Road Research Facility (MnROAD) facility near Albertville, Minn., allowing the research facilities to address national pavement research needs in hot and cold climates.

NCAT's focus is on practical research. The application of research findings lead to specification improvements that agencies can put into contracts. Its research center and Test Track make it one of the world's leading institutions for asphalt pavement research and an important source of information for those tasked with maintaining our nation's infrastructure.

Over its 30-year history, NCAT researchers have:

- advanced aggregate testing methods;
- developed the ignition method to measure asphalt content without solvents;

- developed mix design procedures for stone-matrix asphalt;
- improved the mix design procedure for porous friction course mixtures;
- evaluated asphalt mixtures modified with numerous additives;
- improved test procedures to assess rutting, cracking, and moisture damage;
- developed the Perpetual Pavement design method;
- recommended revisions to American Association of State Highway and Transportation Officials (AASHTO) standards mixes containing high reclaimed asphalt pavement (RAP) contents;
- prepared best practice guidelines for management of RAP and recycled asphalt shingles (RAS);
- provided guidelines on life-cycle cost analysis for pavement type selection; and
- developed a new laboratory method for assessing friction properties of asphalt mixtures.

The third edition of the NCAT textbook, "Hot Mix Asphalt Materials, Mixture Design and Construction," was recently updated and reprinted in a lower-cost, soft-cover format. The NCAT newsletter, "Asphalt Technology News," is published biannually and has a worldwide circulation reaching more than 7,000 readers. It has been well received by practicing engineers in both the public and private sectors.

NCAT is guided by a Board of Directors and an Applications Steering Committee. The 15-member Board guides strategic plans and policies. It includes four members from the NAPA Research and Education Foundation, four from Auburn University, six at-large members, and the President of NAPA. The Applications Steering Committee meets twice a year to review the scientific and technical quality of NCAT's programs and reports its findings to the Board. This group consists of twelve regular members and eight ex-officio members.

NCAT has a dedicated team of 50 employees, including lead researchers, engineers, technicians, and other support staff. The center also employs about eight graduate students and five undergraduate co-op engineering students who are destined for careers throughout the pavement industry.

Current project sponsors include the National Cooperative Highway Research Program, numerous individual state departments of transportation, the Federal Highway Administration, various corporations, and the NAPA Research and Education Foundation. NCAT's annual research income is typically about $5 million.

Newsletters, training information, technical reports, and research synopses can be accessed at http://ncat.us. Pavement Test Track research and performance data can be found at http://pavetrack.com.

Mark Your Calendar.
NCAT Open House April 25–26, 2017.
More information coming soon.
http://ncat.us

Legislative Efforts to Advance Asphalt Technologies

NAPA is actively engaged with lawmakers on Capitol Hill, to ensure that Congress crafts infrastructure legislation and policies that leave pavement type decisions in the hands of local engineers. Working directly with lawmakers and in coalition with other industry groups, NAPA also highlights the need for robust federal investment in our nation's roadways and transportation infrastructure.

The Accelerated Implementation & Deployment of Pavement Technologies (AID-PT) program supports the implementation and deployment of cost-saving and useful technologies that are proven to extend the life of pavements. This program, first established in the Moving Ahead for Progress in the 21st Century (MAP-21) Act, directs funding for continuing advancement of pavement technologies through partnerships between the Federal Highway Administration (FHWA) and the asphalt industry. The NAPA–FHWA Cooperative Agreement is funded under AID-PT and has assisted in the advancement of groundbreaking technologies that improve and preserve pavements. The opportunities presented through this agreement allow NAPA and FHWA to simultaneously facilitate the design and construction of pavements using innovations, such as Thinlay™ thin asphalt overlays for pavement preservation, warm-mix asphalt, and pavements that incorporate higher levels of recycled materials, including reclaimed asphalt pavement (RAP) and recycled asphalt shingles (RAS).

Through NAPA's work with FHWA to successfully implement and administer the program, lawmakers have endorsed and reauthorized the AID-PT program in 2015 as part of the Fixing America's Surface Transportation (FAST) Act. The FAST Act, a five-year highway bill that includes a host of policy reforms and that provides long-term funding to sustain America's infrastructure, allocates $12 million annually to the AID-PT program, half of which is appropriated to asphalt-focused efforts.


Save THE Date
Transportation Construction Coalition Fly-In
MAY 17 – 18, 2017
Hyatt Regency Capitol Hill
WASHINGTON, DC
NAPA Midyear Meeting
JULY 16 – 19, 2017
The Westin Michigan Avenue
CHICAGO, IL
IMPACT Leadership Group Conference
SEPTEMBER 21 – 23, 2017
Griffin Gate Marriott Resort and Spa
LEXINGTON, KY
Paving for Performance: "Designed to Perform" Conference
OCTOBER 11 – 13, 2017
JW Marriott Buckhead
ATLANTA, GA
NAPA Annual Meeting
FEBRUARY 11 – 14, 2018
The Hilton Bayfront
SAN DIEGO, CA
World of Asphalt Show & Conference
MARCH 6 – 8, 2018
George R. Brown Convention Center
HOUSTON, TX

Advancement of Innovative Asphalt Technology

PURPOSE: This cooperative agreement is a joint effort between the Federal Highway Administration (FHWA) and NAPA for the advancement of new and innovative technologies to design, specify, construct, and preserve asphalt pavements.

Background

Congress established the Accelerated Implementation and Deployment of Pavement Technologies Program as part of the Moving Ahead for Progress in the 21st Century Act (MAP-21, P.L. 112-141, §52003) in order to provide funding for continuing to advance pavement technologies through partnerships with FHWA and the industry. As a result, FHWA has partnered with NAPA through a five-year cooperative agreement to advance new and innovative technologies to design, specify, construct, and preserve pavements. A cooperative agreement means the cost is shared between FHWA and NAPA.

Study or Project Focus

The objectives of this cooperative agreement are: to 1) Promote the deployment and adoption of state-of-the-art innovative materials, design procedures, specifications, practices, and construction methods to improve asphalt pavement performance and extend the pavement life of our transportation facilities, and to 2) Replace or update multiple documents developed in previous years to reflect today's technology and to improve the performance of asphalt pavements. The audience for this effort is the asphalt material community, consisting of state and local agencies, industry, manufacturers, suppliers, producers, field construction, and researchers/academia.

Outcome/Benefits

The cooperative agreement presents a unique opportunity for mutual FHWA–NAPA technology activities to be managed under one "umbrella," which will facilitate simultaneous activities and allow for longer term planning for the most cost-effective and successful pavement technology program.

The deliverables of the cooperative agreement will include conferences and workshops, presentations at government and industry events, webinars, publications, surveys for benchmarking, and multimedia tools.

Progress Report

Several deliverables were completed in 2016, including:

- Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2015 (IS 138, sixth edition)

Committee for Asphalt Research and Technology (CART), Engineering Advisory Committee (EAC)

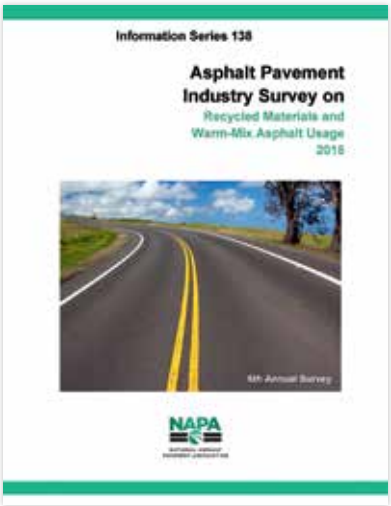
Funding Level: Up to $2.5 million
Research Lead: NAPA
Project Dates: October 2013–September 2018

- High Binder Replacement Mixtures – TechBrief
- Education Tools Development for Asphalt Innovations
- Best Practices for Recycled Tire Rubber – Draft Guide for Industry Review
- Thin Asphalt Overlays/Thinlays – Draft Updated Publication for Review
- Asphalt ETGs website (www.AsphaltETGs.org)

Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2015 (IS-138)

Background/Need

The Federal Highway Administration (FHWA)/NAPA survey was first conducted in 2010, focusing on the use of RAP, RAS, and WMA technologies in the 2009 and 2010 construction seasons. This initial survey served as a benchmark for the asphalt pavement industry's use of these sustainable technologies and complimented state department of transportation surveys conducted by AASHTO/FHWA. Since the initial benchmarking, FHWA has successfully partnered with NAPA to conduct annual surveys to track industry acceptance of these materials. Starting with the 2013 construction season, the survey has been conducted under the NAPA/FHWA Cooperative Agreement.



Study or Project Focus

The survey focuses on the quantities of RAP and RAS being used in asphalt mixtures, as well as the total amount of WMA produced nationally. Estimates are made for the total asphalt mixture market in each state or territory. Date is collected from various contractors and state asphalt pavement associations.

Outcome/Benefits

The survey results have shown significant growth in the use of RAP, RAS, and WMA technologies since 2009 with increases in RAP, RAS, and WMA use of 36 percent, 166 percent, and 618 percent, respectively since 2009. Since 2013, however, these changes have decreased to less than 2% growth per year. In 2015, the survey asked for the first time about WMA technologies use at hot mix asphalt (HMA) temperatures; 60% of producers indicated that they do use WMA

FHWA/NAPA Cooperative Agreement

Funding Level: $40,000
Research Lead: Kent Hansen, Audrey Copeland
Project Dates: Annual

PURPOSE: This annual survey quantifies the use of recycled materials, including reclaimed asphalt pavement (RAP), recycled asphalt shingles (RAS), and warm-mix asphalt (WMA) production by the U.S. asphalt pavement industry to help support and promote sustainable practices. The survey tracks reported use of other commonly used recycled materials, such as ground tire rubber and slags, in asphalt pavement mixtures.

technologies at HMA temperatures. This may explain the decrease in growth of WMA. In 2015, producers were also asked to estimate the tonnage of RAP stockpiled. An estimated 84 million tons of RAP was stockpiled in the U.S. at the end of 2015. Data from the survey has been widely used in the trade and popular press to document sustainable infrastructure practices.

Progress Report

The current and prior year survey reports are available on the NAPA website www.asphaltpavement.org/recycling.

Optimized Flexible Pavement Design and Material Selection

PURPOSE: Synthesize best practices regarding optimized flexible pavement design and materials utilization, develop supporting data, and make recommendations that further refine current and new design practices for cost-effectiveness and performance.

Background

Current flexible pavement design methods may result in overdesigned asphalt pavement thicknesses and unnecessary higher initial costs. In the years since the AASHO Road Test, pavement materials and construction technologies have advanced significantly. However, these advances have not been adequately incorporated into pavement design methods. Capitalizing on known and proven technological advances in will reduce the cost of the pavement structure while providing quality long-term performance.

Outcome/Benefits

The final reports will illustrate the potential for long-lasting asphalt pavements to be designed in a more economical fashion through 1) the use of proper MEPDG calibration and implementation; 2) appropriate pavement performance reliability and criteria for evaluating pavement designs; 3) the use of limiting strain criteria (with appropriate strain levels); and 4) optimized materials utilization.

Progress Report

The following reports are complete:

- A synthesis and research synopsis for "Refining Limiting Strain Criteria and Approximate ranges of Maximum Thicknesses for Designing Long-life Asphalt Pavements," NCAT Report 15-05R and NCAT Research Synopsis 15-05R.
- A report and research synopsis for "Flexible Pavement Design: State of the Practice," NCAT Report 14-04 and NCAT Research Synopsis 14-04, provide an overview of current flexible pavement design practices in the United States.
- The report "Recalibration Procedures for the Structural Asphalt Layer Coefficient in the 1993 AASHTO Pavement Design Guide," NCAT Report 14-08 and NCAT Research Synopsis 14-08, outlines methods for localizing and calibrating the structural number for pavement designs using deflection data, historical performance data, or matching mechanistic-empirical design thicknesses.

All reports are available through the NCAT website, www.ncat.us.

PEC Joint Pavement Type Selection/Pavement Design Task Group

Funding Level: $190,000
Research Lead: National Center for Asphalt Technology (NCAT)
Project Dates: August 2013–April 2015; No Cost Extension until December 2016

Improved Performance and Pavement Life by Use of Premium Asphalt Mixtures

PURPOSE: This project seeks to objectively quantify the performance and cost benefits of premium asphalt mixtures, as compared to conventional asphalt mixtures.

Background/Need

Premium asphalt mixtures, including stone-matrix asphalt (SMA) and highly modified asphalt mixtures using either highly polymer-modified or rubber-modified asphalt, have been utilized for many years to enhance the performance and extend the service life of asphalt pavements and overlays. However, these premium mixtures are generally more expensive than conventional asphalt mixtures. It is important to quantify and compare the performance and life-cycle cost benefits of the premium mixes with those of conventional mixtures to document the life-cycle cost benefits of premium asphalt mixtures.

Study or Project Focus

This study is divided into two phases. Phase 1 will focus on documenting performance and cost benefits of SMA mixtures and comparing them to conventional dense-graded mixtures. Phase 2 will conduct the same documentation, analysis, and comparison for highly modified asphalt mixtures.

Outcome/Benefits/ Deliverables

The expected outcome of this project is to use information gathered from state departments of transportation (DOTs) and NCAT Test Track experiments to quantify the additional pavement life achieved by using premium materials and mixtures. Thousands of dollars may be saved by extending pavement life through the use of premium materials.

Progress Report

A survey of state DOT practices for SMA use has been completed and submitted for task group review.

PEC Pavement Type Selection Task Group

Funding Level: $35,000 (with up to $65,000 available)
Research Lead: National Center for Asphalt Technology (NCAT) – Dr. Randy West
Project Dates: June 2016–July 2017

PaveXpress – Simplified Pavement Design Tool

PURPOSE: Develop a free, online tool and corresponding mobile application capable of providing structural designs for concrete and asphalt roadways and parking facilities.

Background

To better educate and assist pavement decision makers, a simplified pavement design tool, based on AASHTO and industry standard pavement design methods, is desired. The simplified pavement design tool, PaveXpress, will be easy to use and understand while providing technically sound pavement structural designs and analyses that illustrate the benefits of using asphalt pavement structures.

Study or Project Focus

The primary software functionality will involve roadway structural pavement design (asphalt and concrete), pavement structural analysis (asphalt), and an interactive help tool covering program operation and pavement engineering references. Version 2 added modules to handle asphalt overlays in addition to other design and tool improvements. Version 3, released in late 2016, added structural analysis of designs based on mechanistic principles, along with a module for cost estimating structural designs based on user input.

Outcome/Benefits

PaveXpress provides a user-friendly, visually appealing, pavement design tool accessible to users on a variety of devices that provides pavement decision makers technically sound pavement designs, demonstrates the benefits of using asphalt pavement structures, and provides a free alternative to other pavement design software.

The Roadway Pavement Design module compares pavement designs for up to three alternatives: Long-Life Asphalt Pavements per elastic layer theory/fatigue & rutting criteria, Asphalt Pavements per AASHTO 93 methodology, and Concrete Pavements per AASHTO 93/98 Supplement methodology.

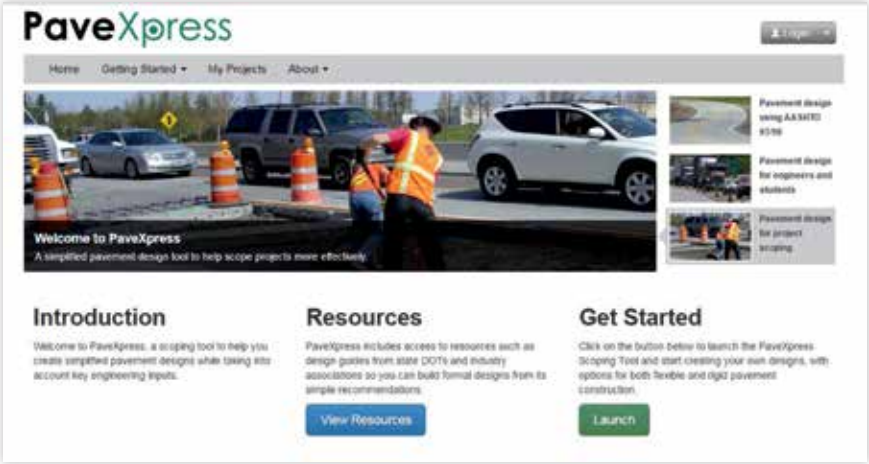
Progress Report

PaveXpress is available at www.pavexpressdesign.com.

In 2016, a structural analysis and cost estimating modules were added.

PEC Pavement Design Task Group

Funding Level: $180,000
Research Lead: Pavia Systems
Project Dates: October 2013–July 2017



Marketing

- Advertisements in industry trade press (print and electronic), including Civil Engineering, Roads & Bridges, *APWA Reporter*, *Engineering Inc.*, *ENR*, and *Public Works* magazines.
- PowerPoint training presentation developed for use by SAPAs and others to introduce PaveXpress to potential users, for example at lunch and learns.

Deployment

- Knowledge transfer to more than 1,750 people through workshops, conferences, and webinars.
- More than 15,000 registered users with 5,000 returning users. PaveXpress has been used in 157 countries, but two-thirds of use is in the United States with users from every state.

Perpetual Pavement Design – PerRoad Updates

PURPOSE: This project will upgrade PerRoad mechanistic-empirical design software to allow pavement designers to work with strain distributions rather than endurance limits and transfer functions. This will allow users to evaluate and compare non-Perpetual Pavement designs to Perpetual Pavement designs.

Background/Need

PerRoad software was developed for the Asphalt Pavement Alliance to facilitate Perpetual Pavement analysis and design of flexible pavements. The current version of the software (3.5) relies primarily on user-entered threshold strain levels (e.g., endurance limits) and corresponding transfer functions to compute the amount of time before cumulative damage reaches 0.1. While this approach to Perpetual Pavement design has proven effective, it is greatly limited by requiring the designer to enter a transfer function, which is often seen as a weak point of any M-E procedure. Recent research has demonstrated the effectiveness of using cumulative strain distributions as a basis for design. Enabling PerRoad users to work with strain distributions, rather than endurance limits and transfer functions, is seen as a much-needed upgrade for the software. Also, PerRoad 3.5 does not facilitate a comparison between Perpetual Pavement and non-Perpetual Pavement designs. There is a need to allow PerRoad users to evaluate both design options within a single program using the same basic set of inputs.

Study or Project Focus

The project focuses on two objectives:

1. Implement strain distribution design criteria within PerRoad.

2. Implement non-Perpetual Pavement design criteria within PerRoad.

Outcome/Benefits/ Deliverables

Redesigned PerRoad software, along with a research synopsis describing the newly revised program and a sensitivity analysis, will be delivered. In addition, a webinar will be developed to present the new design philosophy, outline features of the program, and demonstrate the software, making it easier for pavement designers to understand and prepare Perpetual Pavement or other long-life designs.

PEC Pavement Design Task Group

Funding Level: $25,500
Research Lead: NCAT, Auburn University (D.H. Timm, M.M. Robbins, and X. Guo)
Project Dates: August 2015–December 2016

Progress Report

PerRoad has been modified to include conventional mechanistic design. This new feature runs simultaneously with the pre-existing Perpetual Pavement design option, allowing designers to easily assess the difference between a Perpetual Pavement and a conventional design. The strain distribution concept has also been incorporated in the program. A beta version was tested in Fall 2016 and the full version release is expected at the beginning of 2017 with an implementation webinar to follow.

Other Relevant Information

Along with the software update, a new logo was the developed and implemented.

Determining Service Life Based on Comparable International Roughness Index Values

PURPOSE: Analyze and determine how pavement ride quality (i.e., smoothness) can be used to determine service life in a life-cycle cost analysis (LCCA) and quantify the cost of different pavement options in order to validate LCCA input assumptions, such as the period of performance for initial construction and maintenance.

Background

Technical advancements have improved the performance of asphalt pavements and, as a result, have increased the lifespan of asphalt pavements. However, these technology advances have not been adequately incorporated into analysis and prediction of pavement service life, which is an input for pavement type selection tools, such as LCCA. A method is needed to accurately determine performance life and eliminate errors introduced from inappropriately applied maintenance cycles.

Study or Project Focus

This study focuses on pavement ride quality (smoothness), how it changes over time, and how it can be used in best practices to determine service/performance lives for various cycles (i.e., initial construction, maintenance, rehabilitation, etc.) in an LCCA.

Outcome/Benefits/ Deliverables

This project will assess the state of practice for determining pavement service life and provide recommendations for determining service life as used in life cycle cost analyses based on maintaining ride quality. By compiling and analyzing state rehabilitation data, a more accurate quantification of initial service life may be achieved. Ride quality is a function of pavement smoothness and building and maintaining smooth pavements improves performance and fuel economy for vehicles.

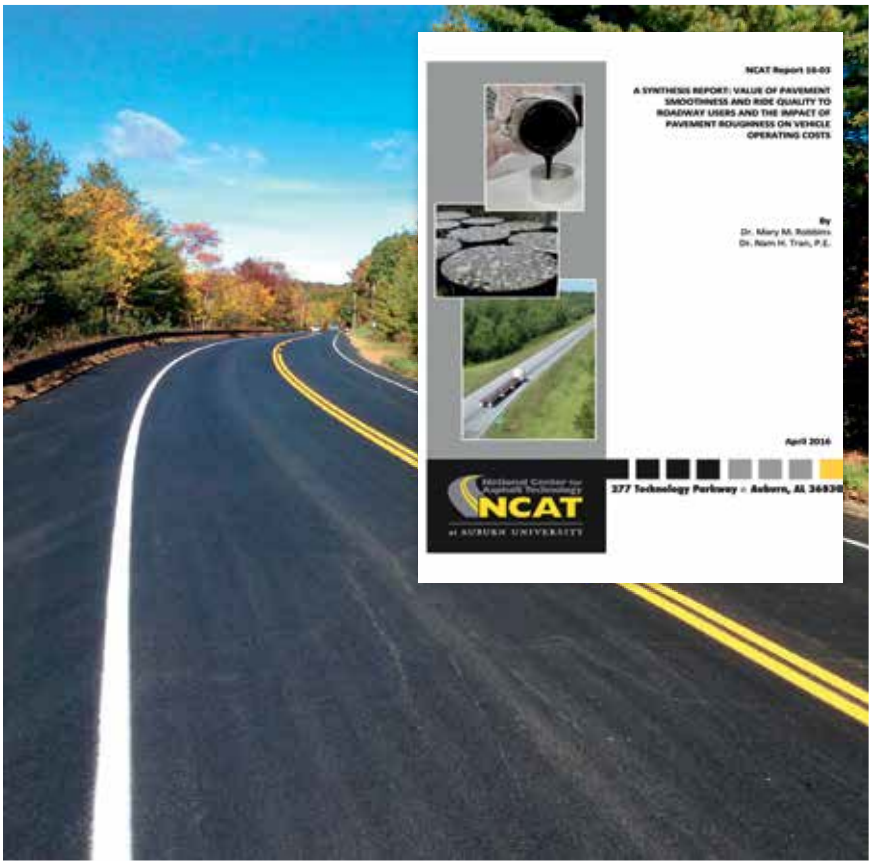
Progress Report

A synthesis report and literature review has been completed. NCAT Report 16-03, "A Synthesis Report: Value of Pavement Smoothness and Ride Quality to Roadway Users and the Impact of Pavement Roughness on Vehicle Operating Costs," is available on the NCAT website, http://eng.auburn.edu/research/centers/ncat/files/technical-reports/rep16-03.pdf.

A survey and summary report of agency practices on determining service life and a report of best practices for establishing service life cycles, "Review of Initial Service Life Determination in LCCA Procedures and in Practice," was submitted in September 2016 and will be published on NCAT website.

PEC Pavement Type Selection Task Group

Funding Level: $65,000
Research Lead: National Center for Asphalt Technology (NCAT)
Project Dates: October 2013–June 2017


NCAT Report 16-03
A SYNTHESIS REPORT: VALUE OF PAVEMENT SMOOTHNESS AND RIDE QUALITY TO ROADWAY USERS AND THE IMPACT OF PAVEMENT ROUGHNESS ON VEHICLE OPERATING COSTS
By
Dr. Mary M. Robbins
Dr. Nam H. Tran, P.E.
April 2016
NCAT
at AUBURN UNIVERSITY
277 Technology Parkway • Auburn, AL 36830

Best Practices for Determining Life-Cycle Costs of Asphalt Pavements

PURPOSE: Develop guidance for state highway agencies as to proper construction- and maintenance-related inputs for LCCAs of asphalt pavements.

Background/Need

Life-cycle cost analysis (LCCA) is a process used to evaluate the overall long-term economics of competing investment options. It considers all anticipated costs over the life of each investment asset and is considered a fair and balanced process for identifying the best long-term value among competing project alternatives, especially when planning new construction or reconstruction of roadways. The LCCA typically includes initial construction and anticipated future costs over the life of each pavement alternative. The determination of the inputs can be complicated, especially estimating future costs of maintenance and rehabilitation activities and timing throughout the course of each pavement alternative's life span. Thus, there is a need to develop some guidance on how each of these inputs can be properly determined for use in the LCCA.

Outcome/Benefits/ Deliverables

A best practices manual for determining the life-cycle cost of asphalt pavement will be prepared largely based on a literature review of reports from previous studies on life-cycle cost analysis and surveys of state agencies on current LCCA practices conducted by AASHTO, state agencies, and research organizations. In addition, the research team will obtain Pavement Management System data from at least two states that have similar mix of asphalt and concrete pavements to get more information about performance periods of flexible and rigid pavements.

Progress Report

A draft LCCA manual has been prepared based on the literature review with additional information on the service life performance periods of asphalt and concrete pavements. The draft is currently under review by the PEC Pavement Type Selection Task Group.

PEC Pavement Type Selection Task Group

Funding Level: $36,200
Research Lead: National Center for Asphalt Technology (NCAT) — Dr. Nam Tran
Project Dates: June 2016–June 2017

Case Studies on Public–Private Partnerships

PURPOSE: Asphalt pavements are routinely chosen for projects where the owner is responsible for the service life or part of the service life of the pavement/project, such as public–private partnerships (PPP). Documenting and understanding the reasons that asphalt pavement is chosen can highlight the benefits of asphalt pavements in LCCA.

Background/Need

For design/build, public–private partnerships (PPPs), and concessionaire company projects, asphalt pavements, including Perpetual Pavements, are regularly chosen for their long life and more certain maintenance costs, which are easily managed over time. Perpetual Pavements are designed to be maintained through resurfacing and never have to be reconstructed, which results in lower life-cycle costs (LCC) over the life of a project or concessionaire agreement. NAPA's 2013 Annual Meeting included an educational session on PPP projects, which provided an opportunity to highlight the decision process, performance levels/mandates, and reasons why asphalt pavements are chosen in these agreements. According to D.J. Gribbin with Macquarie Capital, "the Illinois tollway is primarily asphalt based on lowest cost over 75-year LCCA and owner specifications." According to Bill Hasbrook with OHL, the 5th largest concessionaire company in the U.S. at the time, "3,000 miles of road in our network and almost the entire network is asphalt." During the NAPA 2015 Young Leaders conference in Orlando, Fla., engineers and designers noted that asphalt was selected for the I-4 Ultimate megaproject pavements due to performance life and lower initial cost.

Outcome/Benefits/Deliverables

The expected deliverables are an article/white paper and a PowerPoint presentation discussing why asphalt pavements are routinely selected for PPP and similar projects, along with a review of three to five detailed case studies supporting this position. The project is expected to highlight the low life-cycle cost of long-life asphalt and Perpetual Pavements in language that can easily be adapted for marketing and outreach activities by NAPA's advocacy and communications departments and the Asphalt Pavement Alliance.

Progress Report

An Internet and literature search has been conducted to identify projects using substantial amounts of asphalt paving and may be suitable for case studies.

PEC Pavement Type Selection Task Group

Funding Level: $35,000
Research Lead: NAPA
Project Dates: June 2016–June 2017

Development of Structural Design Guidelines for Porous Asphalt Pavements

PURPOSE: The objective of this study is to develop a simple, easy to apply design procedure for the structural design of porous asphalt pavements.

Background/Need

Currently, the design of porous asphalt pavements is based primarily on hydrologic considerations–i.e., providing sufficient storage capacity for the gradual release of captured storm water into the environment. Porous asphalt is typically used for parking lot and other low volume road applications, and, consequently, not much attention has been paid to their structural design aspects. However, even parking lot and low volume residential pavements see periodic heavy truck (e.g., for deliveries, trash removal) and bus traffic. A design procedure and representative material structural properties are required to ensure that porous pavements do not deteriorate excessively under these traffic loads.

Outcome/Benefits/ Deliverables

The deliverables will include guidelines for typical structural design properties for porous pavement systems and identify where more research and efforts may be needed. The guidelines will be based on a thorough literature review and adaptation of existing design methods. A catalog of designs for porous asphalt pavements will be developed for implementation and training materials. A final report and design manual will summarize all project activities and describe the design procedure.

Progress Report

An interim progress report was received in December 2016 for review by the PEC Pavement Design task group.

Other Relevant Information

This project is being financially supported by the Federal Highway Administration (FHWA) Cooperative Agreement.

PEC Pavement Design Task Group

Funding Level: $90,000
Research Lead: Charles Schwartz and Kevin Hall
Project Dates: April 2016–February 2017

Flexible Pavement Design Course for the American Society of Civil Engineers (ASCE)

PURPOSE: This seminar is designed to educate engineers on pavement mechanics, material properties, traffic, pavement distresses, structural design, production and construction limitations, pavement life cycle, overlay designs, and porous asphalt pavements, as well as to introduce pavement designers to the simplified world of pavement design using modern computational tools, such as WESLEA for Windows and PaveXpress.

Background/Need

The viability of the highway infrastructure relies heavily on optimized pavement design, efficient materials production, and economical construction practices. Predicting the pavement life cycle and developing maintenance and rehabilitation strategies are also keys to high-performing pavement structures. Though these are complex topics, they are highly interwoven and developing a simplified understanding is important for the practicing engineer who may not have been trained in the properties and principles of asphalt pavements.

Outcome/Benefits/ Deliverables

This seminar is intended for all pavement design professionals, whether they have been performing designs for years, are new to the world of pavement design, or they are simply interested in gaining a better understanding of how pavement design works.

Progress Report

Course development is complete and the first session was held in late 2016 in Denver; additional sessions are planned for 2017 to include: January 19-20 in Seattle; June 1-2 in Atlanta; and September 21-22 in Boston.

Marketing

The course has been marketed through NAPA communication and social media channels, as well as directly promoted by ASCE.

PEC Pavement Design Task Group

Funding Level: $4,000
Research Lead: David Timm, Ph.D., P.E., and Michael Huner, P.E.
Project Dates: July 2016–November 2016

Effect of Pavement Types on Building Energy Efficiency: Phase II

PURPOSE: The main project outcome is to understand the effect of different pavement types on building energy efficiency, radiative forcing, and human thermal comfort by creating a numerical model of the thermal interactions between buildings and their environment.

Background/Need

State and local legislation, as well as federal policy and green building codes, are increasingly penalizing dark-colored pavements in an effort to mitigate the urban heat island effect (UHI). Unfortunately, the laws have moved faster than the science, as demonstrated in the PEC Project, "Phase I: Unintended Consequences of Reflective Pavements." Current modeling efforts can demonstrate energy savings from reflective materials; however, these models oversimplify thermal interactions by neglecting the physical interactions between buildings and the surrounding urban environment.

Study or Project Focus

This study will build a numerical model that includes building-environment thermal interactions. The model will be validated from field experiments and used to evaluate the effect of different pavement characteristics (including, but not limited to, thermal conductivity, heat capacity, and albedo) on energy consumption, radiative forcing, and the notable unintended consequence of human thermal discomfort.

Outcome/Benefits

The model is available for use by other researchers. Among studied thermal properties, it was found that modifying ground pavement reflectivity has negligible effects on building energy consumption. However, increased pavement reflectivity did significantly degrade human thermal comfort. The project team concluded that modifying pavement albedo may not be the best parameter for mitigating UHI and reducing building cooling loads.

Progress Report

The project team has developed an urban canopy model that enables modeling of building environment interactions with climatic conditions for Phoenix, Ariz. Field measurements were used to validate the model for a variety of urban land cover types. Using the developed model, the project team studied the effect of different pavement types on buildings energy loads and outdoor human comfort. The model was also used to assess the pavement surface impacts on radiative forcing. Results from the study were presented at conferences and published in the academic journal, Building and Environment, http://dx.doi.org/10.1016/j.buildenv.2016.08.021.

PEC Environmental Sustainability Task Group

Funding Level: $75,100
Research Lead: Zhihua Wang, Arizona State University
Project Dates: July 2014–December 2015; Updated June 2016


Reflective Pavements and Urban Heat Island
Do reflective pavement mandates make sense?
Legislative efforts to mandate reflective pavements have been introduced in some areas, but the scientific evidence doesn't clearly support the use of reflective pavements to address the urban heat island effect. While these pavements do redirect some energy from a pavement's surface, much of it ends up interacting with buildings, pedestrians, and cars — leading to potential unintended negative consequences.
ROOFS
MOST OF THE SCIENCE SURROUNDING REFLECTIVITY AND UHI FOCUSES ON ROOFS, WHICH ARE AT THE TOP OF THE URBAN ENVIRONMENT. PAVEMENTS ARE NOT ROOFS.
REFLECTIVE CONCRETE PAVEMENTS MIGHT NOT WORK AS CLAIMED TO REDUCE THE URBAN HEAT ISLAND EFFECT
SURFACE TEMPS
DIFFERENCES IN SURFACE TEMPERATURES HAVE MINIMAL BEARING ON AIR TEMPERATURE.
SUMMER
REFLECTED RADIATION CAN INCREASE COOLING LOADS FOR SURROUNDING BUILDINGS IN THE SUMMER.
WINTER
LIGHT-COLORED PAVEMENTS REQUIRE MORE DEICING CHEMICALS IN WINTER TO CONTROL SNOW AND ICE.
PEDESTRIANS
REFLECTIVE PAVEMENTS CAN BOOST THE TEMPERATURE PEDESTRIANS EXPERIENCE BY 3° TO 5° CELSIUS, AS WELL AS INCREASE ULTRAVIOLET RADIATION EXPOSURE.
APA

Environmental Product Declaration: Emerald Eco-Label

PURPOSE: To conduct an industry average life cycle assessment and create a tool to calculate asphalt mixtures environmental impacts communicated through Environmental Product Declarations.

Background

Environmental Product Declarations (EPDs) are being incorporated into green rating systems, such as LEED, Greenroads, and the International Green Construction Code (IgCC), replacing material credits for existing best practices, such as recycling and materials reuse. An EPD is a certified document that reports fair, verified, and comparable information on the potential environmental impacts of a product. Information used in an EPD is based on life cycle assessment (LCA) methodology following product-specific requirements and boundaries called product category rules (PCRs).

Study or Project Focus

An LCA study was conducted and PCR developed for asphalt mixtures. In addition, a software tool was created to aid asphalt mix producers in declaring the environmental impacts of their asphalt mixes through a NAPA-verified EPD, also known as the Emerald Eco-Label.

Outcome/Benefits/ Deliverables

Asphalt mix producers can develop NAPA-verified EPDs for each of their various mixes in a fast, simple, and affordable manner using the Emerald Eco-Label tool. EPDs verified under the Emerald Eco-Label Program will help them to meet new material requirements in green rating systems, document their commitment to sustainability, and showcase environmental improvements over time through a common and credible reporting format. Material suppliers with an Emerald Eco-Label EPD for asphalt mixes may gain a competitive advantage over those without.

Progress Report

A PCR Development Working Group composed of various stakeholders has published the PCR for asphalt mixes. To support the PCR's development, an LCA was conducted and published to identify the availability of primary data and validate the feasibility of the PCR. The Emerald Eco-Label tool was developed and has undergone two rounds of beta testing. The underlying LCA, PCR, and Emerald Eco-Label tool all underwent a series of technical reviews before being published.

PEC Environmental Sustainability Task Group

Funding Level: $129,500
Research Lead: Amlan Mukherjee/Heather Dylla/TriSight
Project Dates: August 2014–January 2017

Marketing

The NAPA EPD tool has been branded as the Emerald Eco-Label. To promote the program, various materials, including brochures, a video, print advertisements, media outreach, and webinars are being developed for release in 2017.

Emerald
ECO LABEL

Deployment

The Emerald Eco-Label program made its official debut during a presentation by NAPA President, Mike Acott, at the 2017 Annual Meeting Opening General Session. In addition, PowerPoint templates and educational materials have been developed for promotion of the program at state meetings, lunch and learns, and other educational opportunities. For more information, visit www.asphaltpavement.org

IRI Explorer Case Studies

PURPOSE: Identify how pavement roughness directly impacts use-phase greenhouse-gas emissions for asphalt and concrete pavement types, and develop a tool for analyzing roughness data from pavement networks.

Background

Life cycle assessments (LCA) are used to quantify the environmental impacts associated with a product spanning all phases of its life. While most pavement LCA tools are "cradle to grave," focusing on the material extraction, manufacturing, and construction phases, research has shown that this accounts for only 10%–12% of total greenhouse-gas (GHG) emissions associated with a pavement's life cycle. A very large portion of the emissions come from the pavement use phase from vehicle emissions.

Study or Project Focus

Previous studies have shown that pavement roughness directly impacts rolling resistance, which in turn impacts vehicle fuel efficiency. This study developed a tool and analysis method to mine International Roughness Index (IRI) data from the Federal Highway Administration (FHWA) Long-Term Pavement Performance (LTPP) database and from state department of transportation agencies to identify significant statistical trends in IRI degradation over time. These trends are directly applied to estimating pavement use-phase GHG emissions.

Outcome/Benefits/ Deliverables

Results from analyzing LTPP IRI data showed that asphalt pavements tend to have a lower initial IRI and are overall smoother than concrete pavements; however, they tend to grow rougher at a faster rate than concrete pavements and, in general, maintenance of asphalt pavements occurred at a lower IRI threshold than concrete pavements. A critical insight from the study is that context-specific approaches must be used to identify the best pavement type and maintenance schedules.

IRI Explorer, an easy-to-use interface for analyzing IRI data from the FHWA LTPP database and modeling use-phase GHG emissions, was developed to aid decision-makers in conducting context-specific comparisons of their own networks, including support for additional data not included in the LTPP.

PEC Environmental Sustainability Task Group

Phase 1
Funding: $72,000
Research Lead: Life Cycle Solutions LLC
Project Dates: Project Completed December 2015

Progress Report

State departments of transportation (DOT) IRI data is being added to the interface to create various case studies across the nation.

Marketing

A logo and branding have been developed for IRI Explorer, along with online advertisements and a tri-fold brochure.

Deployment

The project team developed training materials to aid IRI Explorer deployment efforts. This includes a teacher's manual including a PowerPoint presentation and script, case studies, quizzes, as well as a user's manual. Using these materials, two webinars were held to teach State Asphalt Pavement Associations (SAPAs) and DOTs how to use IRI Explorer.

Phase 2
Funding: $30,000
Research Lead: TriSight
Project Dates: Project Started in January 2016, In Progress

Green Rating Systems Engagement

PURPOSE: Review the latest green construction rating systems, including USGBC LEED v.4, to identify potential impacts on asphalt pavements and identify credits that asphalt pavements can help obtain. Engage with developers and publishers of green codes and rating systems to ensure asphalt pavements are treated appropriately.

Background/Need

Numerous green construction rating systems are being used to assess the sustainability of projects including LEED, Greenroads, Envision, and Green Globes – all of these codes can impact pavement type decisions. The green construction market is rapidly growing and is expected to reach over 50% of the total nonresidential construction market. In recent years, green rating systems requirements have significantly changed to focus on material disclosures and transparency. With the recent introduction of these new credits, new documents are required to identify how asphalt mixtures can still meet green rating systems goals.

Study or Project Focus

This project will develop relationships with key individuals working with the respective green rating systems organizations, review green construction rating systems' treatment of asphalt pavements, identify case studies highlighting how asphalt pavements can help achieve credits, and create guidelines to facilitate the documentation processes required for certification. In addition, the project will specifically investigate how asphalt pavements fare in the various Product Health Transparency labels, which are requested by green rating systems.

Outcome/Benefits/ Deliverables

Guidance on how asphalt pavements receive credits, case studies, and brochures will be created for the various green rating systems through collaborative efforts with key individuals from each of the green rating system organizations. Furthermore, ToxServices will provide a detailed review of Product Health Transparency programs available, including an assessment of how each would evaluate asphalt mixtures, and will recommend strategies that best position the asphalt pavement industry to meet green rating requirements for Product Health Transparency.

Progress Report

Draft brochures have been submitted on how asphalt obtains credits in the newest version of Greenroads and LEED. In addition, three draft case studies highlighting how asphalt pavements helped achieve credits in Greenroads have been received. Through engagement with Green Globes and

PEC Environmental Sustainability Task Group

Funding Level: $100,000
Research Lead: Greenroads, Institute for Sustainable Infrastructure, Green Building Initiative, Stuart Kaplow, and ToxServices
Project Dates: January 2016 (ongoing)

Greenroads, both systems have eliminated Urban Heat Index (UHI) credits that were biased against asphalt in the latest revisions. ToxServices has provided a detailed presentation on Product Health Transparency programs and an initial assessment of how each would evaluate asphalt mixtures.

Deployment

Two webinars have been presented as part of the Specialization in Asphalt Sustainability Implementation Series focusing on the green rating systems for parking lots and residential developments, highlighting LEED and Green Globes, and for infrastructure, highlighting Envision and Greenroads.

Critical Review of LCA Treatment of Feedstock Energy

PURPOSE: Evaluate the standard of practice for reporting feedstock energy in LCAs and suggest potential revisions to the ISO procedures to reflect the environmental benefits of sequestering feedstock energy.

Background/Need

Over the years, policies encouraging the implementation of sustainable practices have increased the pressure on public agencies to assess sustainability using The International Organization for Standardization (ISO) standardized methodologies, such as life cycle assessment (LCA) and environmental product declarations (EPDs). Because asphalt cement has a high inherent energy potential, asphalt pavements are disadvantaged and misrepresented in these ISO processes because feedstock energy is required to be included in the total energy consumption for asphalt pavements even in cases, such as asphalt pavements, where the energy is sequestered instead of being released. Agencies such as the Federal Highway Administration (FHWA) adhere to these standards and are recommending that the feedstock energy inherent in asphalt be reported in LCAs for pavements.

Study or Project Focus

This study includes a review of how environmental agencies in the U.S. and abroad handle feedstock energy in carbon accounting, and will examine how feedstock energy impacts the carbon cycle and the appropriateness of the current energy accounting requirement.

Outcome/Benefits/ Deliverables

The project will result in a journal article analyzing the impact feedstock energy in asphalt and other materials has on the carbon cycle and suggests possible amendments to ISO standards to better represent the actual consequences of feedstock energy contained in materials such as asphalt pavements.

Progress Report

A draft report has been submitted critically reviewing the ISO standards, the standards treatment of energy, and how the quantity is expected to be used. Initial results highlight the possibilities for double counting.

Deployment

Dr. Haselbach attended the October 2016 meeting of the ASTM E60 Committee on Sustainability, which is developing standards pertaining to LCAs.

PEC Environmental Sustainability Task Group

Funding Level: $35,000
Research Lead: Dr. Liv Haselbach, Lamar University
Project Dates: November 2016–July 2017

Guidelines for the Use of Thinlays™ for Pavement Preservation

PURPOSE: Develop national guidelines on the use of Thinlays™ for pavement preservation that may be adapted by State Asphalt Pavement Associations (SAPAs) to incorporate state-specific information, such as mix types, performance, and specifications.

Background/Need

Thinlays, a new generation of thin-lift asphalt overlays designed specifically for pavement preservation, have seen increased use as pavement owners seek to preserve pavements while managing fiscal constraints. With reduced budgets, rising material costs, and an increased emphasis on pavement preservation, it is important for the industry to provide pavement owners with practical and factual information about the use of Thinlays to preserve and protect their pavements. It is also important for the industry to provide a uniform message to pavement owners to protect the Thinlay brand.

Study or Project Focus

This project will focus on providing guidance to state and local agencies and to consultants on proper project selection, best practices for design and construction, Thinlay performance, and the benefits of dense-graded Thinlays compared to other preservation treatments.

Outcome/Benefits/ Deliverables

Provide State Asphalt Pavement Associations and contractors with a fact-based guide that can be used to promote the use of Thinlays to city, county, and state officials as well as consulting engineers.

Progress Report

A draft report was received in July 2016. A final draft is expected in December 2016 with the final report published in February 2017.

THINLAY

SAFE. SMOOTH. DURABLE.

Pavement Preservation Task Group

Funding Level: $25,000
Research Lead: National Center for Asphalt Technology (NCAT)
Project Dates: September 2015–February 2017

Targeted Education, Promotion, and Training Program

PURPOSE: Develop training curriculum to help educate city and county public works officials, consulting engineers, and engineering firms on proper engineering methods required to design and deliver a high-quality asphalt pavement.

Background/Need

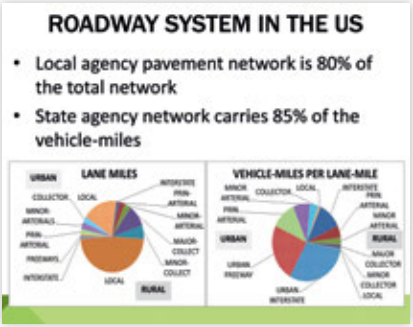
Insufficient knowledge of asphalt pavements and its benefits can lead to limited confidence in designing asphalt pavements and applying emerging technology. Pavement type selection decision-makers and consultants want to be educated on asphalt pavement products. An adaptable training program that can be used by State Asphalt Pavement Associations or others to train and educate persons responsible for specifying and designing pavement is needed.

Study or Project Focus

Develop an adaptable education program that includes life cycle cost analysis, and asphalt innovations including: reclaimed asphalt pavement (RAP), recycled asphalt shingles (RAS), Thinlays™, Perpetual Pavements, OGFC, and Warm Mix Asphalt.

Outcome/Benefits/ Deliverables

Educate city, county, and state officials, as well as consulting engineers, on best practices and benefits of asphalt pavements. With training, well-informed customers will be more confident to consider and use asphalt for their pavement needs.



Progress Report

The project was awarded to NCAT in October 2014 with the addition of adult education experts to the team. A pilot training was held in November 2015 to obtain feedback from the participants and task group. A no-cost extension was approved to allow time to make changes to the program. The program was completed in December 2016. Deployment will begin in 2017.

PEC Best Quality and Competitiveness Task Group

Funding Level: $100,000
Research Lead: National Center for Asphalt Technology (NCAT)
Project Dates: October 2014–November 2016

Considerations and Case Studies in Rapid Highway Construction Using Asphalt Pavement

PURPOSE: Determine the effect of rapid highway construction on the total costs – construction and user delay – associated with maintenance, rehabilitation, and reconstruction of pavements.

Background/Need

One of the most recognized benefits of asphalt pavements is its speed of construction. The construction zone is the primary visible factor that stands between the driving public and the delivery of a roadway for public use. Drivers are very aware of and sensitive to the time they spend in work zone delays. From the driver's point of view, any amount of time lost to roadway activities is excessive and inconvenient. Significant public support and financial savings result when project delivery is accelerated and construction on roadways is unnoticeable to the driving public.

Study or Project Focus

This study provides a foundation for defining the social cost savings associated with accelerated or rapid pavement construction. These cost savings are substantial from a user and non-user standpoint and are a major factor associated with justifying the use of rapid construction operations for public agencies. Information was obtained on actual field projects as well as typical types of rehabilitation and maintenance operations.

Outcome/Benefits/ Deliverables

Report quantifying the benefits of rapid highway construction techniques and contracting practices that allow contractors to innovate through greater leeway in construction and work zone scheduling. Two case histories are included in the report.

Progress Report

The final report was published by TTI in November 2015 and may be accessed at http://tti.tamu.edu/documents/161405-1.pdf.

Other Relevant Information

This project was partially funded by TTI.

PEC Best Quality and Competitiveness Task Group

Funding Level: $50,000
Research Lead: Texas A&M Transportation Institute (TTI)
Project Dates: January 2014–March 2016

Comprehensive Synthesis on High Binder Replacement Effects and Practices

PURPOSE: Develop a synthesis of current and past research on asphalt mixes with 20 percent or greater binder replacement using reclaimed asphalt pavement (RAP) and/or reclaimed asphalt shingles (RAS), and develop articles and presentations from the research to facilitate knowledge transfer.

Background/Need

While the asphalt pavement industry has been using RAP and RAS for many years, opportunities remain for the use of these materials in combination and at greater levels with the potential for significant economic and environmental benefits. When RAP and RAS are used at higher percentages, there is a chance the asphalt binder replacement (ABR) will vary considerably due to fractionation or combining the materials. With states moving to specifying the amount of RAP and RAS that may be used in a mix in terms of ABR, it is important to synthesize existing research regarding ABR.

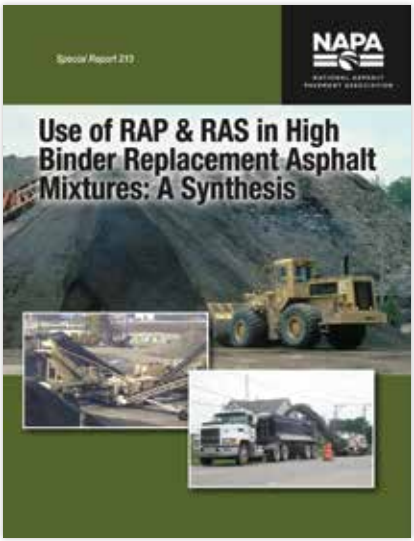
Study or Project Focus

The project focuses on the benefits of using RAP and/or RAS based on ABR in asphalt pavement construction operations, including the economics of using the recycled/reclaimed materials, as well as the conservation of natural resources, reduction in energy consumption, and reduction in emissions.

This synthesis documents laboratory and field performance testing and use of high-ABR mixes, advancing knowledge on the benefits of using of RAP and/or RAS, and encouraging best practices for its use that ensure product quality.

Progress Report

A webinar, "Improved Sustainability and Performance with High RAP and RAS Usage," based on this synthesis was presented in 2014. The final report was made available in March 2016 as NAPA Special Report 213: Use of RAP & RAS in High Binder Replacement Asphalt Mixtures: A Synthesis, and an FHWA TechBrief will be available in February 2017 under the FHWA Cooperative Agreement.



PEC Best Quality and Competitiveness Task Group

Funding Level: $30,000
Research Lead: Dr. David Newcomb, Dr. Jon Epps, and Dr. Fujie Zhou, Independent Contractors
Project Dates: August 2013–April 2016

Webinars

PURPOSE: NAPA webinars provide the industry easy access to leading educators on timely topics in research, engineering, health and safety, environmental sustainability, legislation, business management and marketing.

Benefits

With access to premier experts on numerous topics of concern to the industry, NAPA's goal is to be the best educational resource and provider for the entire asphalt pavement industry and for our partners and their clients. Participants can attend a live webinar or download archived webinars at a time convenient to them. This easy access offers relevant educational opportunities that meet users' needs and schedules.

NAPA webinars are free to NAPA members, Departments of Transportation, City/County and Public Works Agencies, and State Asphalt Pavement Associations. The non-member rate is $129 per webinar.

2016 Webinar Highlights

- Webinar Series: Best Practices in Paving
  - Participants can earn 1.5 PDHs for each webinar attended.
- Webinar Series: Specialization is Asphalt Sustainability Implementation
  - Participants who complete the entire series and pass all 10 quizzes receive 15 PDHs, a certificate, and recognition at the Sustainability Committee Meeting during the NAPA Annual Meeting.

Upcoming webinar series and topics for 2017

- Back to Basics
  - Asphalt Binder
  - Aggregate
  - Mixture Volumes
  - Mix Design
  - Batch and Drum Plant Basics
  - Roller Choices and Patterns
  - QC/QA
  - Basics of Highway Funding
- Safety in the Workforce
  - Motivating Safe Employee Behavior
  - Strategies for Safer Asphalt Plants
  - Strategies for Safer Work Zones
  - Top OSHA Training Programs
  - Innovative Ideas to Improve Safety
- Human Resources and Workforce Development
  - Injury and Illness Record Keeping
  - Employee Wellness
  - Suicide Prevention
  - Drug Testing Program Protocol
  - Attracting the Next Generation of Employees

NAPA WEBINARS

Asphalt Industry Marketing

GOAL: Promote the asphalt industry via a comprehensive marketing and communications program that emphasizes the benefits of asphalt pavements for the public and road owners through well-reasoned, peer-reviewed research. Use positive messages to discuss asphalt's competitive advantages – easy to construct, quiet for neighborhoods, safe for drivers, sustainable for the future, and smooth to drive on. Develop positive and responsive

Making the Case for Drivability

The marketing and communications program speaks to pavement engineers, designers, and pavement-type selection decision-makers about the well-established engineering benefits of asphalt and the industry's proven and emerging innovations. Over the four-year-long campaign, we've learned that our messages need to resonate with three stakeholder groups – pavement owners, the driving public, and the asphalt industry.

GolinHarris, a strategic marketing agency, has helped develop graphics, videos, social media content, editorials, advertisements, presentations, etc. to emphasize the positive properties of asphalt pavements, as well as to explain and promote Pavement Economics Committee (PEC) research. Our Drivability message and other materials are promoted through trade magazines, online, and through the deployment activities of the Asphalt Pavement Alliance and the State Asphalt Pavement Associations (SAPAs). The marketing effort has also developed a website – www.DriveAsphalt.org – to communicate these messages and distribute materials.

Market Research

The program's messages where honed through a series of market surveys conducted by research firm Edelman Berland in 2013 and 2014. In-depth interviews with road owners and surveys of pavement designers and the driving public helped us understand the challenges facing our industry's customers, as well as their needs and impressions of different pavement materials. These survey efforts led to the development of our Drivability marketing campaign, which is designed to be persuasive to both road owners and the driving public.

In 2016, working with GolinHarris, we began a new round of market surveys to understand the reach and effectiveness of our current efforts, as well as to learn how road owners' and pavement designers' concerns, needs, and impressions have changed. This research will help ensure we understand how as an industry we can best serve our customers. Initial surveys results find wide use and acceptance of materials developed through the Go to Market Task Group at the state level by SAPAs, as well as challenges for road owners in the areas of funding, workforce

Go to Market Task Group

Project Lead: GolinHarris
Project Dates: Ongoing

relationships with transportation stakeholders and establish the industry as a trusted, unbiased partner that innovates and uses best practices to improve our product and its costs while supporting the driving public and protecting the environment.

development, and retention of experienced personnel. Moreover, the research finds that while owners place a primary emphasis on cost in pavement type decisions, they believe that smoothness is the most important attribute for drivers.

Looking Ahead

When complete, the market research will be used to calibrate the industry's marketing efforts and to update and adjust our outreach efforts and messages. Furthermore, we'll continue to work to develop materials to promote PEC research projects as they are completed and readied for deployment.

APA Deployment Activities

GOAL: To deploy products and resources developed through the scientific and engineering research community, including the Pavement Economic Committee (PEC) Task Groups, and through the industry's Go to Market communications and marketing program to build and support regional and national initiatives that communicate industry messages to decision-makers with the aim of making asphalt the pavement of choice.

Market Integration

In 2016, the Asphalt Pavement Alliance (APA) focused on establishing a regional system for deploying scientific research and marketing materials to industry customers. The APA has delineated five U.S. regions – Northeast, Northcentral, Southeast, Rocky Mountain, and the Pacific Coast – and began building out Regional Councils in each strategic location. During 2016, regional meetings were held in the Northeast and Northcentral regions, bringing together contractors, suppliers, State Asphalt Pavement Association (SAPA) executives, and representatives from the National Asphalt Pavement Association (NAPA) and the Asphalt Institute. These meetings helped create regional action plans and initiatives, and Regional Councils comprised of industry leaders to provide insight, oversight, and expertise. To lead this effort in the highly competitive Northcentral region, the APA hired Dan Staebell as Northcentral Regional Director in March.

Looking Forward

During 2017, the Deployment Task Group will expand the regional approach by planning meetings for the Southeast, Rocky Mountain, and Pacific Coast regions. These meetings will include regional NAPA members operating to provide input and direction regarding the best outreach efforts to increase asphalt production and protect market share. The Southeast meeting is planned for February 15–16 in Atlanta. Information is available on www.asphaltroads.org. Dates and locations for the other regional meetings are forthcoming.

The Northeast and Northcentral regions will continue to pursue the initiatives identified during 2016. Follow-up regional meetings will be held in 2017 to review goals and to establish future ones. Similar to the previously mentioned regional meetings, participation from NAPA members is highly valued.

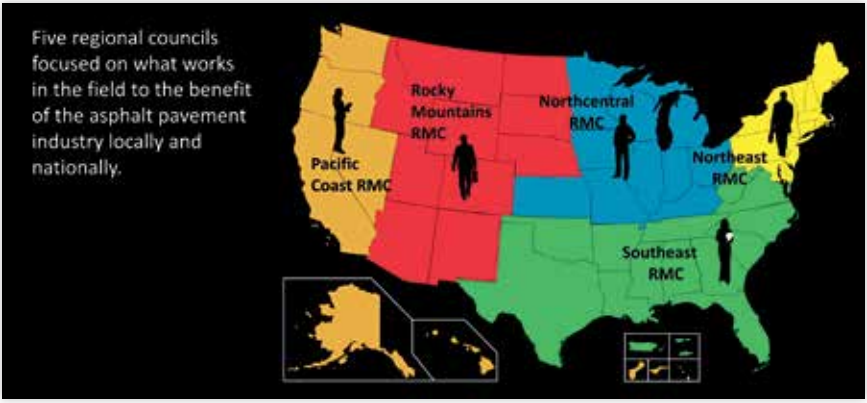
National Efforts

On the national level, the APA continues with its tradeshow program, which provides an opportunity to discuss scientific facts and technological innovations with the industry's primary audiences. This effort has delivered the latest industry information to key stakeholders in the pavement, architectural, green construction, and parking lot industries.

Key to advancing the adoption of long-life asphalt pavement designs, the Perpetual

Deployment Task Group

Deployment Lead: Amy Miller, P.E.
Project Dates: Ongoing



Pavement Awards program recognizes asphalt pavements that are at least 35 years old, have never had a structural failure, and receive periodic resurfacing no more than every 13 years on average. This prestigious award helps departments of transportation convey to lawmakers, taxpayers, and drivers the value of constructing long-life asphalt perpetual pavement. To date, 108 pavements have been recognized with a Perpetual Pavement Award, including eight in 2016.

During 2017, the APA will work with SAPAs and contractors to create unified themes for deploying information developed through the Pavement Economics Committee, its task groups, and the Go to Market program, as well as host national webinars to promote use of PaveXpress to engineers. In particular, materials developed by the Pavement Economic Committee's Private Markets and Local Roads Task Group will be used in meetings and discussions with national accounts.

With these plans and with the united support of the Asphalt Institute, the National Asphalt Pavement Association, and the State Asphalt Pavement Associations –the APA will increase the success of the asphalt industry regionally and nationally.

NAPA gratefully acknowledges the generous support of the State Asphalt Pavement Associations for the programs of the Pavement Economics Committee.

Alabama Asphalt Pavement Association

Arkansas Asphalt Pavement Association

California Asphalt Pavement Association

Colorado Asphalt Pavement Association

Connecticut Asphalt & Aggregate Producers Association

Delaware Asphalt Pavement Association

Asphalt Contractors Association of Florida

Hawaii Asphalt Paving Industry

Illinois Asphalt Pavement Association

Asphalt Pavement Association of Indiana

Asphalt Paving Association of Iowa

Kansas Asphalt Pavement Association

The Plantmix Asphalt Industry of Kentucky

Louisiana Asphalt Pavement Association

Maine Asphalt Pavement Association

The Maryland Asphalt Association

Massachusetts Aggregate & Asphalt Pavement Association

Asphalt Pavement Association of Michigan

Minnesota Asphalt Pavement Association

Mississippi Asphalt Pavement Association

Missouri Asphalt Pavement Association

New Jersey Asphalt Pavement Association

Asphalt Pavement Association of New Mexico

New York Construction Materials Association

Carolina Asphalt Pavement Association

Flexible Pavements of Ohio

Oklahoma Asphalt Pavement Association

Asphalt Pavement Association of Oregon

Pennsylvania Asphalt Pavement Association

South Carolina Asphalt Pavement Association

Tennessee Road Builders Association

Texas Asphalt Pavement Association

Utah Asphalt Pavement Association

Virginia Asphalt Association

Washington Asphalt Pavement Association

Asphalt Pavement Association of West Virginia

Wisconsin Asphalt Pavement Association

NAPA

NATIONAL ASPHALT
PAVEMENT ASSOCIATION