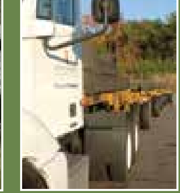


Fall 2019
Volume 31, Number 2

Asphalt Technology News

IN THIS ISSUE

National Center for Asphalt Technology
NCAT
at AUBURN UNIVERSITY

Refining the Ignition Method for Asphalt Content Determination

Developed at NCAT, the ignition oven set the industry standard for determining asphalt content by ignition method.

Accurate determination of asphalt content and aggregate gradation is critical for controlling the quality of asphalt mixtures during construction. Most state specifications require quantitative evaluation of the asphalt content as a criterion for acceptance. The ignition method detailed in AASHTO T 308 is required or allowed by most state DOTs for determining the asphalt content of a mixture.

Developed in the mid-1990s, the procedure was rapidly implemented by laboratories to eliminate the use of hazardous solvents needed for extraction methods. The ignition method removes the binder from mixture samples by burning the binder at a high temperature, typically 1000°F. The test is complete when the change in mass does not change by more than 0.01% for three consecutive minutes. AASHTO T 308 includes two procedures, one for furnaces with an internal balance and one for furnaces without an internal balance.

Since the extremely high temperature used in the test also results in some loss in aggregate mass, the determination of an asphalt content correction factor (CF) is required for each mix and each ignition oven used. Developing the CF involves the preparation of two samples of the asphalt mixture at the design asphalt content. The CF samples are tested and the CF is calculated as the difference between the actual and measured asphalt binder contents expressed as a percentage of the total mix mass.

As shown in Table 1, the precision of the ignition method is much better than the solvent extraction method detailed in AASHTO T 164. The acceptable range of ignition method results for split samples tested in different labs is less than half of the acceptable range of the solvent extraction test.

Although the ignition method is straightforward and more precise than solvent extraction, there are still issues that need to be improved. Some agencies and/or contractors share CFs between ignition units. For example, it is common to determine a CF during mix design and then use that same CF for other furnaces during quality control testing, acceptance testing, and/or independent assurance testing of the mixture. Although this can significantly reduce the test time when more than one unit is being utilized, this approach violates AASHTO T 308, which states that a CF should be established for each mix and for each ignition test unit. Another issue for some regions of the country is with aggregates that have relatively high and/or inconsistent CFs. For example, dolomites are known to undergo chemical changes at high temperatures, causing some decomposition and a higher mass loss than other common aggregate types.

NCHRP 9-56 was funded to explore solutions to these problems. The research, conducted by NCAT, included a survey of state DOTs and asphalt contractors regarding practices used with the ignition method and experiments to determine the sensitivity of the method with respect to aggregate type, furnace type, test temperature, asphalt content, and sample mass. The project also included an interlaboratory study to assess the precision of ignition method CFs for different mixes.

The information requested in the survey included furnace types, typical ranges of asphalt content CFs, aggregate types, and possible factors affecting CFs. Survey results showed that the most common unit was the Thermolyne convection furnace, followed by the Troxler infrared unit, both with internal balances. Very few labs use the Gilson furnaces with no internal balances. The majority of respondents indicated that their CFs were less than 1.0%. The respondents also indicated that aggregate geology, test temperature, and inclusion of hydrated lime may affect CFs.

The sensitivity and interlaboratory studies included four asphalt mixtures using three aggregate blends, and one blend was prepared with and without hydrated lime. The aggregate types were selected based on their historical CFs. Mix 1 had a CF less than 0.5, Mix 2 had the same aggregate blend as Mix 1 except it contained 1.0% hydrated lime, Mix 3 used aggregates that had a CF between 0.5-1.0, and Mix 4 used aggregates with a CF greater than 1.0.

The results of the sensitivity study showed that test temperature was the primary factor affecting the asphalt CF. From Figure 1, it is evident that decreasing the test temperature from 1000°F to 800°F decreased the aggregate mass loss for all mixes that didn't contain lime. It is interesting to note that for the mix containing hydrated lime, the mass gain at 800°F was lower than for the tests at 1000°F. Also, the tests at 800°F effectively removed all of the binder from the mixes without substantial changes in testing time.

Twenty-three labs participated in an interlaboratory study to evaluate test precision. Each of the three brands of ignition furnace were represented in the experiment. Tests were conducted with the furnace set to 1000°F for Mixes 1, 2 and 3, and at 900°F for Mix 4 (as currently recommended in the AASHTO procedure for high mass aggregates). Figure 2 shows the average asphalt CFs for Mix 3 for each laboratory. The minimum and maximum CFs are also reported and the information is grouped by unit type. The results indicate that even when ovens

Table 1. AASHTO T 308 and AASHTO T 164 - Precision Statements

Condition	Standard Deviation		Acceptable Range of Two Tests	
	AASHTO T 308	AASHTO T 164	AASHTO T 308	AASHTO T 164
Single Operator Precision: AC (%)	0.069	0.18/0.21*	0.196	0.52/0.58*
Multilaboratory Precision: AC (%)	0.117	0.29	0.33	0.81/0.83*

*Precision estimate when extractant containing 85% terpene is used.

Table 2. Precision Statement Comparison for Asphalt Binder Content by Mix

Mix #	Actual AC %	Measured AC %	CF	Repeatability Standard Deviation (sr)	Reproducibility Standard Deviation (sR)
1	5.2	5.32	0.12	0.089	0.131
2	5.2	4.97	-0.23	0.074	0.111
3	6.2	7.08	0.90	0.112	0.264
4	6.1	7.31	1.21	0.178	0.403
AASHTO T 308				0.069	0.117

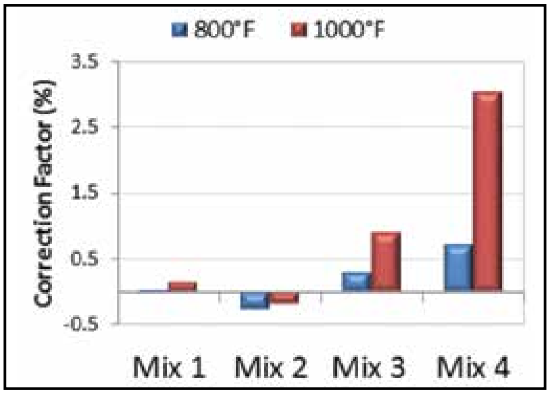


Figure 1. Asphalt Content CFs at Different Test Temperatures

of the same brand are used, the CFs vary significantly. Similar results were obtained for the other three mixes.

Table 2 summarizes the average asphalt content, average CF, and within- and between-lab standard deviations for each mix. Mixes 1 and 2 had similar within- and between-lab standard deviations: 0.089 and 0.074 for within-labs and 0.131 and 0.111 for between-labs. These results are close to the repeatability and reproducibility standard deviations in AASHTO T 308: 0.069 and 0.117, respectively. The results in Table 2 show that as the CFs increased (Mixes 3 and 4) the standard deviations increased. The within-lab standard deviations for Mixes 3 and 4 were 0.112 and 0.178, respectively, and the between-lab standard deviations were 0.264 and 0.403, respectively.

It is also evident in Table 2 that the addition of hydrated lime caused a significant change in the CF, from 0.12 with no lime to -0.23 with 1% lime, a difference of 0.35. The effect of hydrated lime has been reported in other studies. Prowell and Youtcheff[1] explained that during the test, CaO from the lime reacts with oxygen in the furnace and sulfur present in asphalt binders at varying percentages, depending on crude source, to form $CaSO_4$ (anhydrite) in the ash. Stoichiometrically, this reaction product could increase ash mass by 4.53 times the sulfur content of the asphalt, and therefore, result in a negative CF.

This study concluded that CFs were

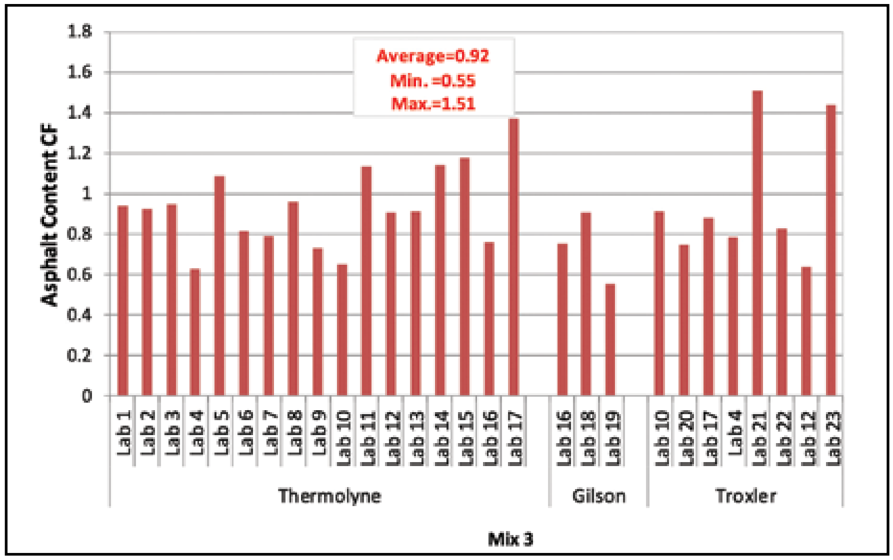


Figure 2. Asphalt Content Average Correction Factors - Mix 3

significantly different for different mixes even when the same brand of furnace was used. This means that it is not appropriate to use the CF for a mix determined with one ignition furnace for tests conducted on the mixture with another furnace. The study also found that the within-lab and between-lab precision information depend on the magnitude of the CF. Mixtures with high CFs have poorer repeatability and reproducibility.

As part of this study, a Standard Practice for Installation, Operation, and Maintenance of Ignition Furnaces was proposed and published as AASHTO Standard R 96-19.

Although this study did not include any mixes with RAP, it is expected that conducting ignition tests at 800°F would improve the accuracy of determining the asphalt content of RAP materials. A follow-up study is currently underway to assess the variability of asphalt CFs for mixes containing recycled materials. In addition, the effect of reducing the test temperature to 800°F is under evaluation. For the final task of this project, another interlaboratory study will be conducted to establish a new precision statement for AASHTO T 308. This interlaboratory study will include virgin and recycled asphalt mixes.

[1]Prowell, B. D., and J. Youtcheff. Effect of Lime on Ignition Furnace Calibration. *Transportation Research Record: Journal of the Transportation Research Board*, No. 1712, TRB, National Research Council, Washington, D.C., 2000, pp. 74-78.

For more information, contact Carolina Rodezno at mcr0010@auburn.edu

Letter from the Director

Momentum is Building for Balanced Mix Design

Momentum is a word that has several meanings. In sports, it is the perceptible shift in a contest when one team or competitor begins to gain the advantage. In physics, it is the property of a moving object calculated by the product of its mass and velocity.

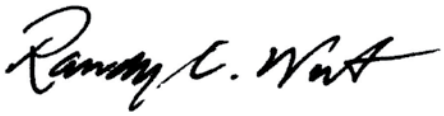
In the world of asphalt pavements, it is clear that the concept of balanced mix design (BMD) is gaining momentum. BMD is a new era of mix design that promises to result in longer lasting asphalt pavements. The impetus for change is rooted in the recognition that some asphalt pavements have not performed to expectations even though they met the project's specifications.

Most state DOTs have tweaked their mix design specifications to increase asphalt contents by a few tenths of a percent. However, these small changes have been unable to overcome some fundamental weaknesses of the current mix design method which depends primarily on the volume of effective asphalt to ensure mixture durability. In reality, the volume of effective asphalt is not easy to measure and it tells us nothing about the quality of the binder. The Superpave mix design system also relies on specified minimum properties of mix components (e.g. aggregate angularity criteria and PG binder specifications), but this approach misses the interactions that occur between materials. This has become more critical as the use of recycled materials has increased and more innovative additives are utilized in mixtures.

The concept of BMD utilizes simple mixture performance tests to more directly assess a mixture's resistance to the types of distress that could occur on the project. The word "balanced" in balanced mix design infers that the mixture will have good resistance to rutting and cracking. Testing of the mix makes more sense than testing the individual components because the interactions are manifest in the performance test results. We want the mix performance tests to be simple enough so that every asphalt lab can perform them, but just being simple and fast is not good enough. The test results have to be demonstrably related to the mixture's resistance to the particular distress. Just because we can measure a mix characteristic does not mean that characteristic is a good indication of performance.

In the last year, NCAT proposed a framework for BMD that is now working its way through AASHTO's Committee on Materials and Pavements. We are nearing the completion of an experiment to determine which cracking tests are best suited for indicating top-down cracking and thermal cracking. We are also finalizing the analysis of a round-robin study to gain more information about the between-lab variability of the most popular mix performance tests. Many other researchers are conducting studies that will help fill in the gaps.

Momentum for BMD is evident by the number of workshops, webinars, training classes, research projects, and pilot projects that now have a focus on BMD. Day to day conversations among asphalt technologists in labs and offices all across the country now center on how to implement BMD tests in mix design and quality assurance testing. If you are a stakeholder in the world of asphalt pavements, you should be involved in work to fill in the gaps of the BMD framework. As the physics of momentum teaches us, it's much easier to be involved in change at the beginning before the velocity takes off, and you are more likely to influence the direction of change when the mass is relatively small. Keep up the good work for better pavements.



Randy C. West, Ph.D., P.E. | Director & Research Professor

Preliminary Results from NCAT Performance Test Round-Robin

Two hundred five-gallon buckets of asphalt mix were sampled during 2018 Test Track construction for the round-robin study.

In 2018, NCAT initiated a round-robin study for mixture performance tests being considered for balanced mix design (BMD) implementation. Over 40 labs participated in the round-robin study with an interesting cross section of state DOTs, contractors, consulting firms, materials suppliers, and even a few international labs. Each lab selected the tests that they wanted to perform. The most popular tests were the Hamburg Wheel-Tracking Test (AASHTO T324-17), the Illinois Flexibility Index Test or I-FIT (AASHTO TP 124-18), the Asphalt Pavement Analyzer or APA (AASHTO T340-10), and the Ideal Cracking Test or Ideal-CT (now ASTM 8225-19).

The study had two main objectives. The first was to give labs that are new to mix performance tests a chance to gauge their results compared to results from other labs. The second objective was to generate information on within-lab and between-lab variability of the tests.

After determining the quantity of mix needed for the study, NCAT staff sampled a single plant-produced mix produced for an experiment on the NCAT Test Track. Two hundred five-gallon buckets of mix were sampled from a hot stockpile of asphalt that had been passed through a material transfer vehicle. The mixture was a 9.5 mm NMAS mixture containing PG 64-22 binder with no polymer or rejuvenator modification. The mixture had an intermediate reclaimed asphalt pavement (RAP) content and was designed using a BMD process. The BMD mix was desired so that reasonable values of rutting and cracking parameters could be obtained from the round-robin testing.

For the first phase of the study, detailed instructions were sent to the participating labs along with enough mix needed for conducting the performance tests they selected. The participating labs then fabricated and tested specimens and sent a data summary along with a copy of the raw data files to NCAT for compilation and analysis.

At this point, all results from Phase 1 have been received. Draft summary reports have been provided to the participating labs for the Hamburg, Ideal-CT, and I-FIT test, and the APA report is currently being prepared. Table 1 summarizes the between-lab variabilities for the Hamburg, I-FIT, and Ideal-CT.

Table 1. Summary of Between-Lab Variability Information from the First Phase of the Round-Robin Study

Test	Parameter	Participating Labs	No. of Outlier Labs	Mean	Std. Dev.	Coef. of Variation (%)
Hamburg	Rut Depth (mm) at 20,000 cycles	32	4	3.45	0.60	17.5
I-FIT	Flexibility Index	19	1	3.95	1.62	41.0
Ideal-CT	CT Index	14	0	109.8	36.6	33.3

For the Hamburg test, four labs reported results that were determined to be outliers. Outlier labs were identified using a standard Boxplot analysis. In these four cases, the reported rut depths were significantly higher than the results from the other 28 labs. Excluding the four outlier lab results for the Hamburg test yielded a coefficient of variation (COV) of 17.5%, which is a reasonable measure for repeatability among participating labs.

For the I-FIT results, only one lab was identified as an outlier, but the between-lab COV was 41%, which is the same as reported by the Illinois DOT in their most recent round-robin. The higher variability for the I-FIT was driven by a handful of labs that reported very high COVs for their within-lab results. For the Ideal-CT, no outlier labs were identified and the between-lab COV was 33%.

After the first phase of the study, there was enough of the sample mix remaining to conduct a second phase for the I-FIT and Ideal-CT. The objective of the second phase of the study is to evaluate how much of the variability is related to sample fabrication and how much is related to testing in the different labs. To accomplish this, I-FIT and Ideal-CT specimens were fabricated at NCAT, taking care to prepare the specimens as uniformly as possible. The fabricated specimens were randomized based on air voids so that each lab would receive a set of samples with approximately the same average air void content. These specimens were then packed and shipped to the participating labs.

The phase two results for the Ideal-CT have been received from all of the participating labs. In this phase, the between-lab mean CT Index was 103.7, the standard deviation was 11.5, and the COV was 11.1%. These results reveal how much effect sample fabrication has on variability. In the case of the Ideal-CT test, the COV was reduced from 33.3% to 11.1% from Phase 1 to Phase 2, indicating that differences in sample fabrication from lab to lab contributed to two-thirds of the overall between-lab variability of the test. This is an important finding that emphasizes the need for thorough hands-on training as part of implementation plans for performance tests used in mix design or production testing.

NCAT continues to finalize the initial reports for the first phase and will provide further details to each participating lab this fall. Further analysis of Phase 2 also continues as additional labs report their results. Another planned aspect of analysis is to examine how results may be affected by the make and model of the test equipment. Another round-robin is being considered that may involve other mixtures and additional video-based training on sample fabrication and testing.

For more information, contact Adam Taylor at tayloa3@auburn.edu

Research Needed on Using Recycled Plastics in Asphalt

Over the last few years, there has been increasing interest in using recycled plastics in asphalt pavements. News outlets and social media reports have suggested that recycling plastics in asphalt mixtures is a golden opportunity to improve the performance of pavements while eliminating the growing amount of waste plastics being landfilled or polluting the environment through litter. According to the Environmental Protection Agency, approximately 33 million tons of plastics were generated in 2014, with less than 10% being recycled. Among the plastics generated, linear low-density polyethylene (LLDE), low-density polyethylene (LDPE), and high-density polyethylene (HDPE) combine to account for the largest proportion while other types of plastics include polyethene terephthalate (PET), polypropylene (PP), polyvinyl chloride (PVC), polyurethane (PU), polystyrene (PS), polycarbonate (PC), and others.

Using recycled plastics in asphalt is not a new concept. In general, there are two approaches to incorporating recycled plastics in asphalt mixtures: the wet process and the dry process. In the wet process, recycled plastics are added to the asphalt binder as with polymer modifiers, where mechanical mixing is required to achieve a homogenous plastics-modified binder blend. In the dry process, recycled plastics are added directly to the mixture either as a partial aggregate replacement or a mixture modifier. Unfortunately, both processes have implementation challenges. For the dry process, there is a concern about the lack of consistency in the quality of the final produced mixtures. For the wet process, a major limitation is poor storage stability of the plastic-modified binder, where the plastic tends to separate from the asphalt binder due to the difference in density and viscosity as well as the chemical incompatibility between the two components.

India reportedly has over 15 years of experience with the dry process for low volume roads. During mixture production, up to 10% of recycled plastics (limited to LDPE, HDPE, PU, and PET) by weight of asphalt binder are added, where the plastics are melted and coat the surface of the aggregates. Existing studies indicate that pre-coated aggregates with recycled plastics have enhanced toughness, abrasion resistance, bond strength, and reduced asphalt absorption, which produces asphalt mixtures with better resistance to rutting, fatigue damage, and moisture damage. Unfortunately, most of these studies lack a robust experimental plan and suffer from the use of dated test methods.

Over the last decade, several laboratory studies in Asia and Africa have reported successful experience with recycled plastics using the wet process. These studies claim that adding recycled plastics can significantly increase binder stiffness and rutting resistance, and thus, has the potential to extend the service lives of asphalt pavements. However, in the U.S., rutting is much less of a problem for most highway agencies; the greatest current challenge is cracking of some form or another. Because stiffer binders tend to be more susceptible to cracking, using plastics in asphalt may be more detrimental to performance.

In Europe, several demonstration projects have been constructed over the past few years using proprietary recycled plastic products in asphalt pavements. A limited number of research studies indicate that adding these plastic products improve the stiffness, rutting resistance, and fracture toughness of the modified asphalt mixtures while reducing the amount of asphalt binder by approximately 6-10%. Nevertheless, their impacts on the actual pavement performance remains unknown and warrants further investigation.

Earlier this year, Dow Chemical completed two small projects on private roads in Texas using asphalt binders modified with recycled plastics using the wet process. The binder formulation was a neat PG 64-22 binder modified with 1.5% LLDPE-rich post-consumer plastics, ElvaloyTM copolymer, and polyphosphoric acid. The final modified binder met the Texas Department of Transportation's PG 70-22 specifications. More recently, the company worked with a contractor in Michigan to complete several parking lot and county road projects using similar binder formulations. Early field performance of these projects will be monitored in the next few years.

Since November 2018, NCAT researchers have been working on a study involving chemical characterization and performance testing of asphalt binders and mixtures modified with recycled polyethene (rPE) materials (Figure 1). The study is sponsored by the Plastics Industry Association. The very first experiment of the study focused on storage stability testing of rPE-modified binders. NCAT researchers found that when more than 3% rPE was used with the wet process, the

Figure 1. Recycled Polyethene (rPE) Samples used in the NCAT Study

modified binder failed the storage stability requirement due to separation of the rPE. However, adding a reactive ethylene-based terpolymer (RET) significantly improved the distribution and stability of rPE in the asphalt binder. The ongoing second experiment focuses on characterizing the rheological and chemical properties of rPE-modified binders. Preliminary results indicate that adding rPE increases the stiffness and rutting related parameters of asphalt binder but has no impact on its cracking related parameters. Using rPE and RET in combination, on the other hand, significantly improved binder elasticity and all rutting and fatigue parameters. Further, rPE modification improved the binder's resistance to oxidative aging, but the improvement was less than with SBS modification. The last experiment of the study will focus on performance test evaluations of rPE-modified asphalt mixtures. A suite of mixture performance tests will be conducted to determine the effect of rPE modification on mixture rutting and cracking resistance. The study is anticipated to be completed later this year.

There is no doubt that waste plastics are a global challenge, but our solution must avoid creating a bigger problem. Ideally, the solution will be a win-win, but it is apparent that it will require more research and development to prove the long-term value of using a new recycled material in the U.S. transportation infrastructure.

Despite the efforts discussed above, the development of the science of recycling waste plastics in asphalt is still at an early stage and needs much more research. Specifically, research efforts should be devoted to demonstrating that adding recycled plastics has no negative impact on the long-term performance, life-cycle costs, environmental impact, and recyclability of asphalt pavements or any unintended consequences on the health and safety of plant operators and construction crews. Furthermore, low-risk demonstration projects are needed to identify the potential changes in the production and construction practices of asphalt mixtures containing recycled plastics.

If all of the performance, environmental, and economic benefits can be proven, using recycled plastics in asphalt could be a sustainable solution. However, mandates for recycling plastics in pavements without a complete understanding of the impacts on pavement performance, the health of highway workers, and the environment could have devastating consequences.

For more information, contact Fan Yin at f-yin@auburn.edu

Asphalt Engineer's Workshop

Engineers employed by state highway agencies play a critical part in ensuring the quality of our roads and the safety of the traveling public. Staff turnover in agencies across the nation creates a challenge of keeping knowledgeable people in these specialized roles, which becomes exacerbated by increased demands to keep pace with changes in technology. Even once a new engineer has a foundation, gaining more in-depth knowledge can be difficult.

NCAT makes it easy for agency engineers to develop a deeper understanding of designing, building, and maintaining asphalt pavements through the Asphalt Engineer's Workshop. This week-long immersive course is free for public agency engineers and is scheduled February 10-14, 2020 at NCAT's main research and training facility in Auburn, Alabama.

Participants will learn different aspects of pavement engineering from design and materials selection to the preservation and rehabilitation of asphalt pavements. Attendees will observe laboratory test demonstrations and tour the Lee Road 159 Pavement Preservation Study test sections. Trouble-shooting discussions will help participants apply what they have learned with the real-world problems they may encounter in their jurisdictions.

Topics covered include:

- Pavement design—lessons learned from the AASHO Road Test, traffic loading, pavement design formulas, Pavement ME design basics
- Asphalt materials—asphalt binders, binder grades and how they react to vehicle loading, aggregate gradations, testing of aggregates, and the use of recycled materials in asphalt mixtures
- Mix design—Superpave mix design and volumetric calculations
- Plant production—batch plants, continuous-mix drum plants, and quality control and assurance processes recommended for producing quality asphalt mixtures
- Performance testing—primary forms of pavement distress and laboratory tests used to predict field performance
- Balanced mix design (BMD)—overview, test options, and potential challenges and strategies for successful implementation
- Paving operations—surface preparation for both new and existing pavements, milling, tack coat best practices, mix delivery, paver operations, rollers and compaction, and field tests
- Pavement performance—distress identification, pavement ratings, performance curves, and pavement management systems
- Pavement preservation and rehabilitation—preservation treatment options for extending pavement life, repair of damaged areas, and structural rehabilitation.

Register soon, as class size is limited to 24 participants. The course is expected to be offered at NCAT every two years, and agencies can also host the course. Both Washington and Georgia Departments of Transportation have taken advantage of this opportunity, allowing more than 20 engineers to gain the same in-depth training at one time. Details are available at http://ncat.us/education/training.

For more information, contact Travis Walbeck at travis.walbeck@auburn.edu

Where Are They Now?

The NCAT experience is unique, combining world-class research and education with Auburn University's friendly atmosphere. NCAT will always have a special place in the hearts of those who have studied and worked here. In this issue, we catch up with Allen Cooley, Mike Huner, and Chris Jones as they reflect on their time at NCAT and how it shaped the course of their careers.

Allen Cooley

Allen Cooley (third from the right) with his crew on a recent project.

Growing up in Vicksburg, Mississippi, Allen Cooley's father worked with the U.S. Army Corps of Engineers and their family attended church with Dr. Ray Brown, who later became Director of NCAT. In 1985, they moved to Jackson, Mississippi where his father started the geotechnical firm Burns Cooley Dennis, Inc. Allen worked there as a young engineer and happened to run into Dr. Brown on a return flight from a training course who encouraged him to get his master's at Auburn.

Allen's graduate research evaluated the influence of baghouse fines on asphalt mixtures. After graduation, he stayed at NCAT as a research engineer and earned his PhD. His dissertation focused on the restricted zone in Superpave gradation requirements. He also worked on projects associated with the implementation of stone-matrix asphalt (SMA) and new-generation open-graded friction course (OGFC) and was involved with the Southeastern Superpave Center.

"When I was at NCAT, Superpave had just come out," said Allen. "Anytime there's something new, there's kinks, and I was lucky enough to be there when a lot of those kinks were being worked out. I was there at a really good time, and it all goes back to a flight from Atlanta, Georgia to Jackson, Mississippi when I saw Ray Brown."

In addition to the practical experience, Allen is most grateful for the people he worked with at NCAT and the relationships formed there.

"Ray Brown, Ken Kandhal, Doug Hansen, Shane Buchanan, Brian Prowell, Robert James, Kevin Williams, Tim Vollor, Bob Johnson, Todd Lynn, Mike Huner, Carol Mims, Vinnie Hester, Kim Johns, just to name a few—I don't know how you could have a better group of people," recounted Allen.

Allen moved back to Mississippi in 2003 to work with Burns Cooley Dennis, Inc., which had grown to include construction materials testing and pavement engineering. The firm's connection to NCAT remains strong, with five other current or former employees having worked at NCAT. Allen is currently finishing up his most enjoyable project ever: gathering field data to locally calibrate performance models for Mississippi's implementation of AASHTOWare Pavement ME Design.

Allen and Nancy, his wife of 24 years, have one son, Zach, who is pursuing a degree in landscape contracting at Mississippi State. Allen enjoys hunting and watching Mississippi State sporting events in his spare time.

Mike Huner

From left to right: Seth, Isabella, Mike, Alisha, Cole, and Jake Huner.

Mike Huner comes from an Auburn Engineering family. His father served as the engineer in Pike County, Alabama for many years, while his brothers Jeff and Chris both work for the Alabama Department of Transportation (ALDOT).

Mike joined ALDOT's civil engineer training program, working during summer and Christmas breaks while attending college. He started at Troy State and played baseball there before transferring to Auburn two years later, where he began working in the lab at NCAT, following in the footsteps of his brother Chris.

When Mike graduated in 1995, his planned career with ALDOT was halted due to a hiring freeze. Instead, he became a research engineer at NCAT and obtained a master's degree. His thesis focused on the effects of reheating on laboratory-compacted asphalt mixtures. Mike taught mix design and asphalt technology courses and was also involved with the construction and first research cycle of the NCAT Test Track.

In 2002, Mike and his family moved to Thompson's Station, Tennessee where he worked with the Asphalt Institute as a regional field engineer for the southeast. He took a job with SemMaterials in 2007 and then became technical director for the asphalt division of the Tennessee Road Builders Association (TRBA) in 2009. In 2014, he started Huner Consulting, LLC to serve as a resource for area cities and counties. He also offers technical training courses and speaks regularly at conferences.

"One thing I kept noticing over the years of my career at NCAT, the Asphalt Institute, and TRBA, was that cities and counties typically don't have a connection to the cutting edge research that's out there—we go to all of these conferences, but that doesn't always trickle down," Mike explained. "NCAT started out as a part-time student job, but it propelled me down a career path of asphalt pavements. I believe that NCAT is the leader in the industry as far as technology and what's going on in the asphalt world, and I was able to be right there at the heartbeat of it. It's priceless in how it built the foundation of my whole career."

Mike and his wife Alisha have three sons and one daughter. All three boys play football at Tennessee Tech. Seth and Cole are majoring in mechanical engineering, while Jake is studying civil engineering with an Army ROTC scholarship. Isabella is a senior in high school and competes in track. Mike and his family are active in their church, including hosting a Bible study for football team members while the boys were in high school, as well as embarking on a recent mission trip to Peru.

Chris Jones

Chris and Courtney Jones with their daughters Grace-Anne and Emma Caroline.

Chris Jones grew up in the Florida panhandle, and his father worked with Couch Construction, an asphalt contractor in Dothan, Alabama. Chris chose Auburn because he wanted to work at NCAT while studying civil engineering.

"I am very grateful for the good friends and contacts I made while working at NCAT, as well as meeting my wife there," said Chris.

While at Auburn, Chris worked for Couch Construction during summer breaks, and he took a position there when he graduated in 1994. At Couch, which was later acquired by APAC, Chris learned all aspects of asphalt construction—materials and mix design, quality control, estimating, and project management. In 1999, he was assigned as the project superintendent for the initial construction of the NCAT Test Track, which was completed in the summer of 2000.

"The Test Track was the most challenging and rewarding construction project of my career," said Chris. "It would have been impossible to complete successfully without the excellent team of people involved: Ray Brown, Buzz Powell, and Mike Huner at NCAT; Gordon Bigham and Tony Davis with Volkert; Skip Powe with ALDOT; my team from APAC (Randy Watkins, Ed Crews, Tim Sexton, Buster Hicks, Keith Kirkland, Earl Russell, Sam King, and Jimmy Strain); as well as numerous other top-notch personnel from NCAT, FHWA, and state DOTs."

After leaving APAC in 2005, Chris worked in estimating and project management with Wiregrass Construction. He also served as a member of the NCAT Applications Steering Committee during that time.

Since 2015, he has been a project manager for Ozark Striping Company, Inc., in Ozark, Alabama. He assists with estimating and is responsible for scheduling permanent striping projects across Alabama and the Florida panhandle for the DOT, counties, and cities, as well as maintenance striping projects in Georgia. He is also a member of the board of directors for the Alabama Road Builders Association.

Chris and his wife Courtney, who assists with technical writing for NCAT, have two daughters. Grace-Anne is a junior in high school, and Emma Caroline is in first grade. He has been active in church ministry through the years, serving as a deacon and youth Sunday school teacher, coordinating outreach for an adult Sunday school class, and preaching on two mission trips to Guyana.

Pavements and Materials Engineering Graduate Certificate

The Pavements and Materials Engineering graduate certificate (pending approval), offered through the Department of Civil Engineering, is available to both degree and non-degree-seeking students who are interested in continuing their education but may not be ready to commit to a master's degree program. If a student chooses to pursue a master's degree, all academic credit earned from this certificate may be applied toward the graduate degree.

A student who earns the certificate will have advanced knowledge and experience in the areas of asphalt materials, pavement evaluation, design, construction, and analysis. Students will develop the necessary skills to interpret and assess information presented in scientific literature related to pavements and materials while obtaining practical experience in the communication of scientific and technical concepts in written format.

You are eligible to apply if you hold a bachelor's degree in civil engineering (or equivalent) from an institution of recognized standing. Exceptions may be approved if the student has the background needed to succeed in the graduate engineering courses. You must also have a GPA of 3.0/4.0 or higher for the last 60 semester hours in a BS program (students who do not meet the GPA criterion may still be eligible to enroll if they have significant experience outside of the classroom).

To complete the program, students must select one of the following specific areas:

- Pavement Design
- Pavement Management
- Pavement Materials
- General (any three courses from Pavement Design, Design and Production of Asphalt Paving Mixtures, Advanced Pavement Design and Rehabilitation, Pavement Management and Rehabilitation, Pavement Construction, Advanced Characterization of Pavement Materials, Infrastructure Sustainability)

To apply, fill out the online graduate application at app.applyyourself.com/?id=auburn-g.

For more information, contact Benjamin Bowers (left) at bfb0014@auburn.edu or Fabricio Leiva (right) at leivafa@auburn.edu

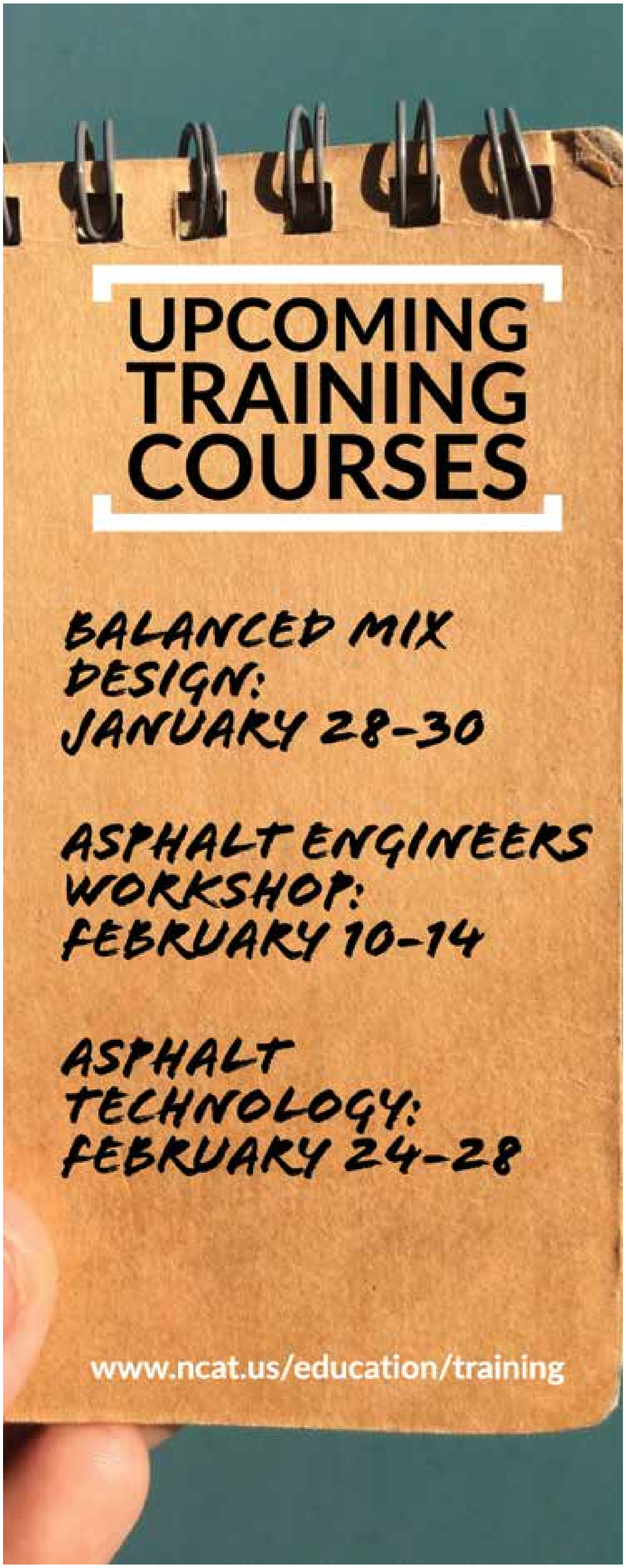
Musselman Joins NCAT Team

James "Jim" Musselman has been hired as NCAT's newest senior engineer, where he will focus on research implementation and training related to asphalt mixtures and construction.

Jim has 34 years of experience as a pavement engineer, beginning his career with the Florida DOT working in the area of asphalt materials and construction. From 1994 through 2016, he served as FDOT's state bituminous engineer where his primary responsibilities included administration of the statewide asphalt program, which encompassed a wide variety of activities related to the design, construction and materials utilization of asphalt pavements in Florida. Jim also held the position of Asphalt Performance Manager for CRH Americas Materials, providing technical support and training to CRH companies throughout North America.

"We are thrilled to have Jim join our team," said Randy West, NCAT Director. "I've known Jim for over three decades and have immense respect for his broad technical knowledge and experience in the development and application of asphalt pavement specifications. His real-world expertise adds value to the work that we do. We are very pleased to have him on board and are already seeing benefits of what he adds to the team."

Jim has both a bachelor's and master's degree in Civil Engineering from the University of Florida and is a registered engineer in the state of Florida.



Asphalt Forum

NCAT invites your comments and questions, which may be submitted to Christine Hall at christine@auburn.edu. Questions and responses are published with editing for consistency and space limitations.

For those that use liquid antistrip agents, what method(s) do you allow to introduce them for asphalt mix during production (i.e. in-line at the mix plant, terminal blended, etc.)? What is the preferred method by contractors that use them and why?

With the increased useof RAP and the growing RAP piles, consistency of these piles is important in good quality control and pavement uniformity. What are other DOTs requiring for quality control measures by contractors for testing the RAP piles? What tests are required and at what frequency?

How are other DOTs handling approval for mix designs for using a specific RAP pile and then switching to another RAP pile? Is a new mix design submittal required? Is verification required to ensure that the RAP used is similar to the original pile?
-Eric Biehl, Ohio DOT

Asphalt Forum Responses

The following responses have been received to questions shared in the previous issue.

Has anyone been successful in using alternate crack sealing materials? We typically require ASTM 6690 Type I, and most northern states use Type II. The materials do perform fairly well, but my concern is with these materials being milled up along with the old pavements. These crack filling materials usually contain large amounts of rubber compounds and are typically crushed and processed in RAP piles. These rubber materials cause lay down crews to dig out and remove them, or else pop outs show up on the new asphalt surface, which are esthetically unpleasing and may cause for concern for pavement failure. The unknown of these materials below the exposed surface may also pose a potential for issues later in the pavement life, perhaps even the start of mid-level cracking. This is a growing concern with the amount of RAP now being permitted in most asphalt mixtures.
-Cliff Selkinghaus, South Carolina DOT

Michael Stanford, Colorado DOT
No, CDOT still uses ASTM D6690 Type II.

Eric Biehl, Ohio DOT
Ohio has three crack sealant types: ASTM D6690 Type II (a modified binder similar to Type II with 2.0% polyester fiber), and a PG 64-22 neat binder with 5.0% polyester fiber. We are also looking at a mastic sealant for wider cracks. The determination on which would be used would depend on the application and when the next planned resurfacing/ pavement preservation activity would occur.

We've seen crack sealant in RAP piles and in new pavements. We don't typically see it that often in mixes on the road because most mix plants process their RAP over a 9/16-inch screen for surface and intermediate layers and a 1.5-inch screen for base layers.

Specification Corner

Ohio DOT
Ohio is looking at requiring rumble strips in the center line on two lane, undivided routes. Due to the potential issues with decreasing the durability around longitudinal joints, which typically have a lower density than the mat, we created a specification to address preparation of these joints: either mill a minimum of 3" off the cold joint or use ODOT SS-872 Void Reducing Asphalt Membrane (VRAM).

National Center for Asphalt Technology NCAT at AUBURN UNIVERSITY
1161 W. Samford Ave., Building 8
Auburn, AL 36849-0001

National Center for Asphalt Technology
277 Technology Parkway, Auburn, AL 36830-5354
ncat.us | Phone: 334.844.6228 | Fax: 334.844.6248

Randy West, Director
Christine Hall, Editor, Writer
Courtney Jones, Writer

ASPHALT TECHNOLOGY NEWS (Library of Congress Catalog No. ISSN 1083-687X) is published by the National Center for Asphalt Technology (NCAT) at Auburn University. Its purpose is to facilitate the exchange and dissemination of information about asphalt technology, trends, developments and concerns. Opinions expressed in this publication by contributors and editors, the mention of brand names, the inclusion of research results, and the interpretation of those results do not imply endorsement or reflect the official positions or policies of NCAT or Auburn University.

The National Asphalt Pavement Association's IMPACT Leadership Group Conference was tailor-made for the more than 80 emerging innovators and industry leaders in the asphalt industry who attended. The event included guided tours of the NCAT Test Track and a visit to our main facility's laboratories.