OHIO ASPHALT

Issue 4 Volume 6 Fall/Winter 2009

Flexible Pavements of Ohio's 48th Annual Meeting and the 2010 World of Asphalt Show and Conference in Cincinnati, February 15-18, 2010

World of Asphalt 2010

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In 2010, two standout events will be combined in one venue, as the World of Asphalt Show and Conference and the Flexible Pavements of Ohio 48th Annual Meeting will be held February 15-18 at the Cincinnati Convention Center. See page 20 for more information.

Flexible Pavements OF OHIO

Flexible Pavements of Ohio is an association for the development, improvement and advancement of quality asphalt pavement construction.

Ohio Asphalt *is published by Flexible Pavements of Ohio four times a year. Advertising deadline is the 1st of the month preceding publication.* Ohio Asphalt *is not copyrighted and portions may be reprinted with the permission of Flexible Pavements of Ohio. 525 Metro Place North, Suite 101, Dublin, OH 43017: telephone: 614.791.3600, 888.446.8649; Web site: www.flexiblepavements.org*

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The President's Page

Clifford Ursich, P.E.
President & Executive Director

If there ever was opportunity to win big it's now. I'm not speaking of investing in Wall Street, I'm talking about investing in your roadways and parking infrastructure.

Buy Low, Sell High

If any of you have been watching Wall Street over the past year there has been ample opportunity to buy low. For those having the financial wherewithal to invest in a market that seemed to be going bust just last February, great dividends will be the reward of the courageous ones who ventured in. There is a similar scenario being played out under our noses in the highway construction "market." The question is, will those who hold the purse strings be courageous and venture in; for great will be their reward.

This "Great Recession" as it has been dubbed, is resulting in unprecedented competition in the construction industry as contractors vie for work. Evidence of this competition can be seen at the bidding table. Currently, it is commonplace for asphalt paving bids to be lower than the engineer's estimate by double digit percentage points, and the increased number of bidders reflects this heightened level of competition. What does this mean for the agencies letting contracts? Great buying power, that's what this all means. Buying power beyond anything experienced in this generation's lifetime.

A case in point, recently I was discussing the matter of purchasing power with an agency representative. I knew that bids for highway projects had typically been coming in very competitive. This person shared with me that their metro park paving project drew 13 bids and was about 50 percent under the engineer's estimate; and they assured me the engineer is very good at what he does. Half price! How many of us wouldn't beat a path to the store that was offering that deal? Certainly that is the exception; but non the less it is a buyers market.

Buy High, Sell Low?

Viewing what happens when Wall Street rises and falls reveals an interesting facet of human nature. It's something that we would do well to avoid in this great time of opportunity; a time when agencies' buying power is so strong.

The sad truth of the matter is that many folks who invest in Wall Street finally get in when markets are peaking. In the not so recent past, a chart came across my computer screen as an attachment to an e-mail from an investment firm known for its "bullishness." It was a chart that shows the fluctuation in the value of the stock market juxtaposed against the number of people entering and exiting the market. It clearly demonstrates human nature. The number of people entering the market is highest when the market value is highest, and the number of people exiting the market is greatest when the market is at its lowest point. People are buying high and selling low, that's what the chart tells us and it's a sure formula for opportunity lost.

Buy Low, Buy NOW!

Property owners, city fathers, county commissioners and other such folks are fellow participants in this very challenging economic time. Like the contracting industry, they too are strained for cash. Many customer and constituent voices are clamoring for their projects to be completed and programs to be funded. Priorities have to be reevaluated and money reallocated to where it can be most wisely spent; and that is a good thing. It is in times such as this that what is convenient must give way to that which is prudent. Otherwise, opportunity is lost.

If there ever was opportunity to win big it's now. I'm not speaking of investing in Wall Street, I'm talking about investing in your roadways and parking infrastructure. In August 2008, asphalt binder prices spiked to $694 per liquid ton, an all-time high. In December 2009, asphalt binder is $417, a 40 percent drop in price. Contractors are hungry for work, and results from the bidding table demonstrate substantial savings.

When you "invest" in asphalt you are investing in a product having a legacy of innovation, continuous quality improvement and characterized by bold initiatives. From the advent of Quality Assurance in 1976, to recycling in the late '80s, to free draining bases, to Superpave, Perpetual Pavement, Smoothseal, Warm Mix Asphalt … and the list goes on, the Ohio asphalt pavement industry and its partners at the Ohio Department of Transportation, National Asphalt Pavement Association, Federal Highway Administration, the Asphalt Institute, the State Asphalt Pavement Associations and Ohio's academia bring to you a product worth investing in. So, BUY LOW, BUY NOW! OA

FPO Expands Customer Outreach

Gall joins staff as Director of Customer Relations

Joining the Flexible Pavements of Ohio (FPO) staff as Director of Customer Relations on December 14, much of Andrew Gall's responsibilities will involve advocacy and outreach efforts to industry customers, federal and state policy makers, affiliated trade associations and the construction industry at large.

"Andrew's institutional knowledge of the industry and our customer base will prove a great asset to the association and its mission of promoting the use of asphalt pavement," FPO's President and Executive Director Cliff Ursich said. "He will be a valued addition to the FPO team."

Gall brings to the position both public- and private-sector experience. He spent more than 12 years working for the Ohio Department of Transportation (ODOT) in various capacities on the department's senior staff, most recently as the departmental chief of staff. In addition to his public service, Gall has held positions with two civil engineering firms in Ohio, where he was responsible for a variety of corporate administrative, marketing and business development tasks.

As ODOT chief of staff, he was responsible for policy development and implementation, statewide media and public relations as well as working with members of the legislature and other state agencies. He managed the ODOT's State Infrastructure Bank, which provided more than $300 million in construction loans dedicated to local transportation infrastructure. He served as the agency liaison on cabinet level committees, including Gov. Bob Taft's Jobs Cabinet, the Bicentennial Commission and the State of Ohio Security Task Force. In 2003, he received a gubernatorial appointment to the State Highway, Bridge and Overpass Vandal Fence Task Force.

Most recently, Gall served as the regional director of Business Development for a civil engineering firm, Quality Control Inspection Inc. He was responsible for the development and implementation of a regional marketing program as well as serving as a corporate resource on the administrative procedures of state and federal construction programs.

"I believe my experience in the transportation industry combined with my public sector service will allow me to advance the mission of FPO in promoting the use of asphalt pavement." Gall said. "I look forward to getting to work."

Representing the interests of the FPO membership to the construction industry, asphalt consumers and state and local government will be Gall's primary focus. He will be tasked with conveying FPO's message and fostering an industry friendly regulatory environment while working to ensuring a stable, adequately funded roadway construction program in the state of Ohio.

"I am excited to represent our membership and continue the work of the association in creating a culture where asphalt pavement is the first choice in roadway construction and maintenance." Gall said

Gall, his wife and twin sons reside in Columbus. He is a graduate of The Ohio State University and a veteran of the United States Marine Corps. OA

Low-Strain, Long-Life Pavements

Vic Roberts, P.E.

This begins a series of articles intended to give pavement owners and engineers the knowledge needed to ensure their asphalt pavement designs result in successful performance. We'll be exploring these areas: soils, drainage, road-base construction, pavement-thickness design and pavement performance. Our authors are Vic Roberts, P.E., former city engineer for the City of Englewood and now vice president for R.B. Jergens Contractors, and James Scherocman, P.E., international paving consultant, former Asphalt Institute engineer for Ohio, and ODOT Flexible Pavements Engineer. Together these gentlemen bring a wealth of knowledge mined from years of practical application.

James Scherocman, P.E.

Everyone wants to build long-lasting asphalt pavements. We all want to build roads that (1) stay crack free, (2) won't rut, and (3) stay smooth and uniform, year after year, generation after generation. Today, we have the right tools to accomplish this amazing goal. And it's surprisingly simple. We'll explain how to succeed using these tools. The concept is simple; low strain equals long life.

We're going to present four articles discussing the Art of Roadbuilding. Let's start by gathering our tools.

Use Soil Classification Systems as a Tool

Ohio Department of Transportation (ODOT) classifies subgrade soil using American Association of State Highway and Transportation Officials' (AASHTO) user-friendly system. Soils are classified from A-1 to A-8 in numerical order. High-grade granular soils are A-1, and muck ranks a lofty A-8. Low numbers have high-quality coarse-grained materials with high internal friction. Whereas, the higher numbers, like we ordinarily find in Ohio, mean progressively worse soils. The three main Ohio soils groups are A-4, A-6 and A-7.

Another widely used system is the Unified Classification System. It was developed by the Army Corps of Engineers in 1952. Ohio subgrade soils usually fall under the CL or CH class (C stands for clay, and L, H, for low or high plasticity). So CL soils are low-to-medium plasticity (similar to A-4 or some A-6 soils). CH soils are more plastic clays (like A-6 and A-7). The liquid limit determines if the soil gets tagged a CL or CH. Liquid limits above 50 are CH soils, and liquid limits below 50 are CL soils.

Bottom-Up Design

It must be understood that no pavement is better than what it's built upon.

As road builders and designers we have a lot of control. We can pick different asphalt mixes, different aggregate sizes and different binders. We control layer thickness, density and quality. But there's one important component that we can't control: the pavement foundation, or subgrade soil. And while it's true that soil cannot be controlled, it at least can be managed.

In Ohio, as in many parts of the country, subgrade soil is primarily clay, or silty-clay. But soils differ – and often within the project limits. But simple soil testing can spot these differences, and alert us to issues **before** construction begins. That's the key. The soil test answers one critical question: Is the soil friend or foe? Soil testing is all about the old axiom: "Know your enemy." Or the Boy Scout motto: "Be prepared!"

ODOT's Construction Inspection Manual begins with this quote: "Soil and rock conditions vary, vary, and will vary again." This is the road builder's motto. Always perform a thorough subsurface investigation – with ample borings. For example, we sometimes see projects with borings every 1,000 feet. That's not enough. Borings should be taken, minimally, every 300 to 400 feet. Remember our motto: "Be prepared!"

The subgrade soil strength can be determined in the laboratory too. The California Bearing Ratio (CBR) rates the subgrade soil strength. As previously stated, Ohio has three main subgrade-soil groups: A-4, A-6 and

A-7 (generalized groups). These soils typically have CBR values between 3 to 7, making them poor-to-fair subgrade soils. And the low CBRs also make these soils ideal candidates for chemical modification – or chemical stabilization – and there's a difference.

The chief difference between modifying and stabilizing is the amount of chemicals that are used. Chemical modification is less expensive than stabilization, as it is aimed at removing excess moisture from the soil (for the construct and go option). Hydrated lime, as well as other less expensive additives, dries wet Ohio soils. So these additives are often picked for the construct-and-go option. For example, 2- to 3-percent hydrated lime modification will usually dry wet soils for construct and go. Chemical stabilization, however, not only dries wet soil but it also improves soil strength. Stabilization additives are usually: (1) hydrated lime (5 to 6 percent); (2) Portland cement; (3) a combination of cement and hydrated lime. We'll talk more about using chemicals to fix subgrade problems a little later, but consider this: More than 75 percent of Ohio road projects have subgrade problems, and they need to be stabilized.

This frequent occurrence of unstable subgrade soils is the single-biggest construction problem. And it later becomes a pavement problem. Why? Because the soils engineer's advice often is ignored (or forgotten), and fixing subgrade problems is the easiest place to whack budgets. For example, if the report shows highly plastic A-6 and A-7 soils, the engineer may advise undercutting or chemically stabilizing. Yet the design engineer (not the soils engineer) may see soft subgrade as a 'minor contingency' – something the owner can handle during construction. No big deal. But a year or two later, this 'minor contingency' turns into 'major money' during the construction phase. Here, everyone faces stark reality. And who remembers the misplaced soil report or the lonely soils engineer by then?

So unfortunately, budget usually controls how much soft soil gets stabilized at this point.

Consider this story: Movie producer Sam Goldwyn, a stickler for producing movies within budgets, visited the director, John Ford, on location. "You're a day behind schedule. You're going to run over budget. What are going to do about it?" he demanded!

Ford opened the script. "I shoot five pages a day," he said. He then ripped five pages from the script. "There, now I'm within budget."

And that's what happens without a realistic subgrade budget too. However, instead of five pages of script, it's another 500 feet of soft subgrade that doesn't get ripped-out and stabilized.

We have two subgrade stabilizing options, and each has its advantages.

The Classic Undercut Option

Soft soils, either identified in the report, or found by rutting during construction, have too much moisture. The moisture content is above the plastic limit (the moisture point where clay turns from a friendly, cohesive state, to a mean, unstable, plastic state). So let's remove the soft soils and replace them with something better. First, 12 inches of soft soils are undercut – maybe more. Next, an ODOT Type D subgrade fabric is installed to keep the soil from migrating upward into the aggregate and weakening the base. In some applications a Tensar geogrid is placed on the new subgrade. Finally, the undercut is filled with an additional 12 inches of aggregate (typically a large size, like 2-inch stone, or bigger).

Undercutting is good for spot locations. And it's favored if unstable soils are deep (because you can only chemically stabilize about an 18-inch deep, maximum). One important point though – the aggregate within the undercut needs drained to avoid long-term soils problems. Our follow-up article will provide more detail. But this critical point needs emphasized!

The Chemical Stabilization Option

All materials deflect under load, and soil deflects most. But an amazing reaction happens when certain chemicals are mixed with wet soil, especially clay or silty-clay soils, whose strength is vulnerable to excess moisture. Ordinarily, excess moisture allows the tiny, flat, clay particles glide across excess water bubbles. But select chemicals make the tiny particles clump together (or agglomerate). Additives, like hydrated lime, Portland cement, Type C fly ash, or lime kiln dust will agglomerate soil particles.

Agglomeration yields larger particles that are more stable and easier to handle – and it makes clay act like granular particles. Mixing hydrated lime or cement, for example, with clay raises the optimum moisture content because the chemical reaction is fueled by water (lime and cement love water). In fact, a lime-stabilized subgrade needs watered after mixing; this is a critical step because un-reacted lime expands.

Match Stabilizing Agent with Soil Type

The material used to stabilize the soil must be matched to the soil type. A-4 soils are moderately plastic, silty-clay soil with 75 percent passing the No. 200 sieve. All clay and silt particles pass the No. 200 sieve.These soils will have trace amounts of granular material too. Therefore, the optimum moisture content (for compaction) is lower than it is for A-6 and A-7 soils.

A-4 soils have more silt than A-6 and A-7 soils, and can be stabilized with Portland cement. Portland cement works reliably for both silt and sand.

But A-4b soils, which have even higher silt contents than A-4a soils, cannot be chemically stabilized. Period! A-4b soils are a red flag! They must be removed within the top three feet of the subgrade elevation, as A-4b soil is frost susceptible.

A-6, the most common Ohio soils, are more plastic than A-4 soils, and also have about 75 percent passing the No. 200 sieve. A-7 soils are similar to A-6 soils, but even more plastic, and both types are frequently undercut or chemically stabilized.

Your best chemical-stabilization tool is the soils engineer, and bench testing, which match the right chemical to the variable soils within your project limits. A good geotech can do this work for you, as well as plot CBR Penetration Curves that compare strengths – stabilized versus in-situ soils. The stabilized depth, and strength, can vary too – 12 to 18 inches is typical. Again, soil boring logs and testing will dictate the proper stabilizing depth.

Advantages of Chemical Stabilization

A chemically stabilized subgrade has some real advantages. The soil becomes less permeable, and subsurface water can't move upward by capillary action. Since almost all pavement problems stem from excess subsurface water, chemical stabilization fixes the root problem. This option provides a "season-long" workable platform too, improving project delivery time – and as Ben Franklin said, "Time is money."

And there's more! Stabilizing drastically reduces deflection; it allows the aggregate interlock to perform much better, as there is no base aggregate "rocking" on an elastic subgrade. A hydrated lime-stabilized subgrade is a low-strain asset that extends pavement life; and that is our goal, EXTENDED PAVEMENT LIFE. Abraham Lincoln said the best way to defeat an enemy is to make him a friend. These chemicals make our enemy – wet, plastic soils – our new friend.

An important consideration comes from the University of Toledo. In its research titled, "*Structural Support of Lime or Cement Stabilized Subgrade Used with Flexible Pavements*," it evaluated – and proved – that chemical stabilization provides a long-term benefit. It's not just an instant fix! In fact, the benefits actually increase over time. Recommendations from that report go on to say, "Structural benefit of soil stabilization should be incorporated during flexible pavement thickness design, **which would result in reduced pavement thickness**." (Emphasis added.) And that's where the BIG savings comes into play; peeling an inch or more off an asphalt pavement design can save BIG BUCKS on a job.

If you're going to use chemical stabilization, then you'll want to secure the talent of a geotechnical firm that is knowledgeable in both stabilization and asphalt pavement thickness design. This ensures the best economy, and the longest asphalt pavement life. If you don't know where to find that expertise, I recommend that you contact Flexible Pavements of Ohio (FPO). FPO is just as interested in your success with asphalt as you are, and it will lead you to a credible firm.

Words of Wisdom from the School of Hard Knocks

Both undercutting and chemical stabilization may involve work **below** the plan subgrade elevation, thus invite damaging underground utilities. But you can protect yourself in the design phase while preserving this option.

Always show subgrade stabilizing on the typical sections and cross sections!

Public agencies must send plans to underground utility companies during the design phase. It's not just a good idea – it's the law (Revised Code 153.64). And utility companies are directed, by the public agency, to carefully review the plans, and then relocate all existing utilities that conflict with proposed public work. That's a good statutory scheme. And utility-conflicts "clearing" is part of the design phase. But what happens if the utility company relocates its gas main, say, 8-inches below plan subgrade (during the design phase)? And then, months later, during the construction phase, the public agency directs the contractor to undercut soft subgrade 12 inches deep? See the problem? In this scenario, who is at fault when the gas main gets damaged? Lots of finger pointing here, but mostly at the public agency.

Showing proposed subgrade stabilizing on the plans, and early in the design phase protects everyone. And it tells the various utility companies that excavation below the ordinary plan subgrade will happen during construction. The utlility company, having been put on "notice" will relocate its facility deeper. Public agencies must make this "notice" a top priority to preserve the ability to stabilize soft soil legally – and without stinging surprises.

Summing it Up

Although the easily forgotten subgrade often takes the backseat to other design parameters, it really shouldn't. In the past, investigating and evaluating subgrade soils in the design phase was regularly neglected, or wasn't given the limelight that it deserves. You can change that.

To succeed, there's no substitute to soil borings and laboratory bench testing that is performed as an integral part of the project design phase. Everything that happens during the roadbuilding process depends on a stable subgrade. This makes the subgrade top priority. First, always get a soils report with ample borings. Next, read it, and include it in the contract documents. Ask questions about anything you don't understand. And finally, follow the soil engineer's recommendations.

If you plan to use chemical stabilization, match the stabilizing agent to the soil type by pre-testing. Use a geotechnical firm that understands stabilization and asphalt pavement design. Consider how chemical stabilization can reduce your pavement cost through its strength gain. Your geotech can run these numbers for you.

Learn from the school of hard knocks. Avoid costly construction costs that arise from failing to consider underground utilities. Ensure that plans show realistic undercuts and depth of stabilization.

The next article will feature road base construction, and sub-surface drainage – another consideration in our quest for low-strain, long-life pavements.

By Eddie Y. Chou, PhD., P.E., University of Toledo

Performance & Cost Effectiveness of Thin HMA Overlay on Ohio Highways

Researchers at the University of Toledo recently completed a study sponsored by the Ohio Department of Transportation (ODOT) and the Federal Highway Administration on the effectiveness of thin hot mix asphalt (HMA) overlay as a maintenance technique. This article summarizes and highlights the major findings of the study, which was based on actual performance experiences of thin asphalt overlay on Ohio highways.

The objectives of the study were to determine:

(1) the cost effectiveness of using thin HMA overlays as a maintenance technique

(2) under what circumstances a thin hot mix overlay would be suitable

(3) the timing of constructing a thin overlay to maximize its benefits

A thin HMA overlay – defined as having a thickness of 2 inches or less – is one of the maintenance techniques performed on asphalt-surfaced pavements to extend the service life of the existing pavement. Thin overlays protect the pavement structure, reduce the rate of pavement deterioration, correct surface deficiencies, reduce permeability and improve the ride quality. Milling may be performed prior to the thin overlay to remove deteriorated surface materials.

The study was performed in two phases. In Phase 1, researchers, in collaboration with ODOT, gathered performance data for all thin overlay projects constructed since 1990 on both Priority and General system pavements. In Phase 2, the performance data that was gathered was used to study the effectiveness of thin overlay as influenced by climate; existing pavement condition prior to thin overlay; thin overlay thickness, ranging from 1 to 2 inches; traffic loading; and other parameters.

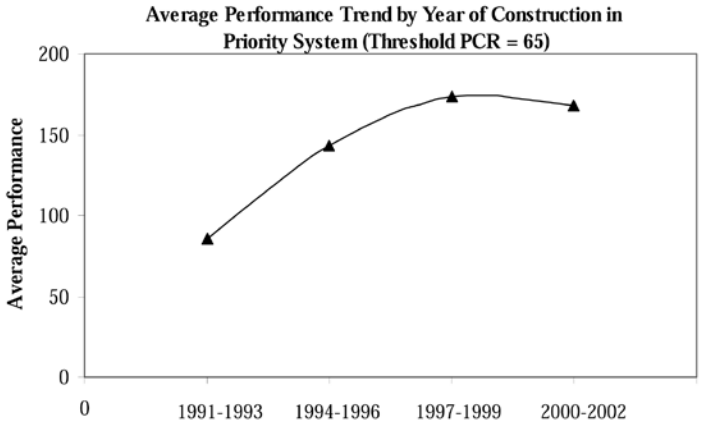
The performance of a thin overlay is measured in terms of the area under the PCR-versus-age curve, whereas the benefit of a thin overlay is defined as that part of the performance due solely to the thin overlay (i.e., total performance subtracting the residual performance of the existing pavement). The cost effectiveness of a thin overlay is determined by comparing the cost per unit area of benefit versus that of a minor rehabilitation – typically, a 3¼-inch overlay with or without repair.

In order to compare the performance of thin overlays based on a uniform-ending condition, and to include the many thin overlays that are still in service, predicted Pavement Condition Ratings (PCR) were used to obtain the performance of overlays as measured by the area under the PCR-Age curve, above the terminal PCR thresholds.

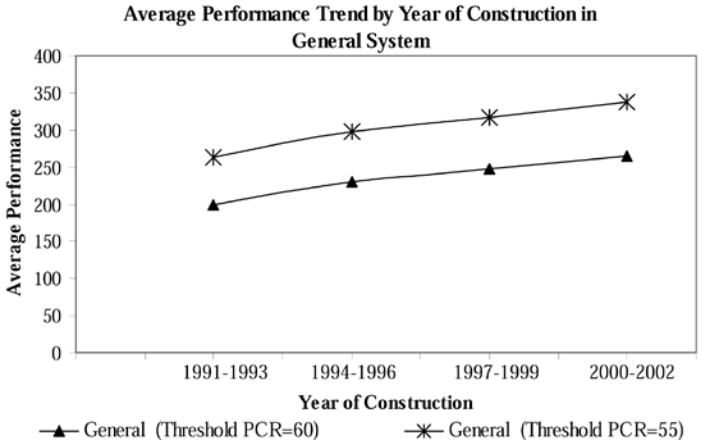
On average, a Priority System thin overlay is expected to last about nine years before its PCR score falls below a terminal score threshold of 65, while for a minor rehabilitation that time is roughly 12 years. For General System thin overlays, the expected service life is more or less 12 years before reaching a PCR threshold of 60, and for a minor rehabilitation, 15 years. In other words, the expected service life of a thin overlay is approximately 75-80 percent of that of a minor rehabilitation.

Based on the cost data from recent projects, the average thin overlay project cost is about 40 percent of the average minor rehabilitation project cost for the Priority System, and approximately 60 percent for the General System pavements. As a result, a majority of the thin overlays are deemed cost effective.

Figure 1: Average Performance as a Function of Year of Construction



(a) Priority System



(b) General System

The existing pavement condition prior to a thin overlay is the most important parameter that influences the thin overlay's performance and cost effectiveness. Better existing pavement condition directly correlates with better thin overlay performance. Thin overlays performed on Priority System pavements with a prior PCR score between 70 and 90, and on General System pavements with a prior PCR score between 65 and 80, have the best chance to be cost effective. Thin overlay projects that are not cost effective tend to be those performed on very poor pavements, and with insufficient thickness.

A thin overlay is more effective in correcting rutting distress, but less effective in eradicating cracking distresses such as reflective, transverse, longitudinal, edge and wheel track cracking. The effect of milling to remove damaged materials prior to overlay is not clear, as the available data are not controlled. Thin overlay should not be performed on pavements with very high cracking deducts. For Priority System thin overlays it is desirable that the existing pavement's cracking deduction be less than 15, and for the General System less than 20 in order for the thin overlay to be more cost effective.

Thin overlays constructed on flexible pavements generally perform better and are more cost effective than those constructed on composite pavements, particularly for the Priority System.

Thin overlay performance varies among ODOT Districts, as the existing pavement conditions prior to thin overlay are quite different among the districts. Statewide, approximately 87 percent of the Priority System's thin overlays constructed between 1994 and 2002 were deemed cost-effective, while 81 percent of the General System's thin overlays constructed during the same period were cost effective.

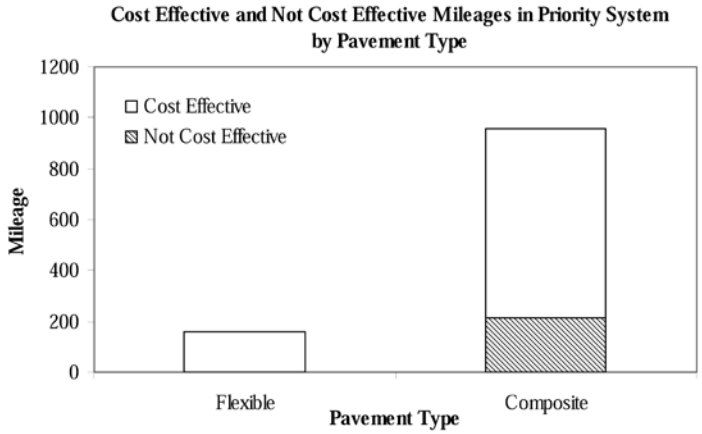
Figure 1 shows that the average statewide thin overlay performance has improved significantly since the earlier 1990s, likely due to improved material specifications and construction quality. The performance improvement is particularly pronounced for Priority System thin overlays, although General System thin overlay performance has also been improving steadily. Another reason for the dramatic improvement in the performance of thin overlays on the Priority System could be ODOT's move toward designed overlays beginning in 1985. Dynaflect deflection measurements were taken to determine the structural adequacy of a pavement. Pavement in poor structural condition would not have received a thin overlay.

Statewide, 87 percent of the Priority System thin overlays and 81 percent of the General System thin overlays constructed between 1994 and 2002 were deemed cost effective by the performance area method. It should be noted that this result is based on the average thin overlay project cost being 40 percent of the average minor rehabilitation project cost on Priority System pavements and 60 percent on General System pavements. The average cost of a thin overlay is significantly less than the average cost of a minor rehabilitation, not only because of reduced material costs, but because a thin overlay can be performed more quickly, thereby requiring far lower costs in maintaining the existing traffic flow. This is particularly significant in urban, high-traffic areas.

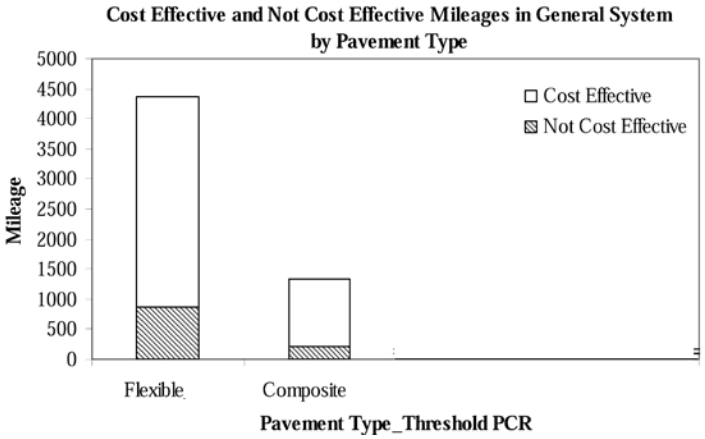
Figure 2 shows that cost effectiveness is influenced by the existing pavement type. This is particularly apparent for the Priority System, where all thin overlays performed on flexible pavements are cost effective, while approximately 80 percent of thin overlays on composite pavement are cost effective. For General System thin overlays, the difference in cost effectiveness percentage due to pavement type is not significant.

For flexible pavements in both the Priority and General systems, the improvement of ride quality due to a thin overlay is very significant, as it takes nearly 16 years, on average, for the IRI of the overlaid pavement to return to the same IRI level prior to the thin overlay. For Priority System composite pavements, the average time is less than seven years; and for General System composite pavements, it's about 11 years. It can be concluded that the benefit of a thin overlay, in terms of improved ride condition, is very substantial for flexible pavements. Even for Priority System composite pavements, a thin overlay provides, on average, nearly seven years of ride condition improvement compared with the ride condition before the thin overlay.

Figure 2: Cost Effectiveness as a Function of Pavement Type (For Thin Overlay Constructed between 1994 and 2002)



(a) Priority System



(b) General System

In summary, the findings of the research study show that thin HMA overlay is generally a cost-effective maintenance treatment. The performance of a thin overlay improves with better existing pavement condition, less annual snowfall amount and increased overlay thickness. Thin overlays on flexible pavements perform better than those on composite pavements. The benefits of a thin overlay include improvements in both pavement condition and ride quality. Employed properly, thin overlay provides a relatively low-cost alternative in preserving and extending the service life of an existing pavement.

Eddie Y. Chou, PhD., P.E. is a professor of Civil Engineering and director of Transportation Infrastructure Systems Research Laboratory at the University of Toledo. Contact him at 419.530.8123 or ychou@utnet.utoledo.edu.

Flexible Pavements of Ohio Resource Listing

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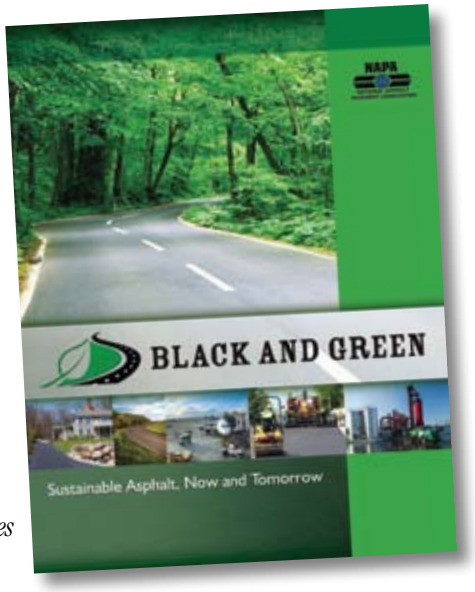
Black & Green

Sustainable Asphalt, Now & Tomorrow



Environmental concerns and sustainability issues are paramount in the public consciousness. This past September, the National Asphalt Pavement Association (NAPA) published an excellent and timely report concerning the sustainability of asphalt pavement, "Black and Green, Sustainable Asphalt, Now and Tomorrow." The report explains the many innovations being advanced by the asphalt pavement industry that improve the sustainability of asphalt pavement. In this issue of Ohio Asphalt *we have reprinted the report's introduction and first topic, "The Road Ahead." In future issues we will reprint additional segments from the report.*

Long before "sustainability" became an eagerly pursued part of the American business plan, the asphalt industry initiated research and field practices that have constantly enhanced the viability of asphalt as an environmentally sound building material.

To date, the monumental accomplishment of this initiative lies in recycling. Asphalt is the most recycled material in America. About 100 million tons of old pavement are reclaimed every year, with about 60 million tons reused in new asphalt mixes, and some 40 million used in other pavement-related applications, such as aggregate and road base.

Asphalt pavement is unique not only in the volume recycled, but also its renewability. It is comprised of approximately 95 percent aggregates (stone, sand and gravel) and about 5 percent asphalt cement. When asphalt pavement is reused in a new asphalt mix, the old asphalt cement is rejuvenated so that it becomes an active part of the glue that holds the new pavement together, just like the old aggregate becomes part of the aggregate content of the new mix. These singular properties make asphalt a uniquely renewable pavement.

Powering the trend to recycling/reusing asphalt is economics. Decades of research and engineering have improved the cost efficiency of converting old asphalt into a reusable resource that has tangible value. Today, pavement engineers, government agencies and contractors regard old asphalt as an asset, not waste, and the trend to recycling and reuse continues to gain momentum as a result.

The industry has worked on other technologies that reduce air emissions including greenhouse gases and other contributors to climate change. These technologies include warm-mix asphalt, with lower emissions due to reduced temperatures, and long-life pavements, which reduce greenhouse gas emissions by reducing the frequency of repair and replacement.

And modern asphalt technology has delivered asphalt pavement designs that actually enhance the quality of stormwater runoff even as they improve driving safety by reducing the amount of spray produced by vehicle tires.

Past, current and future advancements in asphalt as an environmentally sustainable paving material are especially important because asphalt is such a primary component of America's transportation system and because the quantities of material used annually are so large.

Of the 2.6 million miles of paved roads in the United States, over 94 percent are surfaced with asphalt. Approximately 85 percent of the nation's airfield pavements and 85 percent of the parking lots are also surfaced with asphalt. There are about 4,000 asphalt mixing plants located in the United States and the industry employs, directly or indirectly, 300,000 U.S. workers. Because of the vast extent of use of this material, even small changes in asphalt pavement technology can make a big difference in terms of greenhouse gas emissions.

The Road Ahead

None of the advancements in asphalt technology would have been possible without a vibrant research and technology deployment program. Leading the asphalt research effort is the National Center for Asphalt Technology (NCAT) in Auburn, Ala., which originally was endowed by the industry and today is directed by a public-private partnership. With its 1.7-mile pavement test track and its 40,000-square-foot research facility, NCAT conducts a productive, $5 million per year research program that focuses on innovations that directly affect and improve the roads we drive on every day.

An important aspect of the industry's research program is that it is based on partnering. Partners in current and past initiatives include the National Asphalt Pavement Association (NAPA), the Federal Highway

Administration (FHWA), the Federal Aviation Administration (FAA), the American Association of State Highway and Transportation Officials (AASHTO), the state Departments of Transportation (DOTs), the Transportation Research Board (TRB), the U.S. Army Corps of Engineers (USACE), the Environmental Protection Agency (EPA), related industry associations, the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH) and the labor unions. There is also a broad range of international partners with whom the industry shares knowledge, conducts joint research and cooperates on industry matters.

One of the first breakthroughs in asphalt pavement technology achieved by this partnership was Superpave, a pavement design system that has enhanced pavement performance and durability in many ways. It was developed with federal funding under the Strategic Highway Research Program (SHRP) in the late 1980s and early 1990s. Superpave has become so widely accepted that use of the term is actually disappearing – what used to be called the Superpave design system is now the norm for designing asphalt pavements in much of the U.S.

Another example of partnering was the initiative that began in the late 1980s in which NAPA worked with EPA on research into air emissions, including greenhouse gases from asphalt plants. The studies showed that emissions from asphalt plants are low and well controlled; they resulted in EPA declaring that asphalt plants are not major sources of hazardous air pollutants.

Nonetheless, the industry continued to work to reduce emissions. In fact, total emissions from asphalt operations decreased 97 percent from 1970 to 1999, while production of asphalt pavement material increased by 250 percent. The industry is proud of its record of environmental stewardship and its proactive position of continuously reducing emissions, including greenhouse gas emissions.

As impressive as our gains have been in recent years, we can still achieve significant gains in addressing climate change in the coming years by accelerating research and deployment of technologies that reduce greenhouse gas emissions. We can increase use of warm-mix asphalt to represent the majority of all the pavement material produced in the U.S.; we can double the reuse/recycling of asphalt pavements; we can make Perpetual Pavements the standard design method; and we can have porous pavements accepted as a best management practice for reducing stormwater runoff and improving water quality.

If you would like to read the entire report, you can view a digital copy at http://www.sustainableasphalt.turn-page.com/. Reprinted with permission of the NAPA.

OA

Flexible Pavements of Ohio's 48th Annual Meeting co-located with the 2010 World of Asphalt Show and Conference in Cincinnati, February 15-18, 2010

Register now for the **Flexible Pavements of Ohio (FPO) Annual Meeting and Awards Banquet** in Cincinnati, February 16, 2010, along with the **2010 World of Asphalt (WoA)** show and conference. FPO is combining its Annual Meeting and Equipment Exhibition with the WoA for this special visit to Ohio. Registration for the FPO Annual Meeting is through the WoA online registration process. Use the WoA hotel room block for your lodging. The advance registration deadline is Jan. 22, 2010. Register online at **http://www.worldofasphalt.com/ShowInfo/Attendees/Reg/index.asp.**

Program: The FPO Annual Meeting and Awards Banquet will be held the evening of February 16th beginning at 6 p.m. in the Junior Ballroom on the third level of the Cincinnati Convention Center. The program for the meeting includes:

- The Annual Business Meeting with FPO Executive Director Cliff Ursich reporting on the state of the association
- NAPA's Mike Acott will provide the keynote address on the topic of "An Industry Vision"
- Annual paving and service awards will be presented
- Cocktails and dinner are included

This visit of the WoA to Ohio is being co-sponsored by FPO, *Ohio Asphalt* magazine and the Ohio Asphalt Paving Conference (OAPC), which deferred its 2010 conference to the APA Asphalt Pavement Conference noted below.

In addition to the huge trade show, the following educational events are at the WoA:

APA Asphalt Pavement Conference - February 15-16, 2010

The APA Asphalt Pavement Conference covers 18 sessions in a day and a half to help contractors, suppliers and agencies learn how to effectively use resources to produce asphalt pavements that are long lasting, environmentally friendly and will explore asphalt industry economic issues and methods to optimize highway dollars. This program has been developed by the Asphalt Institute with Ohio-specific recommendations from the Ohio Asphalt Paving Conference Committee. View the entire program at http://www.worldofasphalt.com/Education/APC. Certificates for Professional Development Hours (PDHs) will be available.

Visit FPO at Booth #331 at the WoA Trade Show.

Also located with the WoA will be the **AGG 1 Academy and People, Plants & Paving Program**; the **National Traffic Management & Work Zone Safety Power Workshop**, presented by the National Work Zone Safety Information Clearinghouse; the **NIOSH Seminar**; and an **OSHA 10-Hour Course for Construction Workers Certification Program**. For more details of these outstanding educational programs, visit the WoA Web site at http://www.worldofasphalt.com/.

Educational Opportunities

Mark you calendars for these educational opportunities, seminars, conferences and workshops. Visit http://www.flexiblepavements.org/events.cfm for details and to register for any of these educational opportunities.

Comprehensive Asphalt Mix Design
January 25-29, 2010, Columbus

Designed to give the participants a working knowledge of the principles associated with asphalt concrete volumetric mix design, this course meets the requirements for ODOT HT.306, Asphalt Level 3 training. On the final day of the course, students will have the opportunity to take the ODOT examination for Level 3 Bituminous Concrete Technician approval. This session is being offered to ODOT employees only.

Comprehensive Asphalt Mix Design
February 8-12, 2010, Lancaster

A separate session of the Asphalt Level 3 training will be offered for non-ODOT public agencies and industry personnel. The training will be conducted at the National Asphalt Laboratory on the Ohio University-Lancaster campus.

FQCS
March 9, 2010, Dublin

This seminar provides the Ohio Department of Transportation (ODOT)-certified training required to perform the Field Quality Control Supervisor (FQCS) function on ODOT projects as required by ODOT specifications. The FQCS provision extends to the placement procedure in the process of contractor quality control. This training gives participants the understanding of ODOT specifications and processes necessary to fulfill their responsibilities as FQCS, and is recommended to others seeking a better understanding of ODOT asphalt pavement specification requirements. Upon course completion, a certificate for six Professional Development Hours (PDH) will be awarded.

Asphalt Construction Workshop
March 23-24, 2010, Columbus

The Ohio Center for Asphalt Pavement Education (OCAPE) is pleased to present Jim Scherocman's Asphalt Construction Workshop. Designed to provide complete instruction on the fundamentals of HMA placement and compaction, this training is a necessity for anyone involved in the inspection, placement and compaction of asphalt pavements. This course is part of the core curriculum and a requirement for OCAPE certification as an HMA Pavement Field Technician, and is especially recommended for those serving as FQCS. A certificate for 13 PDHs will be issued for completion of this course.

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