OHIO ASPHALT

Issue 1, Volume 4 Winter 2007

Warm Mix Asphalt Research in Ohio

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WINTER 2007

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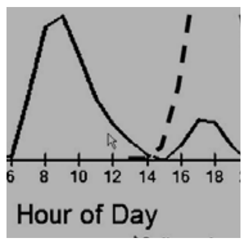

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ON THE COVER: ***The paving crew from Shelly and Sands places warm mix asphalt on the Ohio Warm Mix Field Trial project, located on State Route 541 in Guernsey and Coshocton counties. Note the air quality monitoring instruments set up on the paver by the research team from Ohio University (Ohio University photo). See story on page 8.***

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Flexible Pavements OF OHIO

Flexible Pavements of Ohio is an association for the development, improvement and advancement of quality asphalt pavement construction.
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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. P.O. Box 16186, Columbus, OH 43216; telephone: 614.221.5402, 888.446.8649 (Ohio only); fax: 614.221.0394; website: www.flexiblepavements.org*


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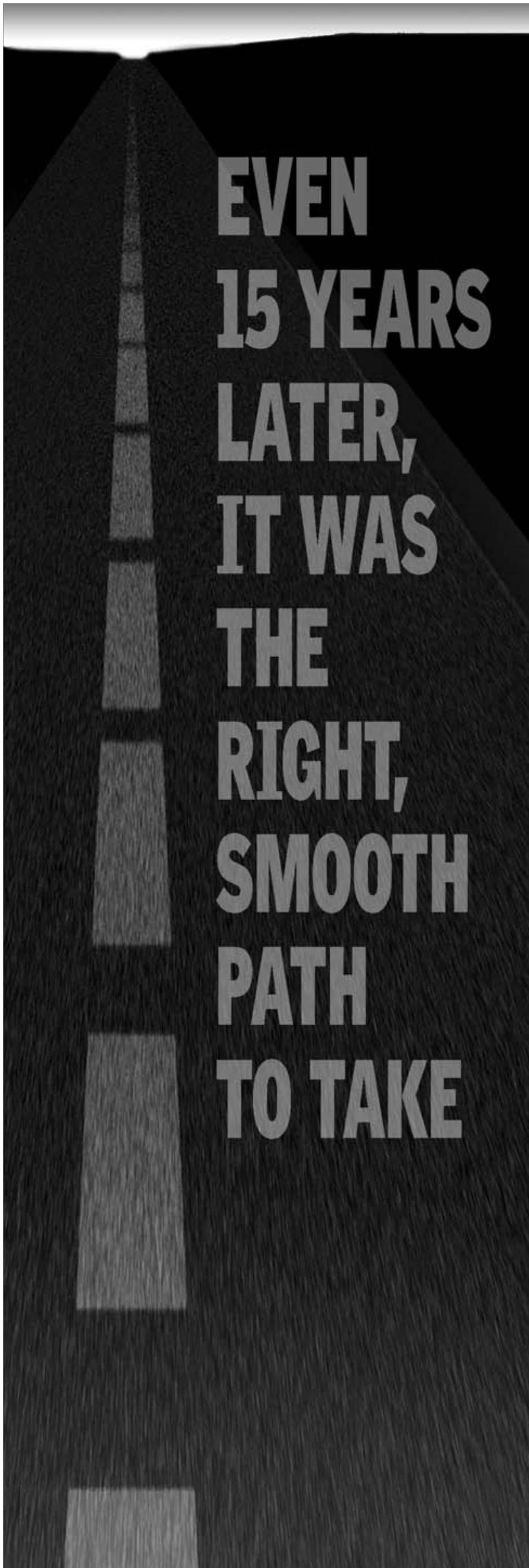


Fred F. Frecker P.E.,
President &
Executive Director

This is the last time I will be writing the President's Page for *Ohio Asphalt.* As most of you know, I will be retiring from Flexible Pavements of Ohio on March 31. I find it hard to believe that I have been here for more than 15 years, it seems like it was only yesterday when I first walked through the office door.

Reflecting on my time at FPO, it kind of divides into two parts. The early years were devoted to product improvement and a focus on the customer while the latter years were spent fending off a major political and lobbying initiative by the competition. Those latter years were kind of like being in the Army; it was a time when I learned a lot, and I wouldn't trade the experience for anything, but I sure wouldn't want to do it again. I must admit that the early years were more enjoyable and satisfying.

Prior to coming to FPO, I spent 27 years with state and local agencies maintaining roadway networks built not only of asphalt but other materials as well. That experience convinced me that of all the pavement products available, asphalt pavements provided the best service, ease of maintenance and economic value. Coming to work for Flexible Pavements of Ohio was a natural, because asphalt pavements were something I believed in. My position at FPO has expanded my horizons beyond those roadway networks to many others around the nation. Data from these has only deepened my belief in asphalt pavement. The reason that more than 95 percent of all the paved surfaces in the U.S. are asphalt has nothing to do with lobbying by the asphalt industry – it is simply because they really do work better.

The things that stand out the most to me during my time at FPO are the advances that have taken place in technology, both in general and in HMA specifically. It really staggers the imagination when you stop to think about it. When I first came to FPO, we were still typing with carbon paper and copying the letting results on a mimeograph machine. In only a decade, the computer and the Internet have transformed the world of communication. Hot Mix Asphalt technology has also advanced more in the last 15 years than it probably did in the preceding 50 years. Superpave, PG binders, and polymer additives are just to name a few on the materials side. On the design side, Perpetual Pavement concepts are revolutionizing thickness design. Warranties, performance specifications, and pay incentives are now standard fare for construction contracts. We all know that technology will drive change, but it is the speed at which change is taking place that is truly amazing. I will be 65 this year and

continued on page 7

Employment Opportunity

DO YOU HAVE THE EYE FOR IT?

FPO SEEKING PAVEMENTS & MATERIALS ENGINEER

Do you have an eye for the next "big thing" in pavement? Do you understand hot mix asphalt specifications and want to help others develop them? Do you enjoy training others in the asphalt industry?

If you answered 'Yes,'
then Flexible Pavements of Ohio (FPO) wants you.

The organization is seeking to fill the position of **Pavements and Materials Engineer**. The following are a few of the duties that are involved in the position:

- Provides FPO members with technical assistance
- Represents the interests of the industry before the Ohio Department of Transportation, the Ohio Environmental Protection Agency and other federal, state and local government agencies
- Assists pavement owners in the development of hot mix asphalt specifications and facilitates the development of new materials and specifications
- Facilitates member involvement in FPO through communication of issues between the membership and agencies regarding paving materials, techniques and specifications, environmental regulations, etc.
- Represents the interests of the membership on affiliated industry committees and associations, such as the Ohio Transportation Engineering Conference, the American Society of Highway Engineers and the American Society of Civil Engineers
- Develops training curriculum and instruction
- Assists in the development of technical and/or promotional publications

If FPO's Pavements and Materials Engineer position sounds right for you, send your resume to Clifford Ursich, P.E., in reference to the Pavement and Materials Engineer position at Flexible Pavements of Ohio, P.O. Box 16186, Columbus, Ohio, 43216. Electronic submissions can be made to cliffursich@flexiblepavements.org.

Flexible Pavements OF OHIO

am now at the point where I realize speed and old age aren't very compatible – thus my decision to step down from FPO.

I am pleased to report that Cliff Ursich will be the next Executive Director of FPO. Cliff has been Executive Vice President during my tenure, and words cannot describe his value to me and the association. We have worked together as a team rather than as supervisor and employee. I can not possibly express my appreciation to Cliff for all that he has done to help me muddle through. Most of the good ideas I had came from him. He is more than qualified to lead the Association in the future.

Besides Cliff, I have been fortunate to work alongside several others. I have also been blessed to have Bill Fair at my side for most of my time at FPO. If it weren't for Bill, we would still be using carbon paper and a mimeograph machine. Bill dragged me kicking and screaming into the 21st century. Bill is one of those people who never needed follow-up to ensure a task got done. To a manager, that is invaluable. Another blessing has been Flo Flowers. Flo is the one who keeps us all in line and ensures the place is running smoothly. I could not have had a better "girl Friday." A special thanks is also in order to Jean Snyder for all her help and patience in "breaking me in."

The most important people are the asphalt producers and contractors that make up Flexible Pavements of Ohio, they are truly unique individuals that have my total respect and admiration. I have never met a more innovative, harder working, generous or dedicated group. I consider it an honor to have had the opportunity to be part of *their* Association.

I have made many new friends while at FPO, not only in the industry but also among the customers it serves. I hope those friendships are able to withstand the test of time and distance. As for what I am going to do after leaving FPO – as my college-age son likes to say: "We'll figure it out when we get there."

Thanks to everyone for all the help in keeping FPO on what history will hopefully prove was the right, and smoothly paved, path.

By Shad Sargand, Ohio University

Integrating Warm Asphalt and Perpetual Pavement

Warm Asphalt

Warm Mix Asphalt (WMA), first introduced in Europe in 1995, is at present gaining considerable attention in the pavement community. WMA offers several advantages over conventional asphalt concrete mixtures including:

- reduced energy consumption in mix preparation
- reduced emissions and consequently reduced fumes and undesirable odors
- reduced binder aging
- extended construction seasons in temperate climates

WMA requires the use of additives to allow the compaction of asphalt concrete (AC) mixtures at lower temperatures than conventional hot mix asphalt (HMA). In the United States only very preliminary studies have been conducted to date in order to evaluate significant properties of WMA, which have been focused on evaluating the "compactibility" of mixes, effect on stiffness properties of resulting WMA, rutting potential, need for curing time and assessment of increased potential for moisture damage.

Since WMA mixes require additives, higher unit material costs are expected. However, these may be offset by the reduction in required energy resources for mix preparation. Even if unit costs are higher for WMA, environmental factors may tilt a decision to use WMA — provided its engineering properties and performance are within expected levels.

Currently, four techniques are known to improve the workability of mixes to allow the preparation and compaction of WMA. These include:

- Aspha-min which includes the addition of sodium aluminum silicate or zeolite
- Sasobit which uses foam in the form of a paraffin-wax compound extracted from coal gasification
- Evotherm which includes additives in the form of an emulsion to improve the coating and workability of WMA mixes
- WAM-Foam which uses a soft binder and a hard-foamed binder added at different times during the mixing process

A few limited field demonstration projects have been constructed in Florida, North Carolina, and Tennessee, but their results have not yet been published. The National Center for Asphalt Technology (NCAT) at Auburn University has completed laboratory studies of Aspha-min and Sasobit, and concluded that each method improved compactibility at temperatures as low as 190°F (88°C) and that there was no effect on resilient modulus or rutting potential. Air voids were reduced and the warm asphalt did not require any curing period. There is the potential for increased susceptibility to moisture damage, which in the case of Aspha-min could be mitigated by adding hydrated lime.

To address the lack of extensive field studies of warm asphalt, a detailed evaluation study by the Ohio Research Institute for Transportation and the Environment (ORITE) to assess the performance and benefits of WMA mixes and pavements — both in field test sections and in the controlled environment of the Accelerated Pavement Load Facility (APLF) — is being sponsored by the Ohio Department of Transportation (ODOT) and the Federal Highway Administration (FHWA).

The balance of this article will discuss the testing of the warm asphalt/perpetual pavement at the APLF. A future article will report on the field test and laboratory tests of the warm asphalt.

Accelerated Pavement Load Facility

The ORITE's APLF at Ohio University's Lancaster Campus is a state-of-the-art indoor test facility for road pavements. It is large enough so that a 45-foot-long, 24-foot-wide (two-lane) test road can be built inside the building from the soil layer up. The environment can be temperature controlled from 10°F (-12°C) to 130°F (44°C); humidity is also controlled and moisture can be added to test its effect on sub-grade soil. A rolling tire load of 9,000 pounds (40 kN) to 30,000 pounds (133 kN) can be applied to simulate a passing truck with standard single or dual tires or wide, single tires, up to 500 times per hour. More information is available at the APLF web page at http://webce.ent.ohiou.edu/orite/APLF.html.

Warm Asphalt Perpetual Pavement Being Tested at APLF

A warm asphalt perpetual pavement was constructed on Sept. 6, 2006, at the ORITE's APLF in Lancaster, for testing under a variety of loads and environmental conditions. Three WMA surface courses are being tested and compared to a conventional HMA surface course. The warm mixes are Aspha-min, Sasobit, and Evotherm, the same as were applied in the field. Each of the four mixes (including HMA) was constructed as a 1.25 inch (3.18 cm) surface course on different thicknesses of perpetual pavement: 16 inches (41 cm), 15 inches (38 cm), 14 inches (36 cm), and 13 inches (33 cm), depending on the section, including a 4-inch (10 cm) fatigue layer. Underneath the perpetual pavement is a standard ODOT 304 dense-graded aggregate base of 6 to 9 inches (15-23 cm) in thickness depending on the size of the intermediate layer; 48 inches (120 cm) of A6-A7 sub-grade, and 24 inches (60 cm) of gravel. Each mix is being tested at two thicknesses (see Figure 3 on pg. 10).

The aim of the project is to subject each test section under repeated loadings at high (about 100°F (38°C)), medium (about 70°F (21°C)), and low (about 32°F (0°C)) temperatures and monitor their load responses. One particular objective is to examine the relationship between the thickness of the pavement and the tensile strain at the bottom of the perpetual pavement layer. The instrumentation includes single-layer deflectometers, pressure cells and longitudinal and transverse strain gages (see Figure 4 on pg. 11).

The environmental parameters being monitored include pavement layer temperature and the temperature, moisture, and groundwater table in the base and sub-grade. Moisture and temperature are being monitored according to the SHRP protocol. Load response displacement, strain and pressure will be measured, and seasonal response in terms of displacement and pressure will also be recorded. Falling weight deflectometer (FWD) tests are also being conducted.

Evotherm

Conventional

Figure 1 & 2. Shown are infrared camera images of asphalt surfaces during construction in the APLF. On the left is the Evotherm treatment while on the right is the conventional hot mix. Note that the color schemes are similar but that the scales are very different – the maximum temperature of the HMA is 85 F° (32.8C°) higher than that of the warm mix on the left. The temperatures in the upper right represent the temperatures where the camera cursor (large cross) is located. Asphalt temperatures at the APLF were about 20 F° (11.1C°) cooler than at the field site because of the much longer distance from the asphalt plant to the APLF (216°F=102°C, 301°F=149°C).

Surface	**Direction of wheel →**		**Lane width**
Evotherm WMA	1.25" (3.18 cm) Evotherm WMA 3" (7.62 cm) ODOT 448 Type II AC 4.75" (12.1 cm) ODOT 448 Type I AC 4" (10.2 cm) Fatigue Resistant Layer 9" (22.9 cm) ODOT 304 DGAB 48" (120 cm) A6-A7 Subgrade	1.25" (3.18 cm) Evotherm WMA 3" (7.62 cm) ODOT 448 Type II AC 7.75" (19.7 cm) ODOT 448 Type I AC 4" (10.2 cm) Fatigue Resistant Layer 6" (15.3 cm) ODOT 304 DGAB 48" (120 cm) A6-A7 Subgrade	8 ft (2.44 m)
Sasobit WMA	1.25" (3.18 cm) Sasobit WMA 3" (7.62 cm) ODOT 448 Type II AC 5.75" (14.6 cm) ODOT 448 Type I AC 4" (10.2 cm) Fatigue Resistant Layer 8" (20.3 cm) ODOT 304 DGAB 48" (120 cm) A6-A7 Subgrade	1.25" (3.18 cm) Sasobit WMA 3" (7.62 cm) ODOT 448 Type II AC 7.75" (19.7 cm) ODOT 448 Type I AC 4" (10.2 cm) Fatigue Resistant Layer 6" (15.3 cm) ODOT 304 DGAB 48" (120 cm) A6-A7 Subgrade	8 ft (2.44 m)
Aspha-min WMA	1.25" (3.18 cm) Aspha-min WMA 3" (7.62 cm) ODOT 448 Type II AC 6.75" (17.1 cm) ODOT 448 Type I AC 4" (10.2 cm) Fatigue Resistant Layer 7" (17.8 cm) ODOT 304 DGAB 48" (120 cm) A6-A7 Subgrade	1.25" (3.18 cm) Aspha-min WMA 3" (7.62 cm) ODOT 448 Type II AC 7.75" (19.7 cm) ODOT 448 Type I AC 4" (10.2 cm) Fatigue Resistant Layer 6" (15.3 cm) ODOT 304 DGAB 48" (120 cm) A6-A7 Subgrade	8 ft (2.44 m)
Conventional HMA	1.25" (3.18 cm) Conventional HMA 3" (7.62 cm) ODOT 448 Type II AC 7.75" (19.7 cm) ODOT 448 Type I AC 4" (10.2 cm) Fatigue Resistant Layer 6" (15.3 cm) ODOT 304 DGAB 48" (120 cm) A6-A7 Subgrade	1.25" (3.18 cm) Conventional HMA 3" (7.62 cm) ODOT 448 Type II AC 7.75" (19.7 cm) ODOT 448 Type I AC 4" (10.2 cm) Fatigue Resistant Layer 6" (15.3 cm) ODOT 304 DGAB 48" (120 cm) A6-A7 Subgrade	8 ft (2.44 m)
	← 22.5 ft (6.9 m) →	← 22.5 ft (6.9 m) →	

APLF Office

Figure 3. Here are the layout and layer thickness of Warm Asphalt Perpetual Pavement test sections in the APLF.

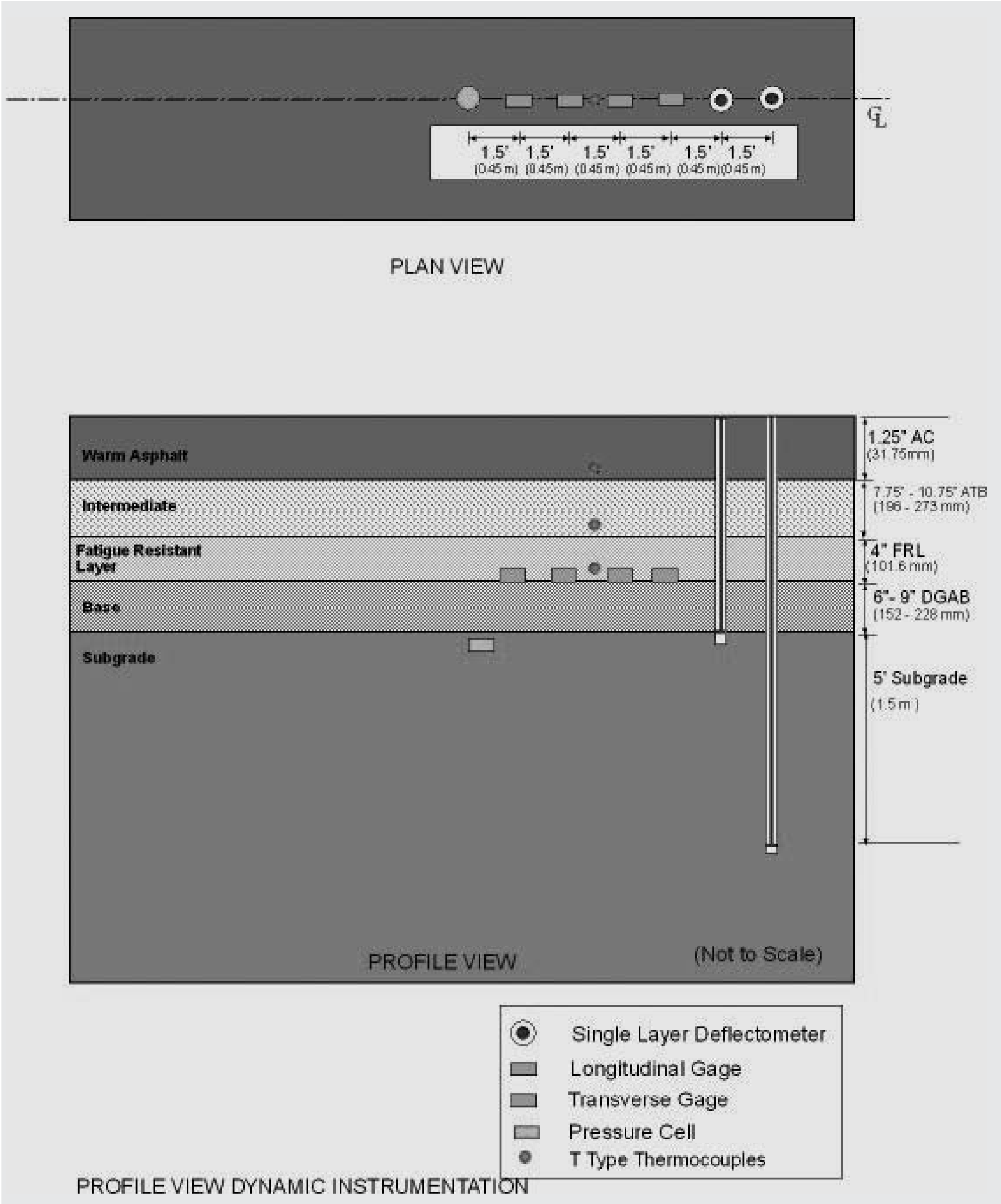


Figure 4. Shown on the left are plan and profile views of APLF instrumentation for Warm Asphalt Perpetual Pavement.

Dr. Shad M. Sargand is the Russ Professor of Civil Engineering at Ohio University, Director of the APLF and Associate Director of the Ohio Research Institute for Transportation and the Environment.

Life Cycle Cost Analysis of a Perpetual Pavement

By Dr. David H. Timm, P.E.
Associate Professor of
Civil Engineering
Auburn University

Perpetual flexible pavements have become an important option for agencies requiring high performance over extended time periods. These long-life pavement structures are intentionally designed with the necessary materials and layer thickness so that deep structural problems, such as fatigue cracking and structural rutting, do not occur. The result is a long-life pavement (exceeding 35 years) that requires only surface treatments such as mill and inlay to restore ride quality.

While the structural design of these pavements has been well established in recent years, an equally important consideration is the lifecycle cost (LCC) of the perpetual pavement relative to a "conventional" design. Since conventional designs are typically thinner, they will have a lower initial cost. However, the true benefit of a perpetual pavement is realized when considering the lifecycle and the reduction in extensive pavement rehabilitation required by a conventional structure. Benefits can be quantified both in actual costs paid by the agency in addition to reductions in work zone user costs (WZUC) paid indirectly by the traveling public.

To demonstrate the LCC of perpetual versus conventional pavements, consider the hypothetical scenarios presented in Table 1. These designs represent typical designs and rehabilitation cycles that may be found on many state routes or U.S. highways. The conventional design is 8 inches of hot mix asphalt while the perpetual design is thicker (12 inches) with an increased unit cost to reflect a higher quality surfacing material. The thicker and higher-quality design results in a rehabilitation cycle that is three years longer than its conventional counterpart. The repetitive mill and inlay activity is meant to restore ride quality lost due to cracking at the surface. Apart from the differences in initial thickness and material costs, the other significant difference is the major reconstruction in year 36 for the

Table 1. Hypothetical Scenarios.

<table>
<tr><th>Scenario</th><th>Conventional Design</th><th>Perpetual Design</th></tr>
<tr><td>Project Length</td><td colspan="2">5 miles</td></tr>
<tr><td>Number of Lanes</td><td colspan="2">2 in each direction</td></tr>
<tr><td>Life Span</td><td colspan="2">50 years</td></tr>
<tr><td>Current Traffic Volume</td><td colspan="2">20,000 vehicles/day</td></tr>
<tr><td>Percent Trucks</td><td colspan="2">20%</td></tr>
<tr><td>Traffic Growth Rate</td><td colspan="2">2%</td></tr>
<tr><td>Discount Rate</td><td colspan="2">4%</td></tr>
<tr><td>HMA Thickness @ Cost</td><td>8" @ $50/ton</td><td>12" @ $50.82/ton</td></tr>
<tr><td>Mill and Inlay</td><td>2" mill @ $1.50/yd^2
2" inlay @ $50/ton
Every 12 years</td><td>2" mill @ $1.50/yd^2
2" inlay @ $60/ton
Every 15 years</td></tr>
<tr><td>Reconstruction</td><td>4" mill @ $1.50/yd^2
6" paving @ $50/ton
Year 36</td><td>None</td></tr>
</table>

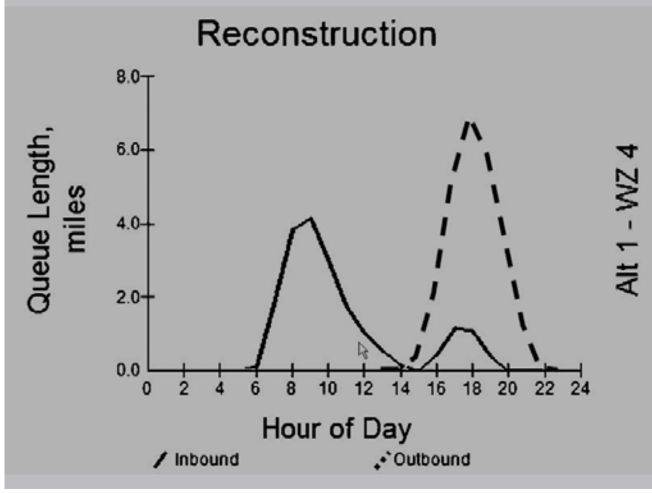
conventional pavement to fully repair the extensive fatigue cracking. Also, for the sake of this analysis, only asphalt costs were considered since all other costs such as sub-grade and base work were assumed to be equal between the two designs.

The scenarios in Figure 1 were analyzed using the lifecycle cost analysis software, LCCA. This software, developed by the Asphalt Pavement Alliance (APA), is based on best practices published by the Federal Highway Administration (1998). The software can analyze agency costs and WZUC and consider the variability of both. The variability comes from uncertainty in the traffic growth rate, the discount rate, agency unit costs and the time between rehabilitations.

The average costs, in terms of net present value, are shown in Figure 1. The initial construction cost indicates that the perpetual pavement is slightly more expensive. However, over the 50-year lifecycle, the perpetual pavement is slightly less expensive. This is a result from the fewer mill and inlay activities and eliminating the reconstruction at year 36.

A more striking difference can be seen in the WZUC. Disrupting traffic in year 36 to perform major reconstruction on the conventional pavement has a serious impact on the traveling public. Figure 2 shows the expected traffic delays where traffic will be backed up four to six miles depending on the time of day. In year 36, this translates to $5.8 million in lost time and vehicle operating costs paid by the public.

Figure 2. Expected Traffic Delay in Year 36.

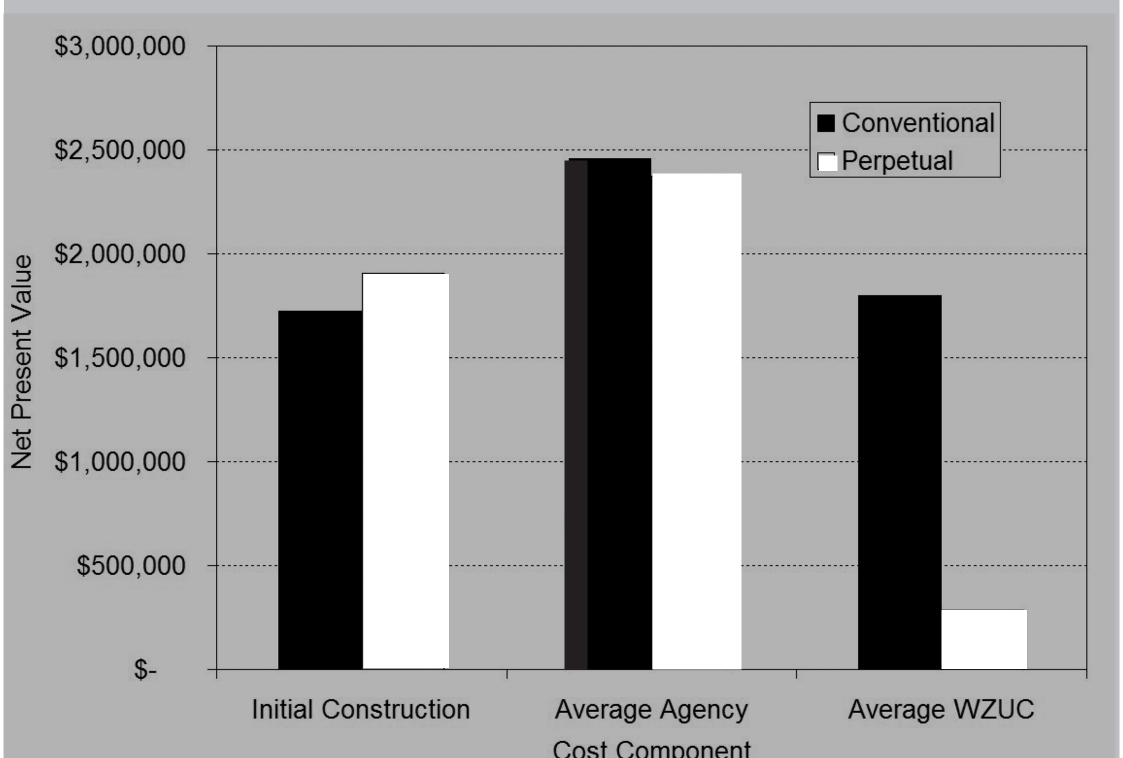


While the above cost comparison certainly does not cover every situation, it does highlight some important trends regarding perpetual pavements relative to conventional pavements that include:

- Higher initial cost
- Lower lifecycle cost
- Lower user cost
- Longer rehabilitation cycles
- Higher performance

It is also important to note that in any pavement selection process, factors such as noise, overall ride quality and environmental issues should be considered.

Figure 1. Net Present Value Cost Comparisons.



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GOT RAP?

By Marvin Traylor, Illinois Asphalt Paving Association, Director of Engineering & Research

Construction Material Prices Soar

In April of 2006, the American Association of State Highway Transportation Officials (AASHTO) released the results of its "Survey on Construction Cost Increases and Competition." Ninety-one percent of responding states said their construction bids had experienced significant increases. The construction bid items experiencing the most increases during the past year were: Earthwork (28 percent increase), Steel (26 percent increase), Concrete (23 percent), and Asphalt (18 percent increase).

While this survey was taken among the State Departments of Transportation (DOTs) similar increases have hit local agencies here in Illinois. Soaring costs and flat revenues have created significant challenges for professionals responsible for maintaining our road and bridge network. For those agencies looking to stretch their construction and maintenance dollars without sacrificing quality, the use of Reclaimed Asphalt Pavement (RAP) offers hope.

RAP as a Component Material in HMA

Hot Mix Asphalt (HMA) is 95 percent aggregate and 5 percent asphalt cement (AC). The aggregate and AC (a solid at ambient temperature) are heated to 300° F to allow the AC to coat the aggregate. The mix is transported to the jobsite hot, placed and compacted before it cools. Once cooled, the asphalt cement returns to a solid state holding the aggregate structure in place.

Before 1970, HMA projects used 100 percent virgin materials. Specific sands and coarse aggregates were blended to provide the load carrying structure, and the percentage of asphalt cement was chosen to assure durability. The oil embargo of the early '70s spurred interest in the use of RAP as an optional component in HMA. The subsequent development of the milling machine and drum mix plant made it practical and economical.

When public streets owned by the state, county, municipality or road district are milled, the contactor hauls the RAP back to the plant for processing and reintroduction into future mixes. The processed RAP becomes another ingredient material – one that has a specific gradation, and specific asphalt content. These properties are an integral part of the HMA-design process that the contractor uses to develop a mix. Research shows that at RAP percentages of 15 percent and below, the effect on the virgin AC are negligible. At higher percentages, softer virgin asphalt should be used to return the blend to its desired characteristics.

(Photos courtesy of Dan Gallagher, Gallagher Asphalt)

Significant Savings

Assuming rock sells for $10 per ton and asphalt cement sells for $400 per ton, the material cost for HMA alone is: (.95 x $10) + (.05 x $400) = $29.50. This is the material cost only and does not include overhead, transportation, traffic control, laydown, or profit. On average, the cost for the contractor to transport and process the RAP material is $6/ton. Therefore, each 10 percent increment of RAP reduces the contractor's material costs by $2.35 per ton.

Using these figures, the cost of an HMA mixture with 50 percent RAP is reduced from $29.50 to $17.75. With 20 million tons of HMA produced annually in Illinois, the potential savings from RAP shouldn't be ignored.

No Decrease in Quality

The Illinois Department of Transportation (IDOT) has allowed (and encouraged) the use of RAP in its mixes since the mid 1970s. Just as IDOT has demanded more consistency from virgin materials through its QC/QA program, it has developed a similar program governing the processing of RAP.

IDOT imposes the same mix design

process and criteria on all mixes, whether the contractor chooses to use RAP or not. RAP and virgin mixes must also meet identical density and smoothness requirements during construction. There is absolutely no difference in the quality of a mix with RAP and a mix without RAP.

IDOT is Increasing the Use of Processed RAP

IDOT and most other state DOTs have historically placed limits on the maximum amount of RAP allowed in mixes. While the industry believes these limits are set too low, many DOTs, including IDOT, are raising the allowable percentages as the processing and plant technology improves. Furthermore, recent research has provided DOTs with more information about how RAP behaves in HMA.

IDOT's new limits on the maximum amount of RAP vary with the level of traffic and location within the pavement structure. Shoulders and base courses are allowed to contain up to 50 percent RAP while surface and binder lifts vary from 10-30 percent depending on the traffic level.

Encouraging the Locals

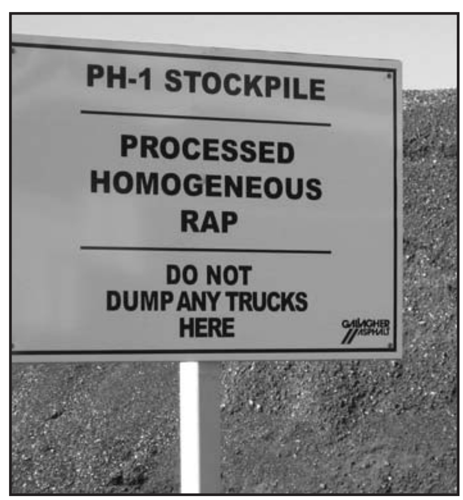
The City of Chicago Department of Transportation (CDOT) has done its share to be a leader in the use of RAP. Currently, 100 percent of the HMA placed by the CDOT crews contains RAP. However, many local agencies do not allow RAP on their projects. Part of the problem is that IDOT's allowable percentages of RAP are in the Bureau of Design and Environment's Manual rather than in its Standard Specifications. Another part of the problem may be the belief that allowing RAP will decrease pavement performance. However, research has shown that properly controlled and processed RAP does not impact quality.

The Bureau of Local Roads and Streets (BLRS) encourages the use of RAP by all local agencies and will be organizing a series of 16 seminars around the state to explain the latest RAP policies. Asphalt industry consultant Tim Murphy (a former IDOT and Asphalt Institute engineer) will conduct the training. The seminars began in the fall and will continue through 2007 until all regions of the state have been reached.

BLRS has also developed a Local Roads (LR) Special Provision (containing the same guidelines used by IDOT for its State Routes) that may be inserted into contracts to make it easier for locals to take advantage of RAP. LR 1031, Reclaimed Asphalt Pavement became available on IDOT's website at http://www.dot.il.gov/blrlrslist.html last October.

It's the Right Thing to Do

The use of RAP significantly reduces material costs. RAP mixes are as good as virgin mixes. The use of RAP will preserve our limited natural resources while reducing our energy demands. RAP is the most recycled product in the world. To make the most of your project dollars and do the right thing for the environment, make sure you've "GOT RAP" in your mixes.



This article originally appeared in the fall 2006 issue of Illinois Interchange. *It is being reprinted with the permission of author Marvin Traylor, director of Engineering & Research for The Illinois Asphalt Paving Association.*

Cost Savings, Recycling is Focus of County Engineers Conference

We've all been alarmed by the recent increases in construction costs; asphalt pavement has been no exception. These increases in costs are reducing owner agencies' ability to deliver their programs, whether they are maintenance or new construction. Everyone is asking, "What can be done to help control costs of paving?"

There are several ways to mitigate the increasing cost of paving. One of the easiest is to recycle more reclaimed asphalt pavement (RAP). Simply put, the more RAP that is recycled, the more money that is saved. For example, with the cost of asphalt binder at $300 per ton the savings from the recycled binder alone is in the order of $1.50 per ton of mix for each 10 percent of RAP incorporated into the mix. A 20-percent use of RAP saves $3 per ton. Of course, recycling RAP saves more than just the binder; but, considering just the savings from the reclaimed binder and based on the present average cost of hot mix asphalt of $80 per cubic yard, 20-percent RAP represents a cost savings of more than 7 percent. How important is it to pave 7 percent more road mileage at the same cost?

Reclaimed asphalt pavement can be recycled without compromising quality. The economic and technical case for recycling RAP was made in an article in the fall 2005 issue of *Ohio Asphalt*. If you missed that article, it can be found on the web at http://www.flexiblepavements.org/documents/RAParticle.pdf

The National Asphalt Pavement Association also recently issued a special report (SR-191) on ways that users can mitigate the increase in cost of asphalt pavement. Besides using more RAP, the report suggests ways of looking at your mix types, layer thicknesses and binder grades to realize greater economy. This report is available at http://www.flexiblepavements.org/documents/SR-191.pdf.

As part of our continuing effort to promote the recycling of RAP, we made it the focus of our exhibit at the County Engineer's of Ohio, Winter Conference, Dec. 11-12, 2006 in Columbus. We had a banner made to emphasize the message and assembled a considerable amount of literature that verifies the beneficial recycling of RAP.

Based on information that our members provided, we had identified a list of 12 county engineers with whom we wished to talk about permitting the recycling of RAP. We mailed all 12 prospects a letter in advance of the conference, inviting them to stop by our exhibit to talk about RAP. At the meeting, we spoke with six counties' representatives as well as a considerable number of others.

With no relief in sight on the cost of construction, now is an appropriate time for agencies to analyze their paving practices to see if their objectives can be achieved more cost effectively. Flexible Pavements of Ohio would welcome the opportunity to provide information that agencies might need to aid in this re-appraisal. We encourage them to contact Flexible Pavements of Ohio, if we can be of assistance.

2006 National Conference, Materials & Energy Conservation for HMA

– A National Workshop

The National Asphalt Pavement Association held a conference on Materials and Energy Conservation, November 1-2, 2006, in Indianapolis. At the conference the various experts presented ideas for reducing the costs associated with producing hot mix asphalt (HMA).

The keynote speaker, **Charles Potts** of Heritage Construction and Materials, advocated for 10 strategies to reduce HMA cost and energy use: Foremost, was the increased recycling of reclaimed asphalt pavement (RAP). Another promising strategy is the move to a warm-mix technology. He also spoke of the need to increase investment in transportation for the sake of the nation's economy.

Two state transportation agency officials reported on their increasing recycling of RAP. The Illinois DOT has published an article on the use of RAP by **Dr. Marvin Traylor**, which is reprinted in this issue of *Ohio Asphalt* (see page 14).

John D'Angelo of the Federal Highway Administration (FHWA) reported on the plan for additional research and development to further increase the utilization of RAP.

Dr. Don Brock of Astec Industries expressed his vision for processing RAP to facilitate use of greater percentages of RAP. **Reid Banks** of Banks Construction described what they do at their plants to process RAP.

Dr. Becky McDaniel of the North Central Superpave Center spoke on mix design considerations in using large percentages of RAP including the blending and adjustment of binder grades.

All the speakers on the use of RAP were in general agreement that using up to 20-percent RAP is simple and economical and should be in general practice. All also agreed that moving to greater percentages will require additional processing and care beyond what is currently practiced and that such processing is fully justified by the potential saving in cost and resources.

Paul Lum of Lafarge Canada spoke on the economy of using reclaimed shingles in HMA.

Kent Hansen of NAPA provided examples of selecting mix and layer types to promote economy in HMA pavement construction. This led into the presentation by **Gerald Huber** of the Heritage Research Group on the cost and performance advantages of using big stone mixes. **Larry Michael,** asphalt consultant, spoke on the most advantageous use of polymer modified asphalt (PMA) and conversely, the adverse cost ramifications for specifying PMA where its performance advantages are not economically justified.

Roger Brown of Pace Construction reported on his company's successful use of RAP in warm mix asphalt.

In the final session of the workshop, several speakers talked about stockpile and plant operational efficiencies that can reduce production costs.

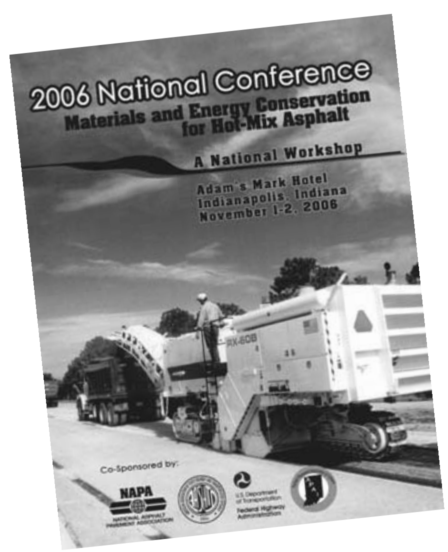
Malcolm Swanson of Astec Industries illustrated the economics of various alternative fuels including waste oil and coal. **Tony Limas** spoke of practices in aggregate and RAP stockpiles that reduce moisture and cut production costs, including: paved and drained bases for stockpiles and covered fine aggregate and RAP stockpiles. **Bill Garrett** of Meeker Equipment spoke of plant tuning for efficiency and **Buzz Prowell** of NCAT reported the findings of the NCAT research on transportation fuel costs.

As voiced by Potts in his opening keynote address, all parties must come to understand the "new economics of asphalt" and adjust their design, specification, production and construction practices to reflect the rapidly increasing cost of energy and materials for HMA.

The conference presentations can be viewed at http://www.hotmix.org/View_Article.php?ID=581

For more information on these issues see:

- The November/December 2006 issue of *HMAT* magazine
- Read the NAPA Special Report 191 at http://www.flexiblepavements.org/documents/SR-191.pdf
- Read the article by Flexible Pavements of Ohio, " The Case for Using Reclaimed Asphalt Pavement" at http://www.flexiblepavements.org/documents/RAParticle.pdf



IN THE HABIT OF ACHIEVING SUCCESS

FPO members recognized (again) by NAPA

If you talk to successful people, teams, programs or businesses, you soon find out that success is not something that occurs by chance.

In an article, "How to Regularly Achieve Repeat Success," author Naseem Mariam writes: "Success is not a one-time act. You need to repeat one success with a second; and the second with a third … You need to know how to make success a habit."

For five Flexible Pavement of Ohio members, success is not only a goal it's also becoming a habit.

> **habit** (hab`it) n. – A thing done often and, hence easily; a usual way of doing

Valley Asphalt Corp., Plant #5, Morrow, Ohio

Annually, the National Asphalt Pavement Association (NAPA) recognizes excellence in hot mix asphalt plant/site operations through its Diamond Achievement Commendations. In 2006, Ohio was recognized as having 24 HMA sites excelling in: appearance, operations, environmental practices, safety, permitting and compliance, and community relations.

"Earning the Diamond Achievement Commendation serves as a signal to neighbors that an HMA facility is a good neighbor," said NAPA Chairman Jim Roberts.

Of Ohio's 24 HMA plants receiving recognition in 2006, all but one are repeat recipients of 2005 Diamond Achievement Commendations. The FPO-member HMA producers and their plants recognized in 2006 by NAPA are:

Barrett Asphalt Materials, Inc.	Carthage Plant No. 1051
Barrett Asphalt Materials, Inc.	Cleves Plant No. 1001
Barrett Asphalt Materials, Inc.	Fairborn Plant No. 1531
Barrett Asphalt Materials, Inc.	Fairfield Plant No. 1121
Barrett Asphalt Materials, Inc.	Mason Plant No. 1031
Barrett Asphalt Materials, Inc.	Moraine Plant No. 141
Barrett Asphalt Materials, Inc.	Newtown Plant
Barrett Asphalt Materials, Inc.	Reading Plant No. 1111
Barrett Asphalt Materials, Inc.	Sidney Plant No. 111
Kokosing Materials, Inc.	Fredericktown Plant
Kokosing Materials, Inc.	Mansfield Plant
Shelly & Sands, Inc.	Mar-Zane, Inc. Plant No. 2, Marietta
Shelly & Sands, Inc.	Mar-Zane Materials, Plant No. 13, Byesville
Shelly & Sands, Inc.	Mar-Zane, Inc. Plant No. 21, Mansfield
Shelly & Sands, Inc.	Mar-Zane, Inc. Plant No. 29, Morristown
The Shelly Company	Allied Corp. Plant No. 76, Cleveland
Valley Asphalt Corp.	Plant No. 5, Morrow
Valley Asphalt Corp.	Plant No. 6, Dayton
Valley Asphalt Corp.	Plant No. 9, Cincinnati
Valley Asphalt Corp.	Plant No. 14, Newton
Valley Asphalt Corp.	Plant No. 17, Cleves
Valley Asphalt Corp.	Plant No. 19, Cincinnati
Valley Asphalt Corp.	Plant No. 23, Cincinnati
Valley Asphalt Corp.	Plant No. 25, Troy

Allied Corp., Cleveland Plant

The Diamond Achievement Commendation is earned through a self-assessment process, is verified by local community members and evaluated by a nationally known independent assessment firm.

EQUITABLE & PROMISSORY ESTOPPEL DO NOT APPLY TO PUBLIC ENTITIES INVOLVED IN CONSTRUCTION

Equitable estoppel applies when a defendant makes a misrepresentation of fact upon which a plaintiff detrimentally relies. Promissory estoppel is a legal doctrine where a defendant makes a representation as to his intention to take certain future action upon which the plaintiff detrimentally relies.

In the case of Hortman v. Miamisburg, 110 Ohio St.3d 194 (2006), the Ohio Supreme Court ruled that the doctrines of equitable and promissory estoppel do not apply to the state or its political subdivisions when the governmental body is engaged in a governmental function like road building.

This case means that even if governmental entities make certain misrepresentations in connection with public works projects, these "promises" may not be enforceable by contractors or other interested parties – particularly when they do not come in the context of an express written contract.

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3rd Rubber Modified Asphalt Conference

May 3 & 4, 2007

Radisson Hotel City Center
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3rd Rubber Modified Asphalt Conference
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Keynote: Asphalt-Petroleum Supply
Bill Haverland - Conoco-Philips

EPA/RCC Comprehensive Study on Rubber Modified Asphalt

Types of Rubber Modifiers - What it is?
How it is processed? How is it incorporated into asphalt?

Recent Research with Rubber Modifiers

Innovations with Rubber in Asphalt

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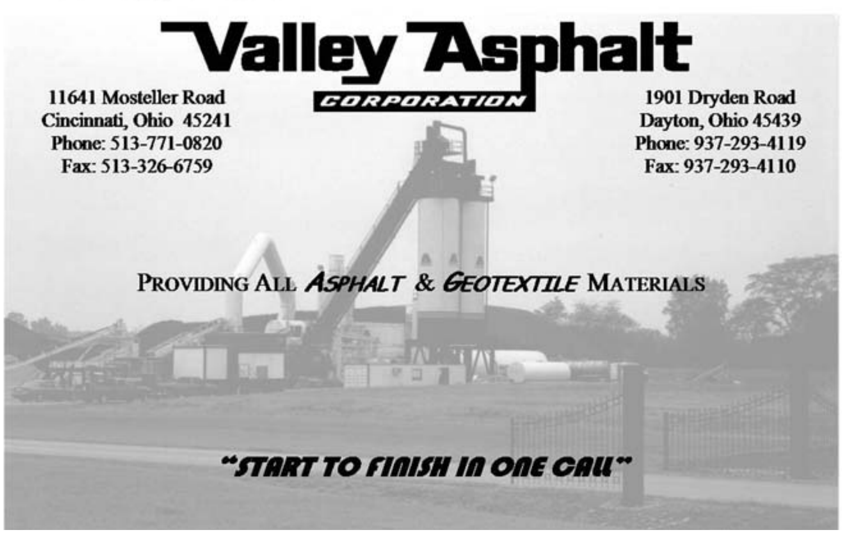

Attend Flexible Pavements of Ohio's

45th Annual Meeting & Equipment Exhibition

This is the annual convention for the asphalt paving industry in Ohio, and there is something for everyone, including: the usual fine program of General Sessions and the Trade and Equipment shows.

Watch for the detailed program in the mail and register for the annual meeting at:
www.flexiblepavements.org or call 888.4Hotmix

You don't have to be registered for the Annual Meeting to visit the Trade Show and Equipment Exhibition. Those exhibits are open to all customers.

Come join the rest of the Ohio asphalt paving industry at the Flexible Pavements of Ohio, 45th Annual Meeting and Equipment Exhibition in Columbus, March 20 & 21, 2007.

March 20-21, 2007

Hilton Columbus Hotel at Easton • 3900 Chagrin Dr. • Columbus, Ohio 43219

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