On October 27, 1938, history was made in Cumberland County, when ground was broken for the construction of the original Pennsylvania Turnpike. The Turnpike was to extend 160 miles starting at US 30 in Irwin and end, 160 miles later, at US 11 in Carlisle, Pennsylvania. The typical section for this highway consisted of four-12 foot concrete lanes with a ten foot grass median and ten foot outside shoulders.

This original concrete pavement served the customer well. However, in the late 50’s and early 60’s, the wear and tear of twenty years of traffic made it necessary for the Commission to start a bituminous resurfacing program, which has evolved into the Commission’s mill and pave program. This initiative continued to provide a reasonable road surface, but with the increasing traffic and higher wheel loads of the 90’s, it became apparent that the pavement structure was rapidly approaching the end of its life cycle and the need for additional capacity in some areas, a major reconstruction/widening effort was necessary.

In order to meet those needs, in 2000, the Commission began a reconstruction initiative which would involve the Turnpike’s original 160 miles and its various western and eastern extension projects. That reconstruction initiative has already led to the reconstruction of 47 miles of the original 160 mile section. During this initiative, various Transportation Agencies were looking at SUPERPAVE with polymer modified PG oils added to the bituminous material and strengthening the subgrade through different types of soil stabilization to obtain longer pavement life. The Turnpike was no exception. A typical SUPERPAVE pavement section during this period consisted of:

- SUPERPAVE Asphalt, 12.5 mm, 2” depth
- SUPERPAVE Asphalt, 19.5 mm, 2” depth
- Bituminous Concrete Base Course, 12” depth
- Asphalt Treated Permeable Base Course, 4” depth
- Subbase, 6” depth

With SUPERPAVE the thought was that the mill and pave cycle could be extended from its current 10-year cycle, to a 15-year cycle on the full-depth bituminous reconstructed roadway sections.

SUPERPAVE was developed to control rutting which should extend the time between resurfacings. However, with increasing oil costs, wasn’t there a way to not only extend resurfacing cycles but also to extend the life cycle of the structural bituminous pavement courses? It was about this time that the concept of a perpetual, long-term, asphalt pavement concept was gaining new life.

In reviewing experiences of other Transportation agencies nationwide and industry and research by various institutions of higher learning, it became apparent that another secret of extending the life of pavements was to make use of the concept of a perpetual, long-term, asphalt pavement.
are today, 70 years later, within the same physical Milepost limits and a few dollars more beginning a Perpetual Pavement Project utilizing a Rich Bottom Base Layer.

Major work items on the current reconstruction project include the following:

- 537,674 cubic yards Class 1 Excavation
- 365,285 square yards of subbase 6” depth
- 201,329 square yards of Asphalt Treated Permeable Base Course, 4” depth
- 201,329 square yards of Rich Bottom Bituminous Concrete Base Course, 4” depth
- 201,329 square yards of Bituminous Concrete Base Course, 8” depth
- 138,922 square yards of Bituminous Concrete Base Course, 4” depth
- 201,327 square yards of SUPERPAVE Asphalt Mixture, 19 mm, 3” depth
- 201,328 square yards of SUPERPAVE Asphalt Mixture, 12.5 mm, 2” depth
- 26,400 Linear feet of various sized drainage Pipe
- Three Overhead Bridge Replacements
- Two Mainline Bridge Replacements
- Four Concrete Arch Extensions
- One Mainline Box Culvert Replacement

This two-year project will be constructed in two major phases. During Phase 1, traffic will be maintained on the

New Turnpike Section

On February 5, 2008 the Commission awarded a reconstruction project between MP 210 and MP 215 in Cumberland County, New Enterprise Stone and Lime Co., Inc. with a bid of $61,714,654.46.

As a side note, on October 26, 1938 the Commission bid and awarded the first ever roadway project to L. M. Hutchinson Co. for an amount of $458,058.00. This grading and drainage project was between MP 204 and MP 215. Here we
existing four lane pavement section while overhead bridges are replaced and a new 12 foot lane and a 12 foot shoulder is constructed in each direction. Upon completion of Phase 1, traffic will be shifted to the newly constructed pavement surfaces and the existing four-lane pavement section will be totally rebuilt to provide the new six-lane highway.

The Commission and the project team are excited about this perpetual pavement project and the long-term value to be realized for future reconstruction work.

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Charlie Cook
What the 2008 elections mean for highway funding

Green Is the Same Color as Money
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Warm-Mix Asphalt Task Force
Inaugural meeting
In the Fall of 1957, the Pennsylvania Turnpike opened its Northeast Extension to traffic. Over the course of fifty-one years, the Portland Cement Concrete roadway (PCC) has been overlaid with various bituminous hot mix asphalt courses, to maintain a safe and relatively smooth riding highway. Inherent to overlays over concrete are reflective transverse cracking, from the bottom up, through the hot mix layers to the surface. These cracks mainly occur over the old concrete slab joints and fractures. This cracking, compounded with an area that experiences harsh winters with several freeze thaw cycles, can make for limited service life of pavements. The Turnpike has tried several methods to prevent this cracking over the years, in order to extend the life of the pavement until monies become available for total reconstruction. All past efforts have met with only limited success.

Currently we have teamed with SemMaterials and are experimenting with their Strata® reflective crack relief system. This system consists of a polymer modified asphalt binder with high asphalt cement contents (8.5% +/-) and a fine graded aggregate mix that is 1” in depth. This product is highly elastic and impermeable, and can be applied with conventional paving equipment. We generically refer to this Strata® type of product as a stress absorbing membrane layer in our specifications. Since 2005, the Turnpike has used this product on three separate competitively bid contracts from Mileposts A95 to A115 on the Northeast extension in the Pocono / Scranton / Wilkes-Barre area. Our latest project had a bid of $9.90 per square yard (SY) for an estimated quantity of 272,496 SY, for the stress absorbing membrane layer in place.

We learned some lessons through our three projects with the stress absorbing membrane layer. In 2005, between MP A95 to MP A105, the existing PCC joints were severely deteriorated. The contractor milled 4” of the existing bituminous pavement overlay, cleaned the joints with compressed air, packed the joints with bituminous material, and placed the stress absorbing membrane layer and a 3” wearing surface. Joint repairs were minimal. By the winter of 2005 we had major transverse cracking.

SemMaterials and our Turnpike Materials unit reviewed the cracking and made recommendations that on the next project the joints needed to be adequately repaired. In addition the pavement cross section was changed to include a 1” leveling course and the wearing course was reduced to 2” depth. On our next project in 2006, between mileposts A105 to A115, the contractor repaired the PCC joints with a compacted 9.5 mm mix followed by a 1” leveling course, 1” of stress absorbing membrane layer, and 2” of 12.5 mm wearing course with PG 64-28 SB asphalt.

We still had minor cracking at the transverse joints, but by repairing the existing PCC joints, it had reduced some of the cracking. This pavement design also provided better density and ride numbers. In 2007 we bid our current project between mileposts A115 and A130 with the same pavement cross section. Slab stabilization of the worst joints with urethane material was also incorporated into all of the projects.

In 2007, the Turnpike requested that SemMaterials provide an analysis on the area where we are still experiencing reflective cracking at the joints. SemMaterials retained Advanced Infrastructure Design, Inc. (AID) to conduct an independent study. In May 2007, AID obtained core samples and performed Falling Weight Deflectometer (FWD) tests on two sections of southbound lane between mileposts A109.60 and A109.90 and between mileposts A114.65 and A114.95. This test helps determine how much movement potential exists in the concrete pavement. Milepost A109.60 to A109.90 essentially consisted of a PCC pavement base, since the existing bituminous material was entirely milled prior to testing. Mileposts A114.65 to A114.95 consisted of a 9.5 mm leveling course, the one inch stress absorbing membrane layer, and the two inches of the 12.5 mm wearing course all over the PCC pavement.

The AID study cores showed that reflective cracks were starting at the top of the pavement, but were stopping at the stress absorbing membrane layer. This layer was still impermeable without cracks. The FWD test showed that even though the concrete slabs had been sub-sealed prior to the overlay, the slabs were still experiencing some movement, causing reflective cracking at the joints. The evidence that the cracks were occurring from the top down indicated that the stress absorbing membrane layer was performing as intended, but the wearing course was not flexible enough to bend at the same rate that the stress absorbing membrane layer was able to flex. A more flexible wearing course would have to be found. The Turnpike noted that the stress absorbing membrane layer may...
have prevented water from entering the pavement structure from beneath the layer and maintenance sealing on the surface should help extend the pavements life.

SemMaterials, through cooperation with Eastern Industries and the Turnpike, came up with two strategies to improve the wearing course flexibility. On November 1, 2007, two test areas were placed in the southbound left lanes between mileposts A118 and A119 to test the improved wearing courses. In the first test area, 459 tons of a 12.5 mm wearing course, PG 64-28, with an experimental flexible polymer asphalt binder known as FXB from SemMaterials, was placed.

This wearing course was designed with 75 gyrations in lieu of our standard 100 gyration mix. The lesser gyrations enable more asphalt and more fine aggregates to be included into the mix, thereby increasing flexibility. In the second test area, 200 tons of Eastern Industries’ standard 75 gyration mix, modified from a PG 64-22 to the PTC specified PG 64-28 with SB or SBS polymer modified binder, was placed. We wanted to compare the performance of a slightly modified standard paving mix to the special modified SemMaterials product. Both of these methods made the wearing course less rigid, and by adding polymers to the asphalt mix, it increased the flexibility of the mix.

In May of 2008 the test areas were reviewed and it was found that the conditions of the southbound left lane pavement had no stress cracking and no visual wear. As for the southbound right lane, there was still minor reflective transverse cracking. Making these adjustments to the wearing course mix appears to have made a significant difference and could be the key to getting us closer to the prevention of future reflective cracking.

Due to the top cracking that was experienced at the joints, the Turnpike may make it a requirement on future projects to perform the FWD testing prior to slab stabilization and again after the sub-sealing is complete. The flexible wearing courses over the stress absorbing membrane layer will be monitored to determine if they continue to be successful in preventing top down cracking, and continue to provide the rut resistant properties of standard hot mix asphalts.

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**NEW MEMBER – WELCOME**

The following company has joined the Association.

**ASPHALT REFINER MEMBERSHIP**

**NuStar Energy LP**

Street Address:  
2330 N. Loop 1604 W  
San Antonio, Texas  78278

Mailing Address:  
P. O. Box 781508  
San Antonio, Texas  78248

Contact:  
Suzanne Fitzpatrick  
Director, Asphalt Marketing

Telephone No.:  
(610) 272-1685  
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E-mail:  
Suzanne.Fitzpatrick@nustarenergy.com

Website:  
webmaster@nustarenergy.com

The Hot-Mix Asphalt Association welcomes the new member. The membership contributes to making our industry a much stronger organization. We look forward to your participation in the Association.
MINIMUM BINDER CONTENT TO SATISFY VOLUMETRIC REQUIREMENTS

By Mansour Solaimanian, Director, Northeast Center of Excellence for Pavement Technology
Penn State, University Park, PA

Background

In a Paving the Way article published in 2006 (Volume 8, Number 2), we discussed the significance of voids in mineral aggregate (VMA) and approaches to adjusting it. We also discussed maximum limits on VMA and how such maximum limits could be determined based on AASHTO specification M323.

Within the last several years there has been concern raised in regard to durability of some SUPERPAVE mixes. Some have reported these problems as a result of insufficient binder content in the mix. This issue has been the driving force for several states to take measures to increase the binder content in the mix. Some have been designing at a reduced number of gyrations, or at an air void level about half a percent lower than what is specified in Table 6 of AASHTO specification M323-04. Both of these changes result in higher design binder content. There has also been a move by some to increase the minimum required VMA to allow more space within the aggregate structure for asphalt and therefore provide a higher binder content mix at a specified design air void level. The Pennsylvania Department of Transportation (PennDOT) is now specifying a half percent higher VMA for all aggregate size gradations than what is specified in AASHTO M323.

Minimum Required Asphalt Binder

In the 2006 Paving the Way article we discussed that if, at a specific asphalt content, design air void is satisfied but the criterion on VMA is not met, then the only way to fix the problem is through changing the aggregate gradation. Under these circumstances, if aggregate gradation is not changed, changing the asphalt content may bring VMA higher but it will cause the air void to deviate from the target. It may be of interest to the mix designer to know the minimum required asphalt content that would satisfy minimum required VMA at design air void level. Several factors must be known before minimum required asphalt content can be determined. These include aggregate bulk specific gravity and absorption, design air void, minimum required VMA, and binder specific gravity. Once these parameters are known, determination of minimum binder content is simply a computational practice. Such computations have been conducted for several different levels of VMA and are presented in Figure 1. Design air void is considered 4 percent, percent absorption as 0.5%, and binder specific gravity as 1.030. As shown in Figure 1, as the aggregate specific gravity decreases, or minimum required VMA increases, the amount of binder needed to satisfy minimum required VMA at design air void is increased. Binder specific gravity somewhat affects the minimum required binder content. As expected, higher specific gravity of the binder results in higher binder mass required to provide the same level of binder volume (i.e., the same level of aggregate coating). For a range of binder specific gravity, this change in the amount of required binder could be as high as half a percent (Figure 2).

The effect of aggregate absorption is obvious, and the percent minimum required binder can be decreased or increased from the values shown in the graph, depending on how different absorption is from 0.5%, shown in Figure 2. It should be noted that Figure 2 is provided for a VMA level of 13.5.

The preceding graphs are only provided as a guide for mix designers and obviously do not replace the actual work required to design a mix.
Warm-mix asphalt (WMA) has been a dominant topic in industry magazines for the last year or so. You have read about it here in the January/February/March issue of *Paving the Way*. There have been a number of informative articles in HMA\(^T\), the publication of the National Asphalt Pavement Association (NAPA). And the topic has been frequently discussed in other leading periodicals, including *Asphalt Contractor*, *Roads & Bridges*, and *Hot-Mix Magazine*.

There is obviously a great deal of interest in this new range of technologies, primarily because of the benefits it can offer in the areas of practicality, economy, and end-product workability.

The article in *Paving the Way* was entitled “Warm Mix Asphalt Heats Up!” In the article, the author organized the WMA technologies into three separate categories: chemical additives; material-foaming techniques; and plant-foaming techniques. While the first two categories involve the use of special materials that are added to the mix, the last one—plant-foaming techniques—focuses primarily on the equipment that is used to produce the mix itself.

The Double Barrel\(^R\) Green System

Astec, Inc., the leading manufacturer of asphalt production facilities, began working on its own version of WMA equipment several years ago. In June of 2007, the company demonstrated its new Double Barrel Green System by doing some actual paving on a city street in Chattanooga, Tennessee. The event was witnessed by a diverse group of industry producers and engineers, including representatives from the National Asphalt Pavement Association (NAPA), two state pavement associations, the national center for Asphalt Technology (NCAT), and three state DOTs.

The basic concept behind the Double Barrel Green System is the mixing of a small amount of water with the liquid asphalt cement (AC) to produce microscopic foam as the liquid AC enters the mixing chamber of the dryer/mixer. This lowers the viscosity of the mix so it can be compacted at temperatures as low as 220°F.

During the demonstration of the new WMA equipment in Chattanooga, Tennessee, they milled two inches of asphalt from a high-traffic street, separated it, and crushed it back to its original sizes. The material was then mixed with virgin rock and liquid AC that had been foamed in the Double Barrel Green System. The final mixture was produced at about 280°F and placed on the road as a surface mix.

According to the official review of the performance, the city was able to realize a 25 percent reduction in mix cost while receiving a product that was equal or superior to what they had received in the past. This was done without any increase in cost or additional additives to the mix, other than water that was used to make the foam.

How Astec’s WMA system works:

The Double Barrel Green System consists of multiple valves, mixing chambers, and nozzles that make up a common liquid-AC manifold that is inset into the side of the dryer/mixer. The manifold has a continuously circulating jacket of hot oil. Ordinary water is injected into a mixing chamber above each foam nozzle (Figure 1).

After the water enters the unit, it is sprayed into the liquid AC from four points around the boiling chamber. The injected water turns to steam—expanding 1,800 times—thereby causing the liquid AC to foam like a whipped-cream topping.

The result is quite effective: The foaming action helps the liquid AC coat the aggregate at a temperature that is about 50°F lower than the temperature of conventional hot-mix asphalt (HMA) mixes.

Engineers who have had an opportunity to see the system in action agree that the benefits of Astec’s WMA system include the following:

- Improved workability of the mix because the liquid AC has a lower viscosity;
- There is no smoke or odor because the light oils in the liquid AC never reach the boiling point;
- High percentages of reclaimed asphalt pavement (RAP) can be used with a standard grade of liquid AC;
- Fuel consumption is reduced by 14 percent because of the lower mix temperature;
- The lower temperature provides a more comfortable, safer environment for plant workers and paving crews;
- Plant production is increased by up to 14 percent — and there is no increase in production costs.

A field test of the new WMA system

The owners of Boggs Paving, Inc., a Monroe, North Carolina paving company, had witnessed the Chattanooga demonstration and were impressed with what they saw. They bought the Double Barrel Green System and installed it as

*Continued on page 8 . . .*
a retrofit on one of their existing Astec dryer/mixers. After experimenting with it for awhile, they approached the engineering department in York County, South Carolina to see if there would be an interest in doing a test. The county engineers were quite interested because they were looking for ways to use RAP and other environmentally friendly production processes.

The test involved residential streets in York County. On most of the streets, Boggs Paving put down a 2-in. lift of warm-mix binder. On the others, they put down a 2-in. warm-mix binder course, followed by a 2-in. warm-mix surface course.

“We produced and put down about 15,000 tons on the entire project,” said Drew Boggs, president of the company. “I would say that about 80 percent of that—or 12,000 tons—was produced as WMA.” He went on to outline the benefits that particularly impressed him: fuel savings, worker comfort and safety; reduction in fumes; and the ability to use high percentages of RAP.

“Running the mix at a lower temperature gives you the opportunity to run more RAP—which is something that is both environmentally friendly and economically advantageous.”

The officials from the York County were quite positive about the results of the test. According to Phil Leazer, transportation manager for York County Engineering Department,

The Astec Double Barrel® Green System is a concept that gives producers the ability to make WMA (warm-mix asphalt) without having to rely in expensive additives, special liquid asphalt cement, or unusual procedures and delivery system to achieve low viscosities at low temperatures.

The system includes a special tank that holds ordinary water. This water is then mixed with the liquid asphalt cement (AC), creating microscopic bubbles that reduce the viscosity of the AC as it coats the aggregate.

The Double Barrel Green System mounts to the side of a new Astec Double Barrel dryer/mixer—or it can be retrofitted in the field to the side of an existing, in-service Astec Double Barrel dryer/mixer.

Figure 1—This diagram shows a close-up view of one of the foam nozzles that make up the central part of the Astec Double Barrel Green System. After the water enters the unit, it is sprayed into the liquid AC from four points around the boiling chamber, causing the liquid AC to foam. Here are the key components: (1) the AC manifold; (2) the nozzle valve (in its open position); (3) the adjustable jet; (4) the water enters here; (5) the water passage; (6) the boiling chamber (where the foam is formed); (7) the spray nozzle; (8) the AC foam (being sprayed on the aggregate).
they are interested in seeing what the field conditions of the mix will be in the future and how it lasts under day-to-day traffic. As far as the test itself, he had some immediate comments:

“We found that we were getting compaction much quicker on the mat—almost 100 percent of the compaction we needed—under just one roller. In addition, the amount of time that you have from lay-down to compaction can be a lot longer with warm-mix asphalt—which means that you don’t have to rush the rolling process.”

Laboratory testing also seemed to prove the value of the WMA technology. “We were actually taking core samples immediately after the finish roller and testing them in the lab,” said Leazer. “We found that the test pavement met compaction requirements on every core that we took.”

As of the first part of May, 2008, Astec had already delivered 79 separate units of the company’s Double Barrel Green System, some of them on brand-new plants and some of them as retrofits on existing plants.

According to J. Don Brock, the chairman and chief executive officer of Astec Industries, Inc., this new WMA production concept is a major step forward for the industry.

“While the direct benefits of this concept to Astec will be quite small,” said Brock, “we are proud to be able to help our industry become more environmentally friendly, reduce the product cost—and, hopefully, produce more tons of mix by being more cost competitive.”

If you would like more information about this system, you can go to the Astec website (www.astecinc.com) and click on the Double Barrel Green System photograph. ◆
HMA PLANT: ENERGY SAVING TIPS

By Bill Garrett, Partner, Meeker Equipment Co., Inc.

PAPA is a great organization and is always developing ideas and information to help us with our HMA Businesses. The intent of this series of articles is to help us better control our energy cost, with some “Back to Basics” concepts and information.

**Drum/Dryer (DD):**

**Air Seals Maintained:**

The largest energy consumer (the burner) mounts on the Drum/Dryer (DD) and one of the major factors in the burners’ fuel consumption rate and performance is determined by the air seals on the drum. When excess air can enter the drum without coming through the burner, then that air must be raised to production temperature (300 deg F), increasing the consumption of ever more costly fuel, also reducing the oxygen available for proper combustion. A 1” seal leak on an 8’ diameter drum is equal to a 2’ square opening in the side of the ducting—WOW!

**Inlet & Discharge Dampers in place & Functional:**

Where the material enters the DD must be completely sealed and sealing is difficult with a moving slinger belt, but careful sealing will add production and reduce fuel consumption.
A material inlet chute must have a functioning damper in the chute to prevent tramp air infiltration and again **reducing production and increasing fuel consumption.**

**Trunnions Must be Properly Adjusted:**

When the trunnions are not adjusted to the manufacturers’ specifications, they fight each other and create increased wear (added $$) and increase drive energy required for desired production.

**Insulation DD:**

As energy continues to increase, insulation becomes one of the best investments to maintain the heat created within the process. Whether hot oil or asphalt piping, pugmills, silos, drag slats, tanks or especially the DD; **insulation saves $$** through heat loss prevention and protection for wiring, gear boxes and motors.

The Drum/Dryer (DD) and the loss of valuable production and energy are primarily the result of maintenance. Keeping air out (sealed properly) and heat in (well insulated) will reduce energy and increase or maintain desired production. 

**Figure 6. DD Inlet material chute sealed well**

**Figure 7. Adjustment can be difficult**

**Figure 8. Tire damage caused**

**Figure 9. Losses before insulation**

**Figure 10. Greatly reduced energy losses**

**Before Drum Insulation 600 tph Counter Flow, 650 deg F**

**After Drum Insulation Same 600 tph Counter Flow, 100 Deg F**
HRI’S PASIN EXPERIENCES

By William Smith, Corporate Quality Control Manager, HRI, Inc.

On March 8, 2007 HRI was the apparent low bidder on ECMS 57791 (Jefferson County, SR 28 Sec. 510, Game School Road) the first Pennsylvania Asphalt Improvement Network (PASIN) project in the state. It soon became evident that this project, and paving season, would be unlike any other in my twenty-two years in Quality Control.

Soon after the job was awarded HRI submitted my name as the Quality Manager (QM) for this project. The PASIN team reviewed the request and approved me as the Q.M. From this point a series of meetings began. The first of these meetings was a kick-off meeting with HRI representatives (VP, QM, Plant Superintendent, Paving Superintendent, and the Project Manager) and the PASIN Implementation Resource Team on May 7, 2007. The same group met again one week later to discuss the development of the PASIN “Hot Mix Asphalt Plant and Production Implementation Plan.”

HRI then participated in a GAP assessment, which was to be completed by May 23. The GAP Assessment Finding Report is a 38 page report showing that, under the PASIN (ISO) requirements, HRI had the following:

– 27 Major Non-conformities
– 4 Minor Non-conformities
– 60 Opportunities for Improvement
– 44 Points of Pride

A large percentage of the issues (~95%) were due to a lack of documented items and/or written procedures. We were informed that our GAP Assessment was very similar to the previous assessments done in the industry.

Between May 23 and June 21 HRI, with the help of the PASIN Implementation Resource Team, developed the Quality Management System (QMS); a 99 page plan that included the following sections:

– Executive Summary
– Overview
– Management Review
– Customer Focus
– Internal Audit
– Corrective and Preventative Actions
– Control of Non-conformities
– Control of Documents
– Control of Records
– Records Inventory Development
– Change Control
– Organizational and Personnel Profiles
– Plant-specific Maps

Plant:
– District 10 Approved HMA QC Plan

– Best Practices
– Key Control Points
– Approved TR448A JMF’s to be used on the project

Paving Operation:
– QC Plan
– Best Practices
– Key Control Points

The PASIN Steering Team reviewed and approved the QMS on July 12, 2007. While trying to develop the QMS the following issues came to light:

1. New terminology and/or variations in terminology between all those involved caused confusion.
2. Development of control of documents would take months if not years. This would be started but not completed by the time the project was finished.
3. HRI did not clearly understand what was needed to fulfill the required sections of the QMS.
4. The PASIN team had variations in their expectations of how the QMS should be developed.
5. This is a pilot project and there was much for everyone involved to learn from the experience throughout the project.

The Best Practices and Key Control Points were developed by PASIN and listed for the contractor. HRI went through the list (84 at the Plant/ 68 in the Field) and listed the person responsible for the item. Each of the Best Practices and Key Control Points included the Action Item (how the Best Practice is ensured), the Status (often this was continuous) and The Due Date (often this was on going). Once all of the Best Practices and Key Control Points were assigned I HRI Plant Foreman Al Snell and Plant Technician Tim Confer discuss Process Capability study sampling with PENNDOT representative.
developed both daily and weekly checklists for the Plant Foreman, Plant Operator, Plant Tech, Paving Foreman, Field Tech and the Quality Manager. These checklists helped to close the documentation gap between doing an item and having some type of documentation to support the work.

Once I had developed the checklists I met with the five employees who would put them to use for Quality Management System training. This training was documented and the foremen then returned to their locations to perform the same training with their employees. Once again, each of those sessions was documented on the HRI Training form.

Along with the Best Practice checklists, HRI developed a Management Review Meeting checklist and, as per our QMS, stated that we would hold a Management Review Meeting at least once every two weeks. The first meeting was held on August 21, 2007, attendance and minutes were documented as per our QMS. Management Review topics included:
1. Test Results
2. Schedule/Personnel
3. Plant/Equipment Breakdowns
4. Documents and Reports Control
5. Purchasing
6. Audits
7. Customer Complaints
8. Non-conformance items
9. Corrective Action
10. Preventative Action
11. System Strength and Improvements
12. System Weaknesses and Opportunities

On September 7, 2007 HRI was given Audit training by Bill Gordon from PA DOT. This training gave three HRI employees guidance into conducting an internal audit. The Internal Audit form was developed and the audit took place September 27 and 28, 2007. The audit form was composed of 61 questions (20 from the plant, 26 from the field and 16 from the QMS) as well as examination of files/records and documents.

HRI also agreed to participate in a Process Capability Study. To gather this data Bill Gordon needed to collect a minimum of 100 volumetric/gyratory specimens. The samples were needed from consecutive drops from our four-ton batch plant. We loaded the trucks so that we could pull a sample from both drop four and drop five. HRI shipped approximately 1000 tons of 9.5mm 0.3<3 million ESAL SRL “H” on each day (October 3 and 4, 2007). From each sample truck we pulled three gyratory specimens, one MTD loose box and one HRI loose box from both drop four and five on each truck. We had nine sample trucks each day, one truck every 110 tons was sampled so that the study would include variations of three gyratories from a single batch as well as variations between two consecutive drops. Two PA DOT representatives and three HRI employees worked very hard for two days to see that all the samples were collected and prepared properly for the MTD lab.

The wearing course for this project was completed on

HRI crew working on first PASIN project bid in the state, SR 28 Sec 510, Game School Road, Jefferson County, District 10.
October 8, 2007 and all MTD test results calculated 100% payment. An external audit was performed on December 4, 2007 and HRI received the final audit report on May 7, 2008.

HRI did not change its processes for this project; we needed only to change our documentation in order to show written proof that our processes were followed.

The new items developed for this project that I feel were the most valuable were the Customer Complaint form and log, the Non-Conformance form and log, the Management Review Meetings (these would be most useful on a monthly or quarterly basis rather than bi-weekly) and most valuable of all in my opinion was the data collected from the Process Capability Study.

This Quality Management System helps point us in the direction we should be going: Continuous Improvement.

Say what you do.
Do what you say.
Prove it.
Improve it.

HRI would like to send a special thank you to Frank Colella from PAPA for all of his help with communications between HRI and the PASIN group.

Bill Smith, HRI Quality Manager discusses PASIN project with PENNDOT Project Manager, Dave Schaffer

CHECK OUT NEW WEB ENABLED PLANT DIAGNOSTIC TOOL

**By Bob Frank, President Compliance Monitoring Service**

This web application lets you adjust variable inputs and automatically calculates drying cost and maximum production rate. You shouldn’t be surprised that the two are related!

To get started, set the top slider to your normal dryer exhaust temperature. Percent oxygen may be harder to determine. As a rule batch plants run between 13% and 17% oxygen due to fugitives. Drum plants can range between 10% and 15%. The higher the burner firing rate at the time of reading the lower the oxygen percentage. 14% is a good starting point for most plants.

Move on down the right hand slider bars, matching normal operating conditions at your plant. The shell loss slider is more seat of the pants than all the others since there are so many variables involved - size of dryer, production rate, insulation, shell temperature. Without getting bogged down in details, if you have a large un-insulated dryer the slider should be hard right, middle for smaller drums. If insulated put the slider on the left. Leave reject at zero for starters.

By now the “roll of lifesavers” on the bottom right should be close to your average drying cost in gallons of fuel oil per ton of mix. The size of each colored disk is proportional to how much fuel went into making your aggregate hot verses going up the stack.

Try all this with the new Plant Diagnostic Tool added to PAPA’s home page – [www.pahotmix.org](http://www.pahotmix.org). Check it out and send me your questions or comments. Next month we’ll take a look at airflow. Bobfrank2@aol.com.

One last thing, if you have trouble getting the lifesaver roll to match your plant, increase the waste slider. This gives you a good indication of how much material is heated but doesn’t make it out the gate.
PA ASPHALT IMPROVEMENT NETWORK (PASIN)
A 2008 PERSPECTIVE

By Sumathi Ravindraraj, P.E., CPCC
PASIN Implementation Resource Team Member

Pennsylvania Asphalt Improvement Network (PASIN) is an initiative to develop, pilot and implement an ISO 9000-2000 based Quality Management System from project design through qualification, procurement, manufacture, delivery of materials, installation, acceptance testing and maintenance of asphalt pavement. The purpose of PASIN is to improve the quality of asphalt highways. In 2007, two PASIN pilot projects were conducted successfully. In the 2008 construction season, four PennDOT projects will pilot the PASIN initiative, in Districts 3, 8, 10, and 12, as follows:

❖ 79105-Lycoming Co., SR 15, Section 121
❖ 80092-Fayette Co., SR 21, Section 07R
❖ 79765-York Co., SR 24, Barrens Road Resurfacing
❖ 84293-Armstrong Co, SR 28, Section 117

The 2008 pilots have many similarities to the 2007 pilots, and some differences. Contractors will be compensated for implementing the PASIN effort in Item 9409-9999 Pilot Asphalt Quality Systems. Additionally, PASIN pilot project contractors will develop and deploy an HMA PASIN Implementation Plan (HMA Plan), similar to last year. Process Capability, however, will not be performed in the same format as last year. Additionally, more guidance will be provided by the PASIN Team, which includes PAPA, PennDOT, and other industry in its membership, during the implementation process.

The contractor’s Quality Manager will lead the PASIN implementation effort. In the HMA Plan for the project, the contractors will communicate the plan for implementing the Best Practices and Quality Management System, by:

❖ Assigning responsibility for implementing Best Practices, as listed in the PASIN Quality Manual, within the company.
❖ Identifying a Management Review Team.
❖ Developing a Corrective, and Preventive Actions methodology.
❖ Establishing a Customer Focus Process.
❖ Creating a Non-Conformance Resolution Process.
❖ Developing an Internal Auditing Process.
❖ Developing processes to Control Documents and Records.

The HMA Plan will be reviewed for approval by the PASIN Steering Team. The contractors will implement the approved HMA Plan. The effectiveness of the implementation will be measured internally by the contractor’s internal audit teams and externally by PASIN’s External Audit Team, which is composed of certified ISO auditors.

Based on feedback at the After Action Reviews for 2007 pilot projects, more guidance will be provided by the PASIN Implementation Team, during the implementation process itself. The contractors will be provided forms, such as the Corrective Action and Customer Complaint Resolution Forms. A sample tracking log of Corrective, and Preventive Actions, Non-Conformances and Customer Complaints will also be made available. PASIN will continue to provide guidance on conducting internal audits, and will aid in training auditors.

The PASIN Team is committed to ensuring the success of the PASIN effort in the asphalt industry. The benefits of PASIN implementation are reduced risk of failure, resulting in increasing profits, while improving quality by deploying the Best Practices and implementing the Quality Management System. PASIN implementation is new to the asphalt industry, and may actually be new to the entire construction industry. PASIN projects will require the involvement of the contractor’s leadership to ensure success. In the beginning, implementation can be overwhelming due to the lack of previous knowledge and experience in an ISO related PennDOT project. However, the PASIN Team provides much needed support for the contractors to ensure successful results. It is the PASIN Team’s expectation that the contractors will work equally hard to collaborate and ensure success.

Those organizations that have participated in the PASIN Orientation Sessions, or pilot projects and are interested in applying the principles established in the PASIN Quality Management System within their company, may ask questions or request guidance from the PASIN Team by contacting George McAuley, ADE at PennDOT, gmcauley@state.pa.us. ✦
Hot-Mix Asphalt (HMA) 101

Understanding the basics of hot-mix asphalt – its composition and the importance of proper transporting, placement and compaction – is a vital necessity for anyone involved in the construction or inspection of asphalt pavements.

Where: The Penn Stater Conference Center
215 Innovation Blvd.
State College, PA 16803
When: November 5 – 6, 2008
Fee: $350
(includes lunch both days)

Who Should Attend
This course has been developed for anyone seeking a basic understanding of hot-mix asphalt pavements. It is intended to focus on areas critical to the successful completion of an asphalt pavement. This course is also valuable for individuals who plan to apply for field technician certification in Pennsylvania.

Instructors
Knowledgeable representatives from the equipment industry and Asphalt Institute engineers will lead this course. Attendees are encouraged to ask questions and interact with the instructors.

asphalt institute

This 2-day course taught by AI engineers and equipment industry representatives provides participants with a solid foundation in:

- Asphalt cements
- Aggregates
- Mix design and plant operations (as they relate to field applications)
- Proper hauling, placement and compaction procedures
HOW TO IMPROVE PROFITS WITH ISO 9000

The following is a first in a series of short articles aimed at helping PAPA members understand how to use ISO 9000 as a tool to improve profitability.

Profit-driven quality requires a quality management system that can be used to seek and find hidden opportunities. The baseline requirement for each and every quality management system is to meet the customer’s specifications in the contract. However, the manner in which you design and implement your quality management system can determine if you build a system that creates cost and paperwork or if you implement a system to achieve more precise control and better profits.

Track record

The track record for ISO 9000 is mixed. However, independent studies published by Quality Systems Update (McGraw–Hill), “ISO 9000: Costs, Benefits and Savings”, show:

- 65% saw moderate to significant productivity improvement
- 64% saw moderate to significant improvement in defect rate
- 21% saw more favorable insurance terms; especially for companies under $25 million in the services, trades and construction sector
- In the services, trade and construction sector, the highest area of improvement was made in cost of quality, due to decreased scrap, less rework and less inspection
- Total average savings $186,963; larger organizations captured larger savings
- Companies with an average cost savings of $125,000 have done so with ISO implementation costs averaging $27,000

Similar studies were published by the University of Maryland and others showing similar results from 7,598 companies that have their ISO 9000 system aimed to improve return on assets.

How to improve profits by implementing ISO 9000

The University of Maryland data also established a clear recipe about how to use ISO 9000 to improve profits:

- “Quality Improvement” must be the stated goal of the quality management system; not “pass the audit” as a goal or “fad of the month”
- Experienced procedure writer readily available; preferably someone who can make simple process maps or easy to read flow charts
- Quality engineering disciplines need be used on important processes during the ISO implementation, such as statistical process control, CpK, etc.
- Company has established work processes rather than operates in a start up mode

In 2005, the American Society for Quality (ASQ) reported anecdotal profit gains in many companies when they used the built-in features of ISO 9000 to optimize process performance. For example, ISO 90001, section 6.1.2 requires “…efficient use of resources…” ASQ reported that a large defense contractor achieved a 10% cost reduction overall by using quality engineering methods to reduce the time required for inspection. Overall, profits will improve as ISO 9000 highlights problems and causes improved productivity and efficiency as chronic problems are eliminated.

The Moment of Truth: Where to begin

✔ Gap Analysis: Contract a trusted outside expert with a track record in the asphalt industry to do 3-5 day independent analysis of current procedures versus ISO 9000.
✔ Project Plan: Develop a timeline to customize your ISO 9000 implementation based on data gathered during the gap analysis.
✔ Education: Set up short training classes to introduce important members of your team to ISO 9000 and your plan about how to use ISO 9000 to improve profits.
✔ Teamwork: If needed, set up small teams of 2-3 people to develop important ISO 9000 systems your company may lack, such as a “corrective action system”
✔ Streamline: Use recognized quality engineering tools to reduce paperwork and improve productivity
✔ Audit: Conduct in-house mini-audits to make sure that the changes that ISO brings about in your business work effectively.

Authors

This article was prepared by Jesses Dunlap, Mike Lohenitz and Bob Bowen of r. bowen international, inc. If you have questions about this article or questions that you would like to see addressed in future articles, please send them to Ronald J. Cominsky, P.E., at PAPA.

References

The Northeast Regional Asphalt Pavement Alliance annual meeting was held on April 2, 2008 at the Radisson Lackawanna Station Hotel in Scranton, Pennsylvania. Forty-five people attended representing the asphalt industry from Canada to Maryland.

Hot-mix asphalt pavement performance was a key agenda item. Several presentations were made illustrating the highly successful performance of hot-mix asphalt when properly designed and constructed. Of particular note is the Maryland intersection (U.S. 40 and Route 213) project which was opened to heavy traffic in August of 1994 and is providing excellent performance. Another highly successful project was constructed in Hamilton, Ontario. This project was a perpetual pavement design. The city of Hamilton noted that, “The associated benefits of delivering a highly durable and safe pavement surface and avoiding major shut-downs of the expressway, (the surface course replacements can be completed during single lane closures at night), are in keeping with the City’s desire to be a leader in the application of sustainable design solutions for public infrastructure. In addition, while the perpetual pavement was just under $700,000 more for the initial construction, life-cycle costs anticipate a savings of over $2,000,000.”

Alternate bids were discussed. Mr. Brian Dolan, President of The Maryland Asphalt Association, Inc. reviewed the success in Maryland with regards to projects awarded under the alternate bid process and then highlighted what he termed “mega-projects”: projects containing over one-million tons of HMA. He noted that those types of projects come at a cost because there is a reduction in available funds for routine overlay programs; consequently, the overall level of pavement service decreases.

Mr. Wayne Bayrd gave a presentation on Trap Rock Industries’ I-95 Asphalt Rubber Open Graded Friction Courses in New Jersey. The original project called for 3” mill and fill with 75,000 tons of 19H76 Intermediate Course and 69,000 tons of...
12.5H76 Surface course, to be covered with 25,000 tons of 9.5 Modified Open Graded Friction Course (MOGFC-3) with PG 76-22 Binder with fiber additive for noise reduction. A request from NJDOT and Rutgers University resulted in a partnering effort with Trap Rock Industries; the MOGFC-3 was changed to an Arizona type ASPHALT RUBBER-OGFC with aggregate top size modifications. The results: 37,000 scrap tires saved from a landfill, reduced tire splash, increased skid resistance, a 5 to 6 db reduction in noise level, a projected increase in service life and a $295,000 IRI bonus payment!

**PAPA’S TECHNICAL COMMITTEE MEETS**

The Pennsylvania Asphalt Pavement Association’s Technical Committee met on May 6, 2008 at the Penn Stater Conference Center in State College, Pennsylvania. The main agenda topic was the Change 3 to Publication 27 (Bulletin 27) issued by PennDOT on March 31, 2008.

The committee discussed the inappropriate timing of the implementation of Change 3 and the Strike-off Letter 421-08-01 providing instructions to the Districts on implementation of Change 3. Some Districts previously approved mix designs and with the issuance of Change 3 these mixes must be redesigned. Most of the mixes provided good pavement performance both structurally and from a durability standpoint. Change 3 to Bulletin 27 now provides for a high potential of pavement rutting and flushing problems statewide. Specific examples of mixes redesigned under the new requirements were discussed in terms of premature pavement distress.

Discussion also ensued on the new Tensile Strength Ratio (TSR) requirements. The committee agreed that mixes have been produced for a number of years and have established a history of satisfactory performance. Also, the aggregate source has been used for several mixtures having never failed a TSR test for any mixture type. The committee agreed that there needs to be some other criteria established that would denote when an existing mix design would not need to have the TSR retested under the new requirements. The committee did not agree that every existing mix design would need to have new TSR testing performed for JMF approval in CY 2009 in accordance to Change 3 of Bulletin 27, if this is the Department’s intent. PAPA members would prefer that the Districts review all approved mix designs immediately and provide a list of mixes that would require renewed TSR testing. Furthermore, PAPA’s members would prefer to have the option to perform some of the TSR testing throughout the construction season on plant produced materials for the mixtures that would require renewed TSR testing in accordance to the changes in Bulletin 27. This would aid in reducing the amount of retesting needed to be performed during the industries reduced production period.

Other topics discussed briefly were the proposed density specification change for 37.5 mm and 25 mm mixes, electronic state book and the definition of the word “critical” as specified in Section 409.3(j) Mat Density Acceptance. These topics are being discussed by other committees such as the Laboratory Standard Operating Committee and the Asphalt Paving Quality Improvement Task Force.

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**Paving the Way** April/May/June 2008 • 19
PennDOT has made significant changes to Publication 27 (Bulletin 27) that are having a dramatic impact on our industry statewide for the 2008 construction season. It is unfortunate that these changes were driven by premature roadway failures in a few of PennDOT’s districts. These failures stemmed from a number of issues that are within the control of the producer/paver. Even though the conditions were isolated, they produce a very poor image for our industry.

Our industry has diligently strived for the use of hot-mix asphalt (HMA), particularly full-depth asphalt, from a performance standpoint. Obviously we have made major strides by partnering with PennDOT whereby HMA is the core of Pennsylvania’s highway system. Also, PAPA has made available to its member companies a best practices guide entitled, “Constructing Quality Hot-Mix Pavements in Pennsylvania.” There are PennDOT issues that our Association is working on daily to resolve. These issues we believe will be far easier to address with positive and credible performance by our industry.

In this highly competitive market, let’s all strive as an industry to produce quality, high performance jobs.

PAPA is actively searching for ideas for upcoming editions of the newsletter. If you would like to write an article or provide PAPA with a company profile, please contact Millie at 717-657-1881 or millie@pahotmix.org. We look forward to hearing new and interesting ideas!
ASSOCIATION JOINS WITH PACA TO COMPLETE SURVEY OF SURFACE MINES

The Pennsylvania Asphalt Pavement Association has joined with the Pennsylvania Aggregates & Concrete Association to complete a statewide survey of clean fill practices and potential use of clean fill in abandoned mines. Key environmental managers from a number of PACA and PAPA members have identified a number of key issues regarding use of clean fill, including:

• PADEP promised, within six to nine months of promulgation of the Clean Fill policy in April of 2004 to have a specific policy for use of clean fill in active surface mines. No policy has yet been issued.
• Some mining districts will not consider allowing any clean fill to be placed in surface mines and will not entertain modifications to reclamation plans to allow clean fill to come in.
• Where clean fill is permitted to come into surface mines, the allowable concentrations of constituents of concern levels are inconsistent, and review timeframes frequently do not fit in with needed construction approval timeframes.

Three deputies at DEP are now involved in this issue—Mineral Resources (mining), Watershed Management, and Air/Waste. Our contacts with DEP indicate that there is now insufficient common ground to come up with a workable policy. This finding goes against promises made to the industry in 2004 by Senior DEP officials.

The issue of “full cost bonding” may be making the situation worse. A survey being undertaken jointly by both Associations will help identify the degree to which a combined “full cost bonding”, an inability to use “clean fill” in surface mines as an environmentally sound reclamation material is a problem. The survey could show that there will be more “abandoned mines” that will not be reclaimed because of DEP’s inability to resolve this issue.

Survey results are expected to be available by June 30th, and a number of DEP officials have requested to be informed of the survey’s outcome.

A number of major operators of surface mines in Pennsylvania have already demonstrated that if materials are properly screened and tested, clean fill can be properly used as part of mine reclamation with no significant environmental impact of concern. Causin more abandoned mines to occur because of lack of there being a long ago promised policy for use of clean fill materials in reclamation is simply not sound environmental nor mining policy. There is hope that a promise can be made by DEP once a “White Paper” on the issue is presented, so that environmentally sound reclamation can occur following the completion of mining extraction activities at Pennsylvania’s many surface mines.

GENERAL AIR EMISSIONS OPERATING PERMIT ADVANCES

DEP officials have advised PAPA Environmental Committee members that the general permit for air emissions at hot mix asphalt plants is advancing toward publication soon in the Pennsylvania Bulletin.

This permit will offer the following benefits:
• Uniform standards for air emissions
• Relatively low cost “spring combustion tune-ups” in lieu of more expensive “stack tests” on demand
• Provision of uniform procedures for receiving and burning waste derived liquid fuel
• Uniform and simplified reporting

A final tweak that PADEP is considering relates to use of alternative fuels. Although DEP is not in a position to approve specific alternative fuels without knowing more about their composition and material properties, it is hoped that a provision will be in the general permit which will allow those seeking to burn alternative fuels to request approval on a “equivalency” basis, without the need for a permit modification. This simple procedure would allow a hot mix asphalt plant operator to demonstrate that an alternative fuel is similar to an already approved fuel under the permit, and get a letter back from DEP indicating that it is okay to proceed with use of the alternative fuel.

Operations under the general permit should be able to occur during the 2009 construction season.
PAPA worked with the Associated Pennsylvania Constructors to provide formal comments on a proposal to limit idling of diesel trucks in Pennsylvania. Under regulation to limit diesel truck idling, aimed at stopping long haul truckers from running their engines overnight at truck stops and other locations where they pull off the side of the road, was written in such a way that it would limit diesel truck idling to only a few minutes, for all diesel trucks. Construction equipment would be affected as well.

In discussions with Senior DEP officials, they stated that the proposed regulation was not meant to apply to the construction industry, so Associated Pennsylvania Constructors submitted comments to DEP on behalf of the construction industry.

Although limiting diesel idling is a good environmental practice for all those operating diesel engines, the industry’s concern was that some trucks are specifically designed to keep asphalt warm by re-circulating engine exhaust, and in other instances, when cold weather prevails, engine emissions are actually worse if engines are not kept running, to operate at the proper temperature.
Stormwater Manual. The major environmental question regarding porous pavement—would the material stand up to repeated “freeze/thaw cycles”?—has now been fully addressed based on testing at the University of New Hampshire, and by direct observation at a number of sites. It has been concluded that infiltrating water with an asphalt pavement does not cause freeze/thaw problems, because the asphalt is a dark color, and the infiltrating water is always warmer than freezing.

The only remaining issue is what is the appropriate traffic duty, as it is generally viewed that turning “heavy vehicles” may cause damage to the pavement, which is typically only used in parking areas, and not on roadways. PAPA Technical Committee recommended revisions are expected shortly, and the Porous Pavement Manual is expected to be out in the next several months.

Should there be any environmental questions on porous pavement that arise before the manual is issued, contact Gary Brown at (800) 725-0593, Ext. 34 on environmental stormwater design issues or Jeff Frantz at (570) 668-4303 for technical questions on pavement mixes.

ENERGY AND RECYCLING SYMPOSIUM SCHEDULED FOR DECEMBER 2008 IN NEW JERSEY

The popular two-day HMA Symposium on Energy and Recycling will come to the northeast on December 3-4, 2008 at the Sheraton Atlantic City Hotel in Atlantic City, New Jersey. Previous symposiums held in Austin and Indianapolis received high marks from attendees.

This updated event will include asphalt and stone supply outlook, DOT perspectives on the use of RAP, plant processing strategies, contractor and DOT experiences with RAP, mix design, strategies for reducing transportation costs and increasing plant efficiency, and warm-mix asphalt.

For more information, contact Roger Sandberg, NAPA’s Vice President – Membership, via e-mail at rsandberg@hotmix.org. State Asphalt Pavement Associations from Delaware, Maine, Maryland, Massachusetts, New Jersey, New York and Pennsylvania are partnering with NAPA for this event. Attendees are welcome from all areas of the U.S. and Canada.

To reserve a room at the Sheraton, call 888-627-7212.
### Price Index

**Consolidated Procedure – Pennsylvania Department of Transportation/Department of General Services**

*(Contract 5610-36)*

*(Be sure to check PAPA’s website - [www.pahotmix.org](http://www.pahotmix.org) - for monthly Price Index)*

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**Dates To...**

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