WARM MIX ASPHALT AND RECYCLED MATERIALS
A publication dedicated to asphalt pavements and the environment.
Overview

Asphalt is the preferred paving material in the United States and in Kentucky.

There are good reasons for asphalt being the riding surface on 94 percent of the paved roads in the U.S. Asphalt is smooth, quiet, safe and durable. It is incredibly versatile and adaptable. It is the right choice.

Today’s asphalt pavement is designed and constructed to meet high expectations. In addition to a long performance life, it is expected to be built and maintained in an environmentally responsible manner. The terms “sustainable” and “livable” are commonly used to describe this approach. By this we mean, meeting our current needs without compromising the ability of future generations to meet their needs.

Asphalt has many sustainable or “green” attributes. But these attributes are important only if the performance is equal to or better than that of conventional hot mix asphalt (HMA). Two of the green approaches meeting the equal performance criteria are warm mix asphalt and using recycled materials.

Warm Mix Asphalt

Warm mix asphalt (WMA) is the fastest growing segment of the asphalt industry. It is still relatively new; the first public demonstration of WMA was done in Nashville in 2004. In 2010, in the U.S., more than 47 million tons of WMA were produced, 13 percent of all mixes. It is estimated that WMA made up about 25 percent of all mixes in 2011. Why so much interest? The reasons are straightforward. WMA has been adopted so readily primarily because it allows asphalt mixtures to be mixed and paved at lower temperatures than are needed for HMA.

Temperature reductions of 50 to 100 degrees are possible. This results in reduced emissions and less fuel being used. Some mix producers use WMA, which has less odor and fumes, to be a “good neighbor.” Another benefit of WMA is better compactability; some WMA technologies are used to aid in compaction of harsh mixes. WMA is ideally suited for night-time and late-season paving.

There are several (20-plus) technologies available for producing WMA. These technologies can be loosely grouped as mechanical production or foaming, chemical additives, and organic additives or waxes. Foaming is the most widely used WMA process, followed by chemical additives.

The Federal Highway Administration (FHWA) supports the use of WMA and includes it in their “Every Day Counts” program/promotion. Forty-one states allowed the use of WMA in 2011 – six more states are expected to allow it by the end of 2013. The Kentucky Transportation Cabinet (KYTC) has a permissive specification (Division 400) which allows the use of WMA.

In 2013, more than 31 asphalt plants are already approved for by the Kentucky Transportation
Cabinet to run Warm Mix Asphalt and more plants are expected to come on line in the months and years ahead. KYTC has used WMA on I-65 and I-75, heavily traveled interstates with high truck volumes, with good success.

Warm mix’s actual project performance is as good as or better than conventional HMA’s performance. WMA is expected to become the standard means of mix production in the U.S. in a few years.

**Recycled Materials**

**Recycled Asphalt Pavement**

The use of recycled materials in asphalt is quite common-place. In fact, recycled (or reclaimed) asphalt pavement (RAP) is the most commonly used recycled material in the U.S. Almost 100 million tons of RAP is re-used each year in the US. RAP has been used widely for more than 30 years and now makes up about 12 percent of the volume of the asphalt mixtures produced in the U.S.

Numerous federal and state studies have documented that the performance of RAP mixes can equal or exceed that of mixes containing all new materials. The Federal Highway Administration (FHWA) supports the use of RAP and has established the RAP Expert Task Group (ETG), consisting of government, industry, and academic personnel, to encourage the increased use of RAP. The KYTC has been approving RAP mixes for 30-plus years. The applicable requirements are listed in section 409 of the 2012 KYTC Standard Specifications.

Much discussion has taken place as to how much actual blending of the RAP binder and virgin (new) asphalt really occurs. Although complete separation and re-blending is highly unlikely, asphalt technologists agree that some mixing does take place. Research documents that the RAP mix behaves as a composite, as if the RAP and virgin binders were fully blended, rather than the RAP acting as “black rock” floating in the mass of new material.

Modern RAP mixes are carefully engineered combinations of materials. Sophisticated mix design procedures and mixture performance tests are available to evaluate the materials combination.
The National Asphalt Pavement Association (NAPA) estimates that the US has 18 billion tons of asphalt pavements in place. That is both an incredible investment and a valuable and renewable resource. With the ability to recycle and re-use this resource, future generations should see savings in materials and energy, as well as significant environmental benefits.

**Recycled Asphalt Shingles**

Recycled asphalt roofing shingles (RAS) are a more recent (last 5 to 10 years) addition to the list of commonly used recycled materials. An estimated 11 million tons of scrap shingles are generated in the U.S. each year. There are two primary sources of shingles — manufacturers’ waste and tear-offs. One million tons are manufacturers’ waste and 10 million tons are tear-offs from replacing old roofs.

The two types of shingle materials are quite different, with the tear-offs having higher asphalt contents and harder asphalt. Manufacturers’ waste shingle material consists of new materials (defective shingles and trimmings) from roofing shingle production plants. This material is not readily available in Kentucky. Tear-off shingles (sometimes described as post-consumer waste shingles) are readily available as old or damaged roofs are replaced. So, this type of material is now used regularly in Kentucky.

RAS is a very attractive component of an asphalt mixture because of its extremely high asphalt content. RAS can have an asphalt content in the 20 to 35 percent range, compared to RAP having a typical asphalt content of about 5 percent. New shingle waste has an asphalt content of about 20 percent; older tear-offs can have 30 to 35 percent asphalt (despite the fact that not all the asphalt from the shingles blend completely in the mix). RAS use is typically limited to about 5 percent of the total weight of the mix. Like RAP, RAS is a widely approved mixture component. Some agencies place limits on how much of the total asphalt content can be made up of recycled asphalt. 30 percent replacement by recycled asphalt is a typical limit. KYTC uses this approach. The specifications regarding the use of RAS are covered in Section 409 of the Standards.
An FHWA newsletter (April 2010, Focus) said, “Reclaimed asphalt shingles (RAS) may also be coming soon to a roadway near you. The use of RAS in HMA can help reduce costs, save landfill space, and improve the performance of pavements.” In Kentucky, it is already happening.

**More Green Advantages of Today’s Asphalt**

In addition to warm mix asphalt and using recycled materials, asphalt mixes produced today can offer some additional green characteristics and advantages. Among these innovations are porous or permeable pavements and Perpetual Pavements. Other less obvious benefits are the quiet noise levels and fuel-saving capability of asphalt pavements.

Porous or permeable pavements are specifically designed to drain stormwater run-off from the pavement surface. These installations can be a surface layer (open-graded friction course [OGFC] or permeable friction course) or a fully drainable system that allows infiltration into the soil.

Perpetual Pavements are asphalt pavements designed and constructed to last for an extended period (50 years or more) before requiring major structural rehabilitation or reconstruction. Surface distresses may require periodic thin overlay or mill-and-fill work to address top-down cracking or raveling over time. Perpetual Pavements use a multi-layer approach, with each layer designed to address specific demands (fatigue resistance, rutting resistance, skid-resistance, low noise, etc.) upon the pavemen system. These types of pavements are suited for moderate to high type facilities.

Today’s asphalt also has some other, less obvious benefits. One such attribute is that it is well suited for night-time paving. This characteristic disrupts traffic less and causes less congestion. Similarly, it can be opened to traffic quickly, again minimizing delays and traffic tie-ups. Where traffic noise is an issue, asphalt is significantly more quiet than other pavement types. Asphalt is the smoothest pavement type and studies have shown that smooth pavements are more fuel-efficient.

*All-in-all, asphalt is the green and best choice.*

**For More Information Contact Us**

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To learn more about asphalt’s environmental advantages or other information on asphalt, visit the following websites.

>> Plantmix Asphalt Industry of Kentucky
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>> Asphalt Pavement Alliance
www.asphaltroads.org

>> National Asphalt Pavement Association
www.asphaltpavement.org

>> Asphalt Institute
www.asphaltinstitute.org
For Your Next Paving Project, Contact One of These Qualified Contractors:

For Asphalt Plant Locations Please Visit - http://www.paiky.org/members/asphaltplantlocations/

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Our mission: To serve our membership, expand the use of plant mix asphalt and promote it as the pavement material of choice throughout Kentucky by advocating, communicating, and educating our customers, government agencies, and the general public on the benefits of quality asphalt pavements.