

## EDC Overview

It is a commonly held perception that it takes an average of 13 years to deliver a major highway project (from planning through completion). However, several opportunities exist in the current project delivery process where innovative approaches will improve project delivery times. Consequently, in the summer of 2010, Federal Highway Administrator Victor Mendez launched the Every Day Counts (EDC) Initiative. Specifically, this initiative is designed to identify and deploy innovation aimed at enhancing the safety of roadways and protecting the environment, while ultimately shortening the transportation project development process.

### What is Warm Mix Asphalt (WMA), and How Widely is it Used?

Warm Mix Asphalt (WMA) encompasses a wide-range of enabling technologies to enhance asphalt production and lay-down properties. WMA can be produced and placed at temperatures significantly lower than conventional Hot Mix Asphalt (HMA).

In the mid-1990's, WMA technologies were developed in Europe in response to the then proposed Kyoto Protocol. Today in the United States, over 40 State highway agencies have developed and adopted WMA specifications. In 2010, of the approximately 360 million tons of asphalt pavement materials produced in the United States, 42 million tons (11.8 percent) were produced using a WMA technology.

## Contact Information

*For training or more information on this Every Day Counts Initiative, please contact your local FHWA Divisions Office.*

To learn more about EDC, visit:  
<http://www.fhwa.dot.gov/everydaycounts>

## About Every Day Counts

*Every Day Counts is designed to identify and deploy innovation aimed at shortening project delivery, enhancing the safety of our roadway, and protecting the environment.*



## Warm Mix Asphalt (WMA)



U.S. Department  
of Transportation  
Federal Highway  
Administration

## Do the Lower Production Temperatures Affect Road Durability?

WMA mixtures have been placed throughout the United States at conventional HMA density acceptance criteria. Achieving target density is essential to ensure rutting resistance. In addition, WMA's lower production temperatures result in less binder aging, which may reduce susceptibility to fatigue and thermal cracking – resulting in increased durability.

## Is WMA Cost-Effective?

Because production burner temperatures are lower, less energy is needed. The reduction in fuel consumption typically ranges from 20-35 percent. For some technologies, the reduction can be as high as 50 percent. Because the cooler mix can be hauled for longer distances, production is more efficient.

Reducing production temperatures from 325°F for HMA to around 265°F for WMA saves between ½ to 1 gallon of fuel per ton of mix. For the 42 million tons of WMA produced in 2010, this equates to over 35 million gallons of fuel saved.

## What Advantages Does WMA Offer?

**Emissions:** Based on production temperature reductions (HMA to WMA), it is estimated that the annual use of WMA in 2010 reduced CO<sub>2</sub> by over 930,000 tons--the equivalent of taking over 175,000 automobiles off the road.

**Extended Paving Seasons:** WMA can be used in cooler temperatures, allowing paving seasons to start earlier and later in the construction season. WMA also provides agencies with an effective long-term solution for emergency off-season repairs.

**Improved Performance:** The WMA technology aids in the compaction of asphalt materials. Improved compaction directly improves pavement performance and extends service-life. It also increases the assurance that service-life is achieved or increased.



*Lower temperatures for warm mix asphalt are environmentally friendly*

**Portability:** WMA can travel long haul distances at lower temperatures without stiffening, which can be particularly significant for rural roads. It is also easier to compact.

**Safety:** WMA technology produces greatly reduces air emissions, which improves the environment for construction workers as well as drivers and pedestrians - both at the production plant and on the construction site.

This reduction is particularly important in tunnels, where ventilation is reduced. The cooler, healthier working environments for highway crews are also likely to increase job satisfaction, retention, and job performance.

## Is WMA Really a "Green" Technology?

Yes. WMA reduces visible air emissions and produces lower greenhouse gas emissions than hot mix asphalt (HMA). The lower burn temperatures used to produce WMA generate lower emissions of CO<sub>2</sub>e. Additionally, less energy is needed to operate burners, which reduces fossil fuel consumption. Using higher percentages of recycled asphalt pavement (RAP) in WMA can multiply the technology's "green" impact.

## How Well Does WMA Accommodate Recycled Asphalt Pavement (RAP)?

More recycled asphalt can be incorporated into the mix with WMA.

## Which Types of Asphalt Support WMA?

WMA technologies are very versatile. This technology has been used in all types of asphalt concrete: dense-graded, stone matrix, porous, and mastic asphalt. In addition, WMA has been used successfully in a range of thicknesses. It is durable enough to withstand high traffic demands. Multiple WMA technologies are available, so the choice of WMA can be adapted to the temperatures and materials required. Because the cooling time is extended, paving and patching at cooler temperatures is possible.

## Does Using WMA Require Plant and Mix Design Modifications?

The need for plant modifications depends upon the type of additive used. Most require relatively simple plant and mix design modifications to introduce the temperature-reducing additive in the mixture stream. Other technologies, particularly those involving water-based foaming techniques, require more substantial modifications.

Mix design procedures for WMA were established as part of NCHRP Project 9-43 "Mix Design Practices for Warm Mix Asphalt." This project is documented in NCHRP Report 691 accessible at the following site:

<http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=977>

The Report 691 *Draft Appendix to AASHTO R 35: Special Mixture Design Considerations and Methods for Warm Mix Asphalt (WMA)* has been approved by the AASHTO Subcommittee on Materials for use as part of the 2012 Edition of their Standard Specifications. The National Highway Institute offers free web-based training on the appendix: NHI 13117, entitled "Special Mixture Design Consideration and Methods for Warm Mix Asphalt."