

"STATUS OF WMA IMPLEMENTATION & WMA THAT DOUBLES AS ANTI STRIP ADDITIVE"

PAPA REGIONAL TECHNICAL MEETINGS
March 14, 15 & 16, 2017



www.pa-asphalt.org



PA Asphalt Pavement Association
Gary L Hoffman, P.E.
Director of Technical Services

Warm Mix Asphalt

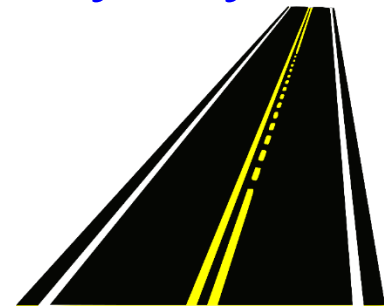
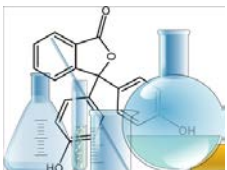




What's WMA ?



- Definition of **Warm Mix Asphalt** - Warm Mix Asphalt (WMA) is the generic term for a variety of technologies that allow producers of Hot Mix Asphalt (HMA) pavement material to lower temperatures at which the material is mixed and placed on the road. It is a proven a technology that improves the “**lubricity**” of the binder.
- <http://www.fhwa.dot.gov/innovation/everydaycounts/edc-1/wma.cfm>



PennDOT BULLETIN 15 (PUB 35) Qualified Products List for Construction, Section MISC: Miscellaneous - Warm Mix Asphalt (WMA) Technologies



BULLETIN 15 (Publication 35) Qualified Products List for Construction

Posted:
3/6/2017 3:45:43PM

Section MISC: Miscellaneous

MISC Warm Mix Asphalt (WMA) Technologies

Last Revised: 11/16/2016

ECMS Standard Special Provision I-c03111 and I-c04111

For WMA Technologies that can be blended at a refinery or terminal and supplied by a bituminous material supplier (Performance Graded Asphalt Binder Supplier), the bituminous supplier must complete an online Product Evaluation Application for each grade and WMA Technology to be evaluated for potential approval. Approved WMA bituminous material suppliers are listed in Publication 35 (Bulletin 15), Miscellaneous Section, for Warm Mix Modified Performance Graded Asphalt binders.

	Product	Name	Ref. No.
AKZNO 15	AkzoNobel Surface Chemistry, 525 West Van Buren Street, Chicago, IL 60607-3835 https://www.akzonobel.com/		
	Chemical Additive	Rediset® LQ-1106	2011-210M
	<i>Provisional Approval: Contact PennDOT Materials Testing Laboratory at (717) 787-2707 before using.</i>		
	Chemical Additive	Rediset® WMX	---
ASTIN 15	Astec Industries, Inc., P.O. Box 72787, Chattanooga, TN 37407 http://www.astecindustries.com/		
	Mechanical Foaming Equipment/Process	Double Barrel Green® / GreenPac™ System	---
CECA 15	CECA, Subsidiary of Arkema, 89 Boulevard National, La Garenne-Colombes 92257		
	Chemical Additive	Cecabase RT	2011-153
EASIN 15	Eastern Industries, Inc., 4401 Camp Meeting Rd., Ste 200, Center Valley, PA 18034 http://www.eastern-ind.com/		
	Mechanical Foaming Equipment/Process	SMART-FOAM System	---
GENID 15	Gencor Industries, Inc., 5201 N. Orange Blossom Trail, Orlando, FL 32810 http://www.gencor.com/		
	Mechanical Foaming Equipment/Process	Green Machine UltraFoam GX2™ Process	---
MAXEQ 15	Maxam Equipment, Inc., 1575 Universal Ave., Kansas City, MO 64120 http://maxamequipment.com/Products.htm		
	Mechanical Foaming Equipment/Process	AQUABlack® Solutions WMA System	---
MCCTE 15	McConnaughay Technologies, 1911 Lorings Crossing, Cortland, NY 13045 http://www.mcconnaughay.com/		
	Foaming Additive/Process	Low Emission Asphalt (LEA)	---

PennDOT BULLETIN 15 (PUB 35) Qualified Products List for Construction, Section MISC: Miscellaneous - Warm Mix Asphalt (WMA) Technologies

Section MISC: Miscellaneous

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Product	Name	Ref. No.
MEawe 15 Chemical Additive	WestRock (formerly MeadWestvaco Corporation), Asphalt Innovations, 5255 Virginia Avenue, N. Charleston, SC 29406-3615 http://www.mwv.com/en-us/ Evothem™ (DAT, 3G)	---
MEEeq 15 Mechanical Foaming Equipment/Process	Meeker Equipment Company, Inc., P.O. Box 925, Louisville, KY 19446-0661 http://www.meekerequipment.com/ Warm Mix System	---
PQCOR 15 Foaming Additive/Process	PQ Corporation, Valley Forge, P.O. Box 840, Valley Forge, PA 19482 http://pqcorp.com/ Advera® WMA	---
SASW- 15 Organic Additive	Sasol Wax North America Corporation, 102 Cutting Blvd., Richmond, CA 94804 http://www.sasolwax.us.com/ Sasobit®	---
SONNE 15 Facility	Sonneborn Refined Products, 600 Parsippany Road, Suite 100, Parsippany, NJ 07054 http://www.sonneborn.com/products 100 Sonneborn Lane Petrolia, PA 16050 Organic Additive Organic Additive <i>Provisional Approval: Contact PennDOT Materials Testing Laboratory at (717) 787-2707 before using.</i>	2016-025 2012-085M
STAAS 15 Mechanical Foaming Equipment/Process	Stansteel Asphalt Plant Products, 12700 Shelbyville Road, Louisville, KY 40243 http://www.stansteel.com/ Accu-Sheer™ Warm Mix Asphalt System	---
TERRO 15 Mechanical Foaming Equipment/Process	Terex Roadbuilding, P.O. Box 1985, Oklahoma City, OK 73101-1985 http://www.terex.com/ Warm Mix Asphalt System	---

PennDOT BULLETIN 15 (PUB 35) Qualified Products List for Construction, Section MISC: Miscellaneous - Warm Mix Asphalt Technologies – Chemical or Organic Additive

- AKZNO 15 AkzoNobel Surface Chemistry – www.akzonobel.com
 - ✓ Chemical Additive - Rediset® LQ-1106
 - ✓ Chemical Additive - Rediset® WMX

- CECA 15 CECA Subsidiary of Arkema
 - ✓ Chemical Additive – Cecebase RT

- MEAWE 15 WestRock, Asphalt Innovations - <http://mwv.com/en-us>
 - ✓ Chemical Additive – Evotherm™ (DAT, 3G)

- SASW 15 Sasol Wax America Corporation - <http://sasolwax.us.com>
 - ✓ Organic Additive – Sasobit®

- SONNE 15 Sonneborn Refined Products - <http://www.sonneborn.com/products>
 - ✓ Organic Additive – SonneWarmix RT
 - ✓ Organic Additive – SonneWarmix™

- ZYDEXA 15 Zydex Industries - <http://zydexindustries.com>
 - ✓ Chemical Additive - Zycotherm

**PennDOT BULLETIN 15 (PUB 35) Qualified Products List for
Construction, Section MISC: Miscellaneous - Warm Mix Asphalt
Technologies – Chemical or Organic Additive**

**ONLY WMA TECHNOLOGIES APPROVED AS
AN ANTI-STRIP ADDITIVE**

- 1. WestRock (Ingevity) –
Evotherm™ (DAT, 3G)**
- 2. AkzoNobel Surface Chemistry -
Rediset® LQ-1106**

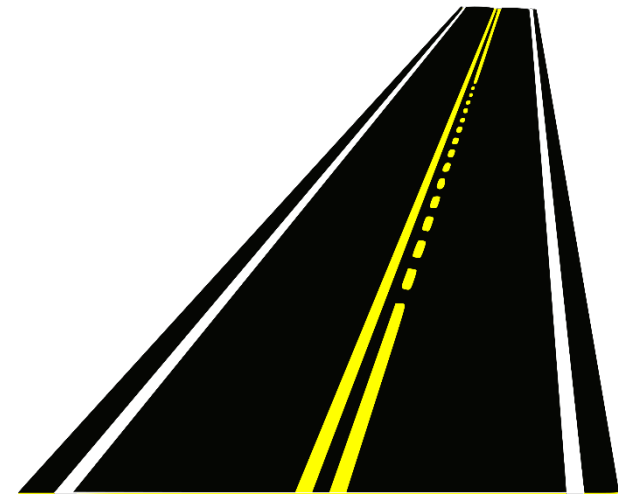
WMA Implementation by PennDOT

- 2014 – 9 of 11 Engineering Districts WMA
- 2015 – 10 of 11 Engineering Districts WMA
- 2016 – 11 of 11 Engineering Districts WMA
- 2017 – 100% WMA



pennsylvania

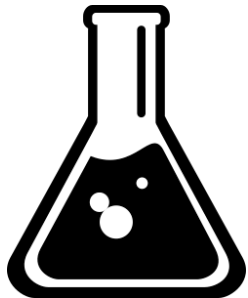
DEPARTMENT OF TRANSPORTATION



Anti-Strip Additive - WMA & HMA

Asphalt Stripping:

The loss of bond between aggregates and asphalt binder that typically begins at the bottom of the HMA layer and progresses upward. When stripping begins at the surface and progresses downward it is usually called [raveling](#).



Need for Anti-Strip Additive



“Cost Benefit Analysis of Anti-Strip Additives in Hot Mix Asphalt with Various Aggregates”

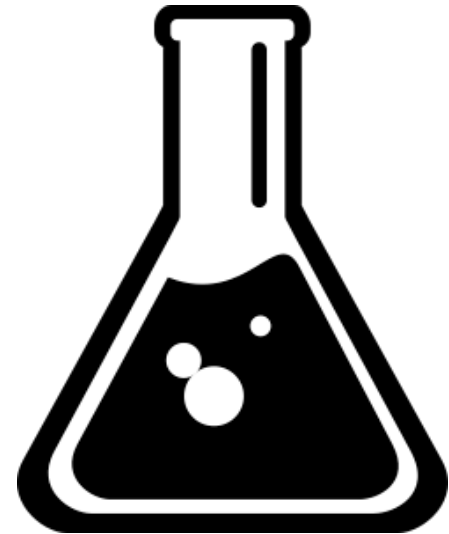
FINAL REPORT

May 15, 2015



Donald Christensen
Advanced Asphalt Technologies, LLC

Dennis Morian
William Wang
Quality Engineering Solutions, Inc.



Anti-Strip Additive



- What is an Anti-Strip Additive?
- Concerns:
 - ✓ TSR Test variability
 - ✓ AS Approval List (What about Evotherm?)
 - ✓ Basis for quantity of AS Additive
 - ✓ CT S-16-001 Step 2 - **Revises Pub. 408-Sect. 411, 311, POM-Sect. C04-02, C04-03, Pub 242-Ch5, Bulletin 27-Chapters 2A & 2B**
- Implemented January 1, 2017 **SOL 481-16-06**

Anti-Strip Additive

SOL 481-16-06 as of **01-01-2017- Put at least .25% Anti-Strip Additive in all mixes**



481-16-06

DATE: October 28, 2016

SUBJECT: Implementation of Cost Benefit Analysis of Anti-Strip Additives in Hot Mix Asphalt with Various Aggregates Research

TO: District Executives
Attn: Assistant District Executives - Construction

FROM: R. Scott Christie, P.E. /s/
Deputy Secretary for Highway Administration

This Strike-Off Letter (SOL) is time and cost neutral for projects let after December 30, 2016 and for projects let before December 30, 2016 that Districts elect to not add the requirements of this SOL. This SOL is time neutral and cost adding for projects let before December 30, 2016 that Districts elect to add the requirements of this SOL. The purpose of this SOL is to implement the recommendations of the research report Cost Benefit Analysis of Anti-Strip Additives in Hot Mix Asphalt with Various Aggregates.

All asphalt mix designs approved after December 30, 2016 will be required to contain a minimum amount of anti-strip agent as required in the attached Bulletin 27 Chapter 2A and 2B revisions. Minimum anti-strip requirements associated with warm mix asphalts have been deleted from Pub. 408 Section 41 and 311. All HMA/WMA asphalt mixtures will now be evaluated using the Bulletin 27 revised specifications. In addition to the minimum anti-strip requirements for all asphalt mix designs, asphalt mix designs that contain both fine and coarse highly moisture susceptible aggregates, as defined in the revised Bulletin 27 chapter 2A and 2B revisions, will be required to be evaluated for moisture susceptibility or treated with a higher dosage of anti-strip treatment as specified.

This change does not affect the AASHTO T 283 testing required or the time frame for completion of AASHTO T 283 testing required in the letter to all producers of bituminous materials (Publication 41, Bulletin 41) dated October 20, 2014 and revised by the February 11, 2015 letter to District Executives titled Minimum Effective Asphalt for 9.5mm Superpave Mixtures. Additional AASHTO T 283 testing should not be required to comply with this specification change, however, District Materials Engineers/Managers may require additional testing to confirm mixture acceptance in unforeseen circumstances on a case by case basis.

If you have any questions regarding the contents of this SOL, you may contact Mr. Neal W. Fannin, P.E. at (814) 496-6144 or nfannin@ps.gov.

WMA With Anti-Strip Additive

What About **WMA** Additives that are also approved as Anti-Strip Additive?

- **Evotherm™ (DAT, 3G)**
- **Rediset® LQ-1106**



WMA /AS ADDITIVE DOSAGE?

Neal Fannin's Email procedure to Districts is as follows:

- Pick two JMFs with the lowest asphalt and the highest RAP/RAS content. (I say 2 because I suggest testing a wearing JMF with the lowest asphalt content and highest RAP/RAS and a base because the RAP percentages are higher and asphalt are less in a base, and bases may be subject to more stripping and never get picked up because we bury them under other layers.)
- You should already have a TSR (AASHTO T 283) test with either no anti-strip or some amount that the mix was designed at. This data should be used as the first test.
- The producer should then do at least one but I suggest 2 more TSR tests on the same JMF with varying dosages of the warm mix / anti-strip additive. (So you end up with tests on the JMF with 0%, 0.25%, 0.5% as an example. These percentages will vary depending on the warm mix / anti-strip additive and the producer should work with their technical representative to establish manufacturer suggested dosages to test.)
- The TRS results should go up with increasing dosages of the additive. If they do not the additive may be ineffective as an anti-strip OR just be ineffective as an anti-strip with the aggregate type tested OR the warm mix / anti-strip additive needs to be used at a higher dosage rate than recommended with certain aggregates.
- This multiple testing is NOT needed every year. It is just needed to establish the effectiveness of chemical warm mix additive products as effective anti-strip additives for specific aggregates.
- This kind of testing is NOT needed for products that are marketed as anti-strip products only.
- This testing does not affect the testing needed if a producer chooses to perform testing to establish dosage rates of mixtures with highly moisture susceptible aggregates as outlined in SOL 481-16-06, Bulletin 27 page 2A-7 (See attached) Although the test results can be used for the evaluation of the JMF family tested.
- Please let me know about any products that you get failing results with. I would like to identify poorly performing products in order to alert all DMEs about potential problems.
- If you have any questions please let me know. If we all follow the same rules then this transition will go much more smoothly.
- As always, the DME is free to handle special situations as he / she sees fit.



WMA ADDITIVE/Anti-Strip

BOTTOM LINE - TEST USING AASHTO T-283 (TSR) TESTING PROTOCOL

- One wearing mix per geology
 - Highest RAP
 - Lowest virgin AC
 - 2 dosage rates
- One base mix per geology
 - Highest RAP
 - Lowest virgin AC
 - 2 dosage rates



WMA ADDITIVE/Anti-Strip

Takeaways From Neal Fannin

- **Work with your DME/M first.**
- **The intention is not to add testing requirements but some may be necessary.**
- **I'm from Central Office, I am here to help.**

Neal W. Fannin P.E. | Pavement Materials Engineer
Pennsylvania Department of Transportation
Bureau of Project Delivery, nfannin@pa.gov
Innovations and Support Services Division
81 Lab Lane | Harrisburg, PA 17110
Phone: 717.775.8099 | Cell: 717.480.8364
Dist 2-0 Phone: 814.496.6144

Questions?? Comments?? Still Confused?

To contact



Pennsylvania **A**sphalt **P**avement **A**ssociation
3544 North Progress Avenue, Suite 100, Harrisburg, PA
17110-9647

www.pa-asphalt.org

717-657-1881



Charles Goodhart, Executive Director – cgoodhart@pa-asphalt.org

Gary Hoffman, Director of Technical Services – gary@pa-asphalt.org

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