

Quality Assurance for Warm Mix

SEAUPG

Southeastern Asphalt User/Producer Group

Respectively Submitted

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Introduction

- QA versus QC
- Warm Mix "Definition"
- QA practices "BMP's"
- WMA Past experiences
- Summary

QA/QC

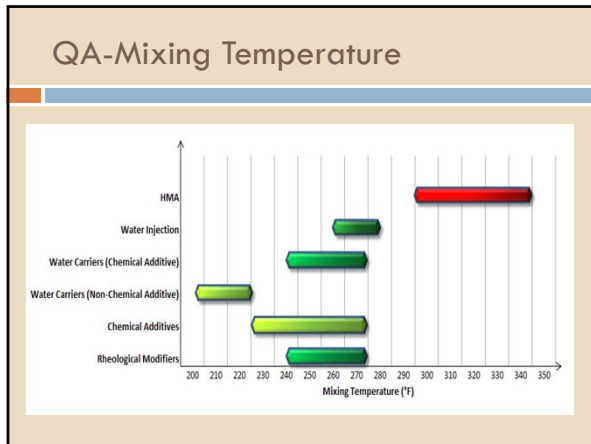
- QA testing: Activities designed to ensure that the development process is adequate to ensure you meet given objectives-(Proactive)
- QC testing: Activities designed to evaluate a developed product-(after the fact)
- Contractor Terms QA=Risk Management

WMA – What is it?

- Hot Mix Asphalt adjusted in order for it to be produced and placed at lower temperatures; "Warm Mix".
- Production and placement temperature **MAY** be lowered by 50°F – 70°F +.
- Conventional Definitions

WMA – Is Also This!

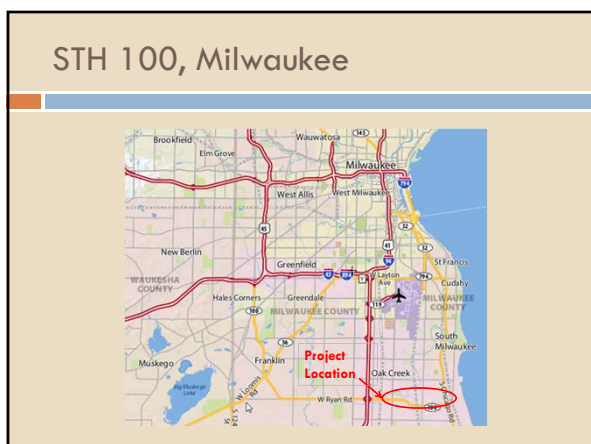
- A method used to achieve one of more following:
 - Compaction Aid
 - Increase Workability
 - Allow increased haul distances from the asphalt plant to the jobsite
 - Allow for Cold Weather paving and extend the paving season
 - Improve Ride "Paving over Crack sealant"



- ### QA Practices
- Know the specification
 - Temperature Requirements
 - Rheology Testing
 - Proposed use-Dosage Rates
 - Mix volumetrics -Lab
 - Aggregates
 - Aggregate QC is the best QA for asphalt production
 - Moistures (Quality and efficiency)

- ### QA Practices-
- Asphalt Plant
 - Weigh bridges and bins calibrated
 - Burner is optimized for lower temperatures
 - Baghouse temperatures-exhaust gas heater
 - Proper binder temp/injection systems calibration
 - Production testing
 - Gyrotory heights
 - Field TSR values

- ### Cases Studies.....so far!
- STH 100, Milwaukee – Sasobit & Evotherm
 - M-95, Iron Mountain – Sasobit
 - Canal Street, Milwaukee – Advera
 - West Bend Airport, West Bend – Advera
 - County Road 513, Rapid River – Advera & Evotherm



- ### STH 100, Milwaukee 2006
- Mix Design
 - Existing approved WisDOT design
 - Binder: PG 64-28
 - AC Target: 5.00%-14%RAP
 - Project Specifics
 - Surface Layer: 1-3/4 E-3 12.5 mm
 - Normal Mix Temperature: 310° F
 - Warm Mix 265 F


STH 100, Milwaukee

- Field Results (Mix-averages)

Property	AVERAGE VOLUMETRIC PROPERTIES			
	JMF	Control	Sasobit	Evotherm
G _{mm}	2.534	2.523	2.520	2.519
G _{mb}	2.433	2.431	2.433	2.436
V _a	4.0%	3.7%	3.5%	3.3%
VMA	14.2	14.1	14.1	14.0
VFB	71.8	74.1	75.3	76.2
P _b	5.30%	5.21%	5.19%	5.22%

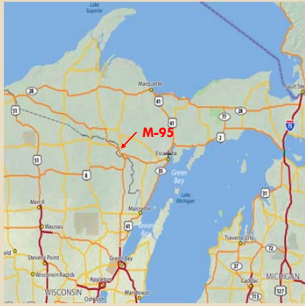
STH 100, Milwaukee

- Final Product



M-95, Iron Mountain

- Passing relief lane
- MDOT PWL specification



M-95, Iron Mountain

- Mix Design
 - Existing approved MDOT design
 - Binder: PG 58-34
 - AC Target: 5.52% - 15% RAP
- Project Specifics
 - Surface Layer: 1-3/4 5E3 (i.e. E-3 9.5 mm)
 - Normal Mix Temperature: 317° F
 - Warm Mix 270 °F

M-95, Iron Mountain



HOT MIX PAVING

WARM MIX PAVING

M-95, Iron Mountain




M-95, Iron Mountain

- PWL = 100 for both Control and WMA sections

Property	JMF	Control	Sasobit
G _{mm}	2.552	2.582	2.575
G _{mb}	2.450	2.466	2.471
V _a	4.00%	4.52%	4.04%
VMA	16.2	15.8	15.3
VFB	75.4	71.3	73.6
P _b	5.52%	5.61%	5.32%

M-95, Iron Mountain

- Final product



Canal Street, Milwaukee

- Canal Street adjacent to Miller Park
- City of Milwaukee specified Warm Mix
- 4,500 Tons




- Paved just before Thanksgiving, temperatures were in the 40's, partly to mostly cloudy with 15-20mph winds.

Canal Street, Milwaukee

- Mix Design
 - Binder: PG 64-22
 - AC Target: 5.10%
 - Recycle: 25% RAP
- Project Specifics
 - Lower Layer: 3" E-119.0 mm
 - Surface Layer: 1-1/2" E-112.5 mm

Canal Street, Milwaukee

- Production Temperatures
 - HMA: 320°F (load out)
 - Advera WMA: 265°F (load out)
- Placement Temperatures
 - HMA: 295-305°F
 - Advera WMA: 245-250°F
- Densities
 - HMA: 92.0
 - WMA: 93.4



Canal Street, Milwaukee

Lower Layer Mix				Surface Layer Mix			
Property	JMF	Advera		Property	JMF	Advera	
		HOT	REHEAT			HOT	REHEAT
G _{mm}	2.574	2.565	2.577	G _{mm}	2.558	2.555	2.557
G _{mb}	2.472	2.495	2.496	G _{mb}	2.456	2.453	2.454
V _a	4.0	2.7	3.2	V _a	4.0	4.0	4.0
VMA	13.0	12.3	12.2	VMA	14.0	14.1	14.0
VFB	69.2	77.9	74.3	VFB	71.4	71.7	71.4
P _b	4.50	4.54	4.49	P _b	5.10	5.19	5.19

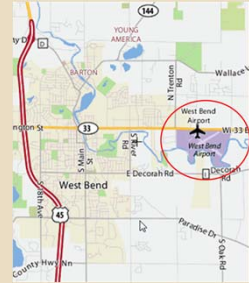
Canal Street, Milwaukee

- Final Product



West Bend Airport, West Bend

- City of West Bend Wisconsin
- Existing Runway severe distress cracking
- Abundance of crack sealant



West Bend Airport, West Bend

- Mix Design
 - Binder: PG 64-38
 - AC Target: 5.30%
 - Recycle: 20% RAP
- Project Specifics
 - Surface Layer: 2" E-3 12.5mm
 - Runway 75 feet wide
 - Paved in echelon 37.5 feet wide
 - Lay down temp 235°F degrees or below

West Bend Airport, West Bend



West Bend Airport, West Bend




West Bend Airport, West Bend




West Bend Airport, West Bend

- Densities Average 93.2%
- Little to no reflective bumps from crack sealant
- Mix volumetrics earned 100 percent pay
- Extremely happy owner!



County Road 513, Rapid River

- Mix Design
 - MDOT approved mix design
 - Binder: PG 52-34
 - AC Target: 5.30%
 - Recycle: 17% RAP
- Project Specifics
 - Lower Layer: 2" 12.5mm
 - Surface Layer: 2" 12.5mm
 - Length: 11.25 miles
 - Tonnage: 25,000



County Road 513, Rapid River

- Funded by MDOT and the Delta County Road Commission
- Part of NCHRP 09-47A, Being conducted by the National Center for Asphalt Technology (NCAT) in cooperation with Advanced Materials Services, LLC

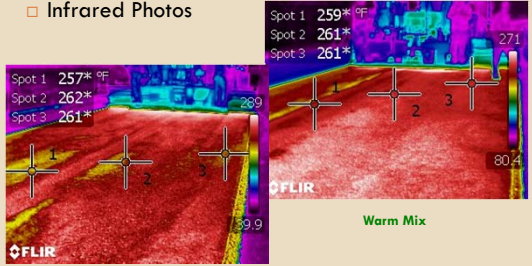


County Road 513, Rapid River



County Road 513, Rapid River

- Infrared Photos



Hot Mix


Warm Mix

County Road 513, Rapid River

Property	Advera			Evotherm		Control (HMA)	
	JMF	HOT	REHEAT	HOT	REHEAT	HOT	REHEAT
G _{mm}	2.489	2.489	2.488	2.489	2.488	2.481	2.484
G _{mb}	2.389	2.394	2.399	2.400	2.407	2.392	2.407
V _a	4.0%	3.8%	3.6%	3.6%	3.3%	3.6%	3.1%
VMA	14.6	14.5	14.2	14.3	13.9	14.7	14.0
VFB	72.6	73.7	74.8	75.0	76.6	75.5	77.7
P _b	5.30%	5.39%	5.25%	5.37%	5.25%	5.52%	5.32%

Summary

- The data collected thus far is consistent with national results and there has not been a significant difference between HMA and WMA testing results w/most products
 - ▣ Hot sample volumetrics are no different than reheated sample volumetrics




Summary

- Most WMA additives don't require the mix design to be recreated
 - ▣ Field trials have shown that mixture volumetrics are nearly identical between HMA and that same HMA mix design with WMA additives.

Note: Depending on what WMA technology used, a new mix design or at least initial laboratory work may be required prior to field production.


Summary

- The benefits of WMA are numerous. They include:
 1. Reduction in fuel consumption
 2. Reduction in plant emissions
 3. Extension of the paving season (i.e. compaction aid for cold weather paving)



Summary

- The benefits of WMA are numerous
 4. Increased haul distances
 5. Increased workability
 6. Improved ride quality
 7. A better product



Questions?

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Thank You