The Institute of Asphalt Technology
Irish Branch

Warm Mix Asphalt

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Warm Mix Asphalt

What is it?

How do we make it?

Why should we use it?

What is Warm Mix Asphalt ?

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- Tii Definition from Series 900 (CC-SPW-00900 Oct 2023)

Warm Mix Asphalt - WMA	WMA are produced at lower temperatures, typically 20-40°C lower, compared to equivalent Hot Mix Asphalts (HMA) but always above 100°C. WMA can either be produced using chemical additives or organic additives.

- Mixture Designations

  For mixtures produced with a WMA additive, the letter “W” shall be added to the mixture designation after the binder designation. Example: “AC 32 dense base 40/60 W des”.

- Currently allowed in AC and SMA mixtures. Not currently allowed in HRA and PA.

What is Warm Mix Asphalt ?

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True Warm Mix | Hot WMA | HMA

95° 105° 120° 135° 150° 160° 175°

What is Warm Mix Asphalt ?

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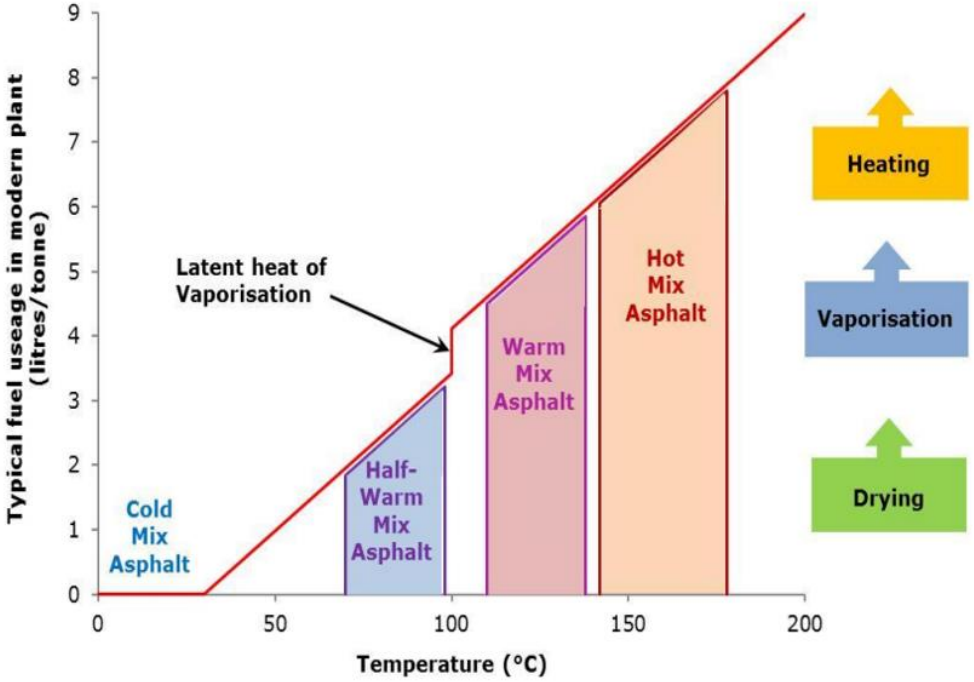

TII CC-SPW-00900 October 2023 (Series 900)

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What has changed ?

Higher RA Contents

Guidance on RA Usage

Warm Mix Asphalt

Guidance on Warm Mix

Requirement for EPDs

https://www.tiipublications.ie

What is Warm Mix asphalt ?

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TII Publications
Road Pavements – Bituminous Materials

Table 2 Asphalt Concrete – Prod

hEN reference		
Table column reference	**1**	**2**
Layer	Base	Binder
Mixture designation	AC 32 dense/HDM[1] base des	AC 20 dense/HDM[1] bin des

Temperature of the mixture – maximum				
	Hot	Warm[6]	Hot	Warm[6]
40/60	190	150	190	150
70/100	180	150	180	150
160/220				

Temperature of the mixture – minimum	**Delivery**	**Rolling**		**Delivery**	**Rolling**	
		Hot	Warm		Hot	Warm
40/60 pen		105	90		105	90
70/100 pen		90	85		90	85
160/220 pen						

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Note.

NG – Warm mix temperatures
(CC-GSW-00900 Notes for Guidance)

3.3.7 Temperature

The temperature of the mixture given in Table 2 is the maximum to prevent degradation of the binder; the temperature required at delivery to achieve adequate compaction in the Works may vary according to items such as product type, laid thickness, plant employed and prevailing conditions and as such should be agreed between the manufacturer and the laying contractor. The minimum temperature at delivery shall be declared.

The production of bituminous mixtures to warm-mix temperature limits may require early batches to be produced at higher temperatures, up to but not exceeding hot-mix limits. This may be required to cater for heating the plant when the manufacturing process starts from cold.

How do we make it?

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- Manufactured using the same asphalt plant as HMA
- Manufactured using the same aggregates, filler's & bituminous binders
- Raw Material Difference – An additive is added to the Bitumen, heat is replaced with chemistry
- To modify the bitumen viscosity & modify the frictional resistance of the mixture during compaction

Heat is replaced with chemistry

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- Additive added at the Bitumen Terminal – “Splash Blending

Heat is replaced with chemistry

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- Additive added to the bitumen kettle at the mixing plant.

Dosage?

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- Dosage will depend on the additive used and the reductions targeted.
- Dosage must account for Reclaimed Asphalt content. The Binder content of the RA must also be dosed with the additive.
- The additive supplier will provide information on how to calculate the dose etc.

Mixing – Things to watch out for

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- Moisture of your RA or aggregates – If too wet , this will impact on everything you do.
- Controlling Temperature
  - In a standard plant set up your controls are;
    - Burner control
    - Mixing speed
- "Heat the Steel"
    - Start hot and reduce down as you go
    - This will help, plant, lorries, mtv, paver
- Potential adjustments;
    - Variable speed drums
    - Reconfigure drying drum (remove lifters)
- Items to watch
    - Bag house performance
    - Coating of stone

Delivery – Insulated Lorries

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- As with all Asphalt insulated Lorries with tight fitting covers are essential.

- For long hauls or where extended shelf life is needed the dosage of Additive can be increased.

Laying WMA on Site

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- Uses the same equipment and practices
- No Plant modification are required.
- Very little difference in delivery, laying, compaction
- May want to adjust rolling pattern.-
  - Break down (or lead) Roller will need to be close to the paver
- May not flow out of the lorry as smoothly
  - Reluctance using warm mix for hand lay

The Why?

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- 3 Main Reasons/Benefits
- Sustainability – Lower Carbon Value (CO_2)
- Durability – At least equivalent. Potentially Improved quality
- HS&W – Less emissions

Where is the Saving ?

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	AC 20 dense bin 40/60 des HMA	AC 20 dense bin 40/60 des WMA
Raw materials	20.689 (Bitumen 18.013)	20.689 (Bitumen 18.013)
Transport	3.519	3.519
Processes (energies)	32.704	28.572
Totals KG/T CO^2	**56.911**	**52.780**

Where is the Saving ?

BREEDON

	AC 20 dense bin 40/60 des HMA	AC 20 dense bin 40/60 des WMA
Totals KG/T CO^2	**56.911**	**52.780**
Saving in KG/T	-	4.131
Saving in %	-	7.25%

25,000 Tonnes of Asphalt/ Annum		
Saving in KG,s	-	**103,275**
Savings in Tonnes	-	**103**

Where is the Saving ?

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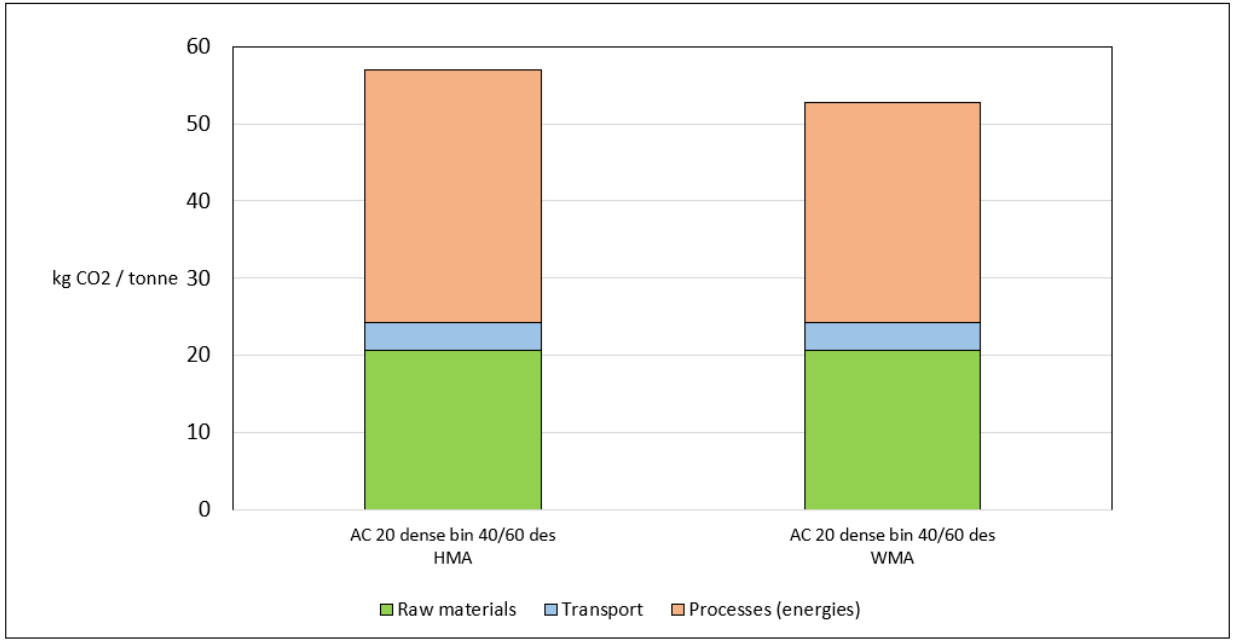

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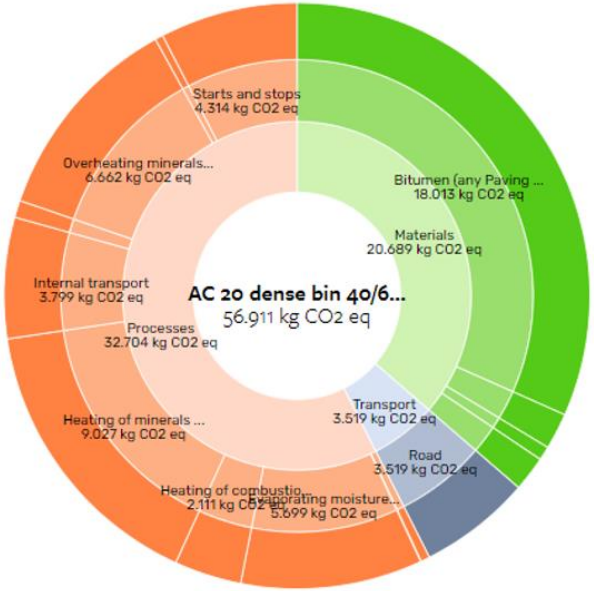
Where is the Saving ?



AC 20 dense bin 40/60 des

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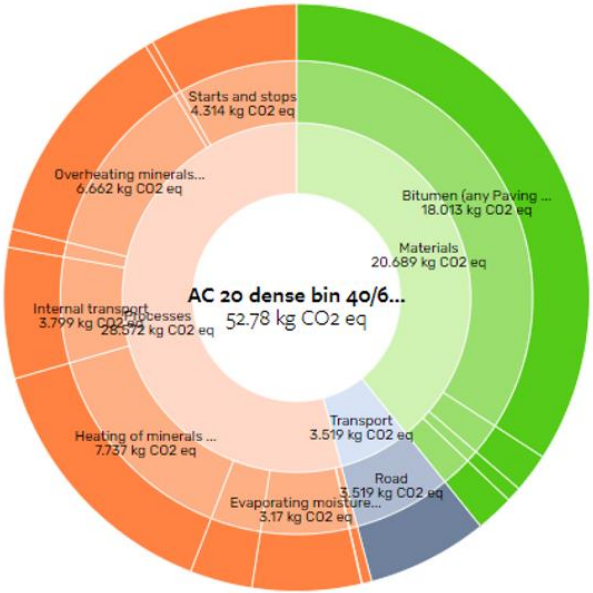

AC 20 dense bin 40/60 des W

Benefits of WMA – Material Quality

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- Key mechanical properties of the asphalt are equivalent to HMA products
- Faster construction programme & less disruption as material can be opened to traffic or overlaid much sooner than HMA
- Fully recyclable as reclaimed asphalt pavement (RAP) that can be used again & again in asphalt production as RA. (Check with the supplier)

Benefits of WMA – Material Quality

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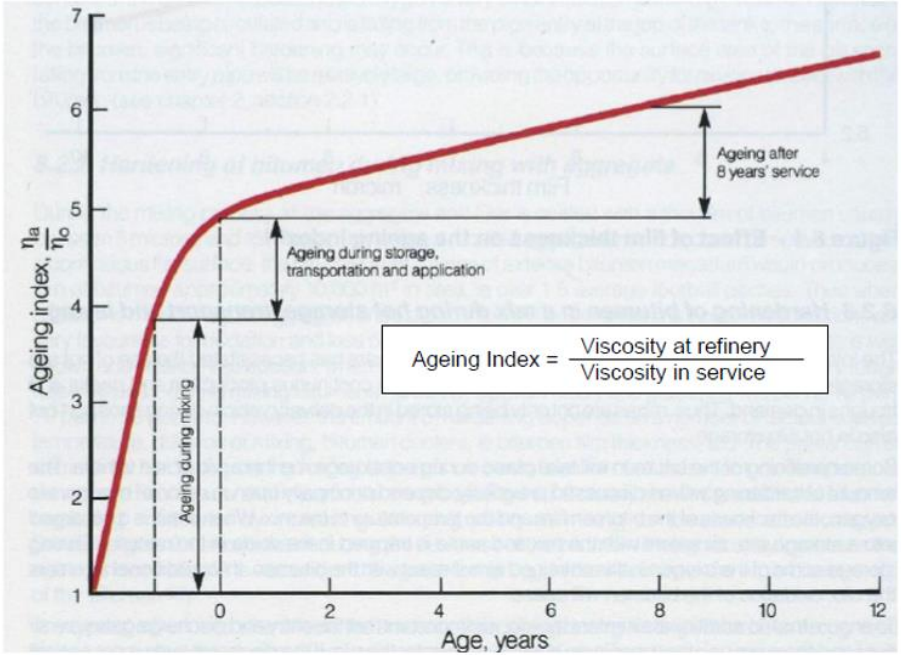
- The reduction in manufacturing temperatures leads to a reduced binder ageing (oxidization & hardening) of the bitumen when compared to conventional HMA manufacturing temperatures.
- The Characteristics of bitumen change with time it hardens. The first few hours of its life is when asphalt will age the most. The affect of reducing temperature when mixing will significantly help to increase the life of the pavement.



Benefits of WMA – Material Quality

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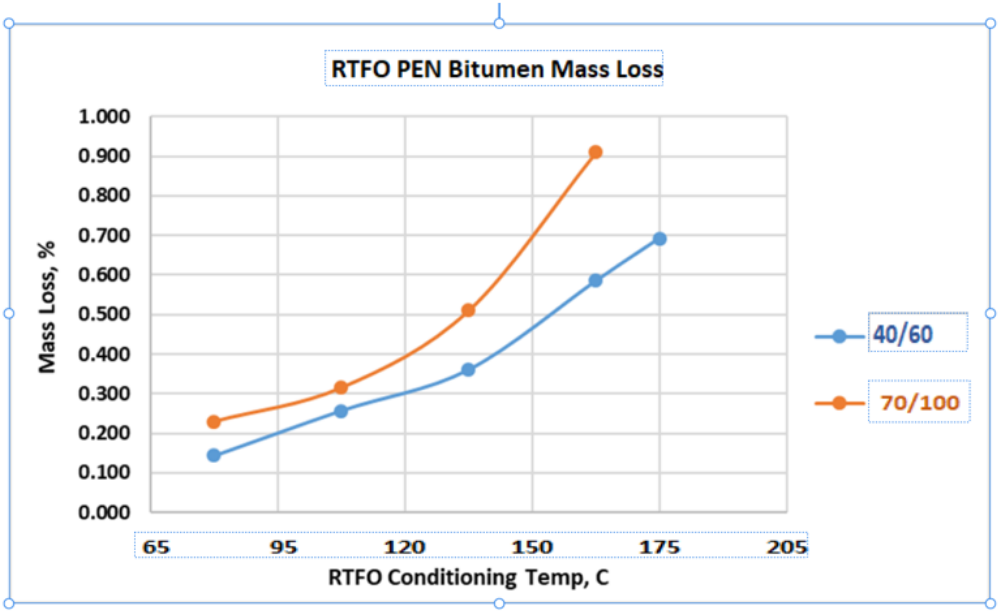

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HS&W - Benefits of Warm Mix Asphalt

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- Health, Safety & Well been of Asphalt workers & General Public
  - Less Steam, lower Nox & Sox, lower VOCs.
- The lower mixing & paving temperatures minimise fume & odor emissions and creates cooler working conditions for asphalt workers.
- Better visibility through reduced steam that can impact vision for asphalt worker's & road user's

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HS&W - Benefits of Warm Mix Asphalt

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Hot Mix Asphalt

Warm Mix Asphalt

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Benefits of Warm Mix Asphalt – HS&W

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Benefits of Warm Mix Asphalt – HS&W

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Good Visibility Laying Warm Mix

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What are we waiting for ?