ASECAP DAYS
MADRID 2025

52nd ASECAP DAYS

Challenges of Future Mobility | The Role of Road Infrastructure

26 - 28 May 2025 | Madrid
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Hosted by seopan
Asociación de Empresas Constructoras y Concesionarias de Infraestructuras

Sustainable Pavements

Nicoletta Gasbarro

Fabio Maria Colasanti

Autostrade per l'Italia

Sustainable Pavements

Autostrade per l'Italia Group

The largest highway operator in Europe

- ~3.000 km motorway network
- ~320 km tunnels
- ~ 4200 bridges and viaducts
- 4,3 M daily customers
- 2,5 M daily vehicle transit

autostrade per l'Italia

movyon — Technology, R&D

tecne — Engineering and implementation

amplia Infrastructures — Construction and related services

elgea — Energy from renewable sources

FREETOX Sostenibilità. Innovazione. Mobilità — Services for travellers

- around **3.000 km** of highway managed
- **4,3 million** customers travel along the network every day

8 million square meters of surfaces area through our pavement maintenance activities

Pavement maintenance plan

- Improving **preventive maintenance**
- **Maximise** the effects of interventions
- Evaluate **sustainability** of maintenance activities

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Sustainable Pavements

ASECAP DAYS MADRID 2025

HiPER: Highway Pavement Evolutive Research

HiPER project responds to our needs.

This need has led to development of more research activities on different field of pavements.

The research activities are carried out in collaboration with:

UNIVERSITÀ POLITECNICA DELLE MARCHE

movyon

amplia Infrastructures

HiPER Tech

HIGH PERFORMANCE SURVEY

TECHNOLOGICAL INNOVATION

INNOVATIVE MATERIALS

ASSET MANAGEMENT

Sustainable Pavements

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HIGH PERFORMANCE SURVEY

TECHNOLOGICAL INNOVATION

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WARM MIX ASPHALT WITH HIGH PERCENTAGES OF RAP

ASSET MANAGEMENT

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In line with the Sustainable Development Goals of the 2030 Agenda, specifically Goal No. 12 concerning the reduction and protection of natural resources, we aim to make highways and, in this case, road pavements increasingly sustainable.

The goal is to reduce the use of natural resources in the bituminous mix supply chain and to lower emissions through the use of chemical additives that decrease the production and the use of high percenatges of RAP.

Process of warm mix asphalt with high percentages of reclaimed asphalt pavement (RAP)

R&D ACTIVITIES

PRODUCTION OF THE MIXTURES

LAYING OF ASPHALT CONCRETE

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R&D Activities

Definition of the mixtures

The research activity is aimed at evaluating the feasibility of producing bituminous mixtures for wearing courses and base layers using warm technology ***(Warm Mix Asphalt, WMA),*** *containing high percentages of recycled aggregates* ***(Reclaimed Asphalt Pavement, RAP)***

The materials considered for the definition of the mix belong to a Amplia Infrastractures plant.

Binder

Aggregates

Chemical Additive

The investigation, initially carried out in the laboratory, focused on the performance characterization of bituminous mixtures for:

- **porous asphalt layers** (Open Graded **25% RAP Warm** - OG25W);
- **base layers** (Dense Graded **45% RAP Warm** - DG45W).

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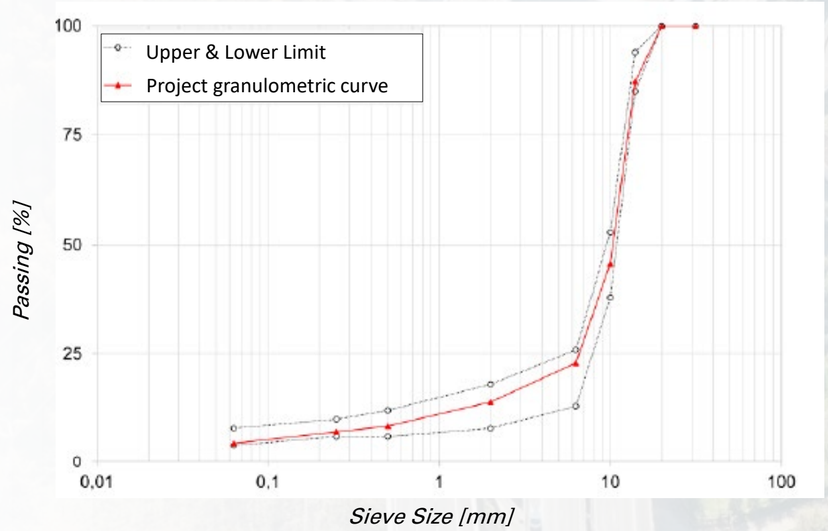
R&D Activities

Definition of the mixtures

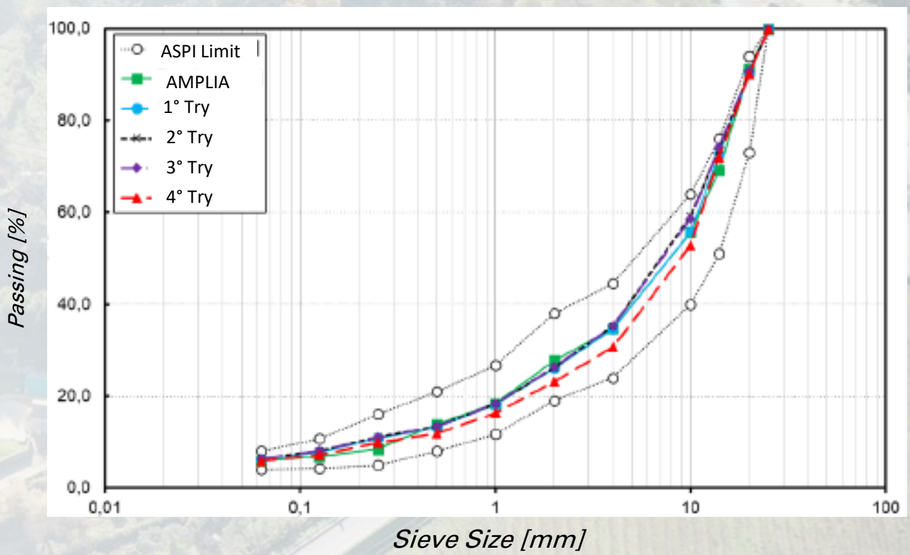
The research activity is aimed at evaluating the feasibility of producing bituminous mixtures for wearing courses and base layers using warm technology ***(Warm Mix Asphalt, WMA),*** *containing high percentages of recycled aggregates* ***(Reclaimed Asphalt Pavement, RAP)***

Definition of the mixtures: Compliance with the Construction Specifications

Open Grade **25% RAP Warm**



Dense Grade **45% RAP Warm**



A very important activity for the definition of the curves is the **screening of the RAP**.

- Open Graded **25% RAP Warm** - OG25W: 8/16 (20%) and 4/8 (5%)
- Dense Graded **45% RAP Warm** - DG45W: 8/20 (30%) and 0/8 (15%)

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R&D Activities

Results OG25W

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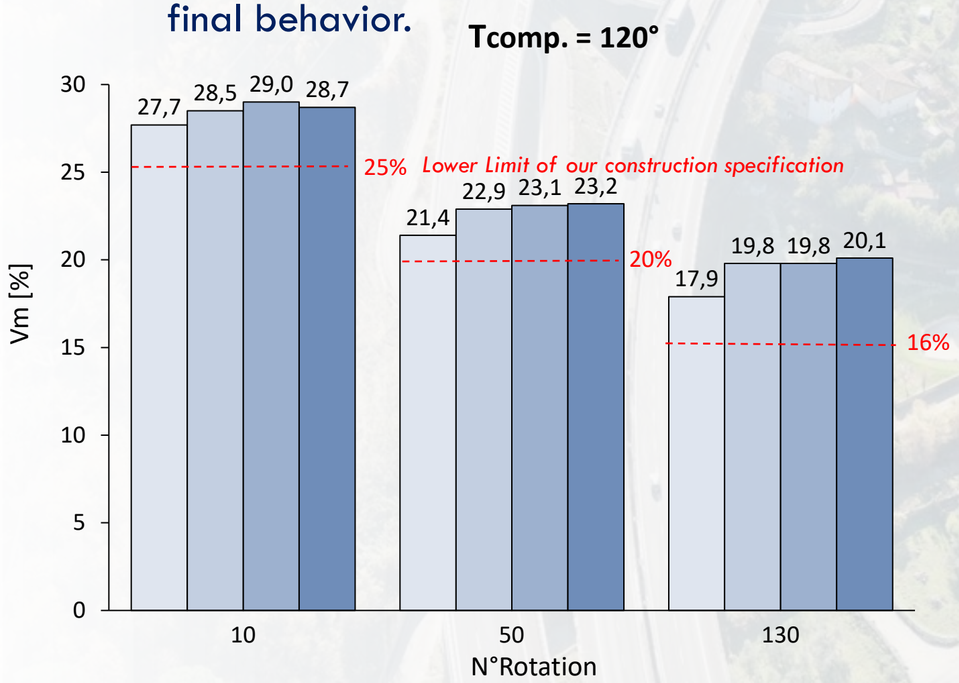
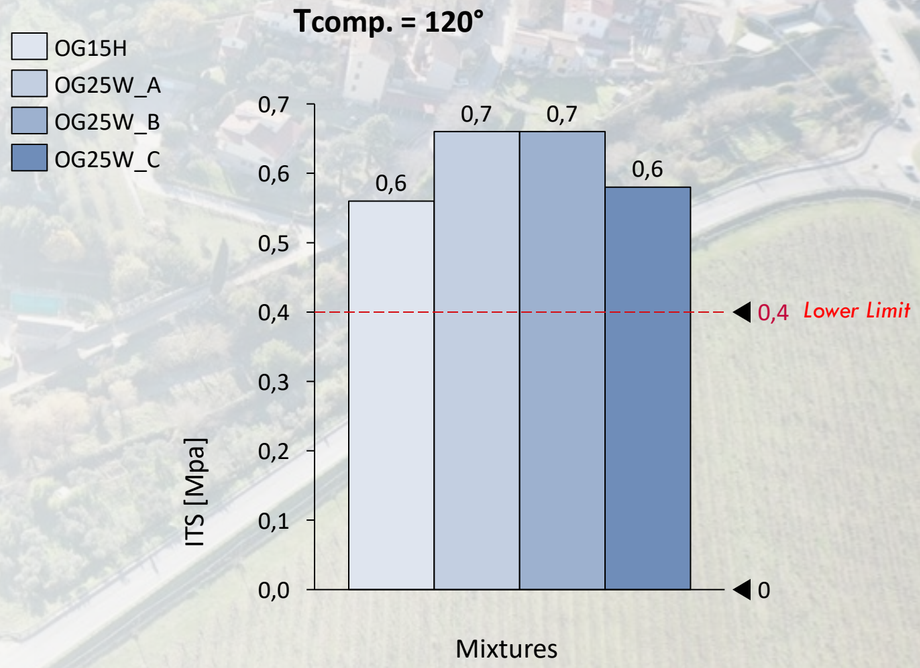
The three types of mixtures were produced in the laboratory at temperatures reduced by 40°C compared to those currently used for the same hot mixtures.

Open Graded 25% RAP Warm	**Open Graded 15% RAP Hot**
OG25W_A: 5,4%	*OG15H**
OG25W_B: 5,6%	Reference mixture*: in our construction specifications
OG25W_C: 5,8%	

***RESULTS:* Porous asphalt layers** (Open Graded **25% RAP Warm** - OG25W)

All the tests were carried out in collaboration with Politecnica delle Marche University. The performance of each type of mixture was studied by considering three different total binder contents (OG25W_A, OG25W_B, OG25W_C) to highlight the influence of the binder on their final behavior.





All mixtures meet the limits established in the technical specifications and demonstrate performance equivalent to that of the reference mixture. **Consequently, we used the mixture with the lowest asphalt binder content as a reference.**

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R&D Activities

Results DG45W

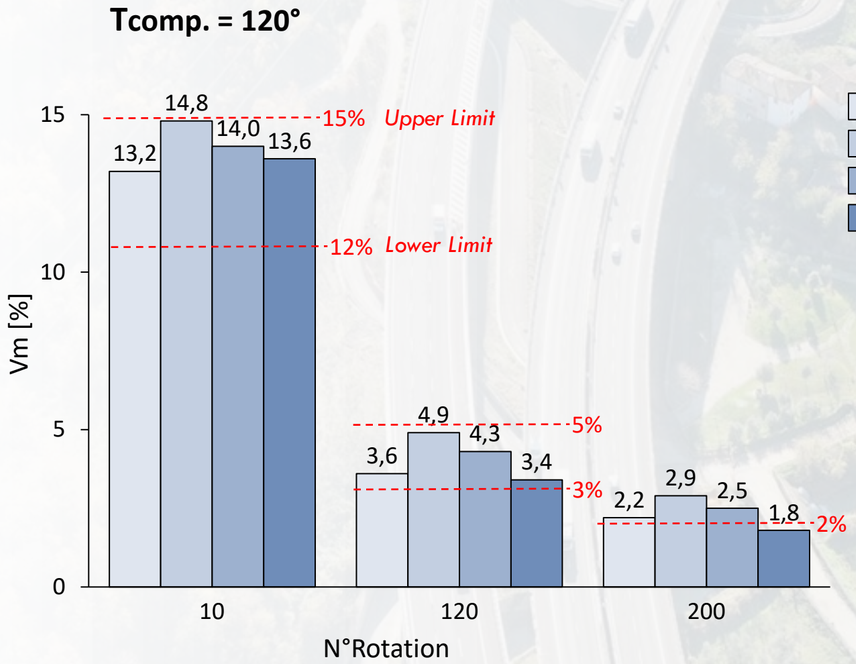
The three types of mixtures were produced in the laboratory at temperatures reduced by 40°C compared to those currently used for the same hot mixtures.

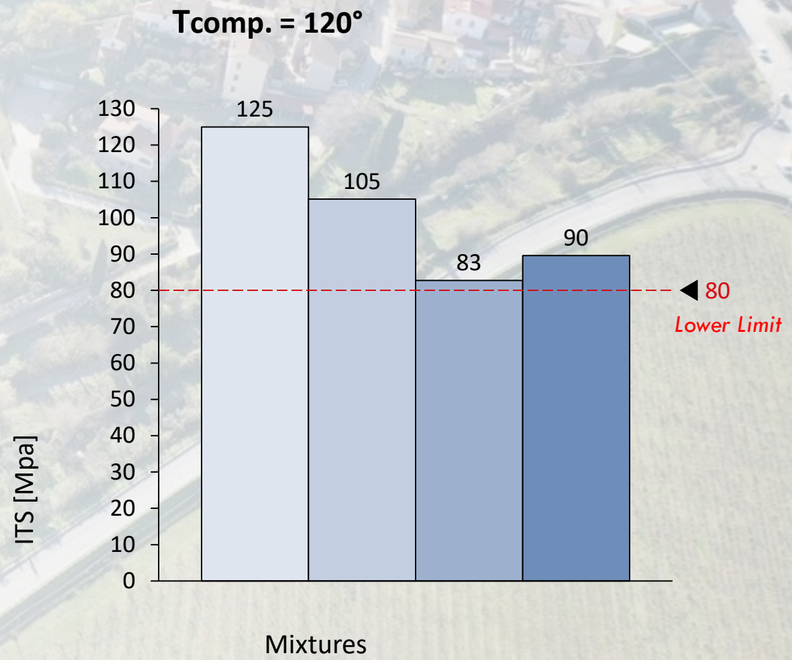
Dense Graded 45% RAP Warm	**Dense Graded 30% RAP Hot**
DG45W_A: 4,4% *DG45W_B: 4,6%* *DG45W_C: 4,8%*	*DG30H**

Reference mixture*: in our construction specifications

***RESULTS:* Base layers** (Dense Graded **45% RAP Warm** - DG45W)

The performance of each type of mixture was studied by considering three different total binder contents to highlight the influence of the binder on their final behavior.





All mixtures meet the limits established in the technical specifications and demonstrate performance equivalent to that of the reference mixture. **Consequently, we used the mixture with the lowest asphalt binder content as a reference.**

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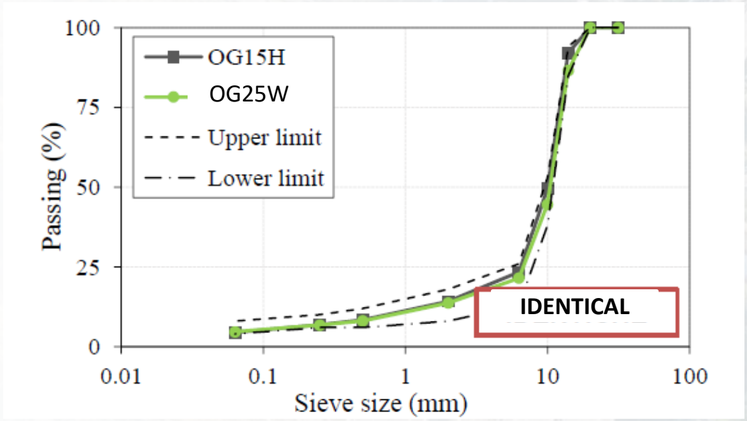
R&D Activities

Results

We used the mixture with the lowest asphalt binder content as a reference. The curves between the two different mixtures, Hot and Warm, are identical.

RESULTS: **Porous asphalt layers** (Open Graded **25% RAP Warm** - OG25W)



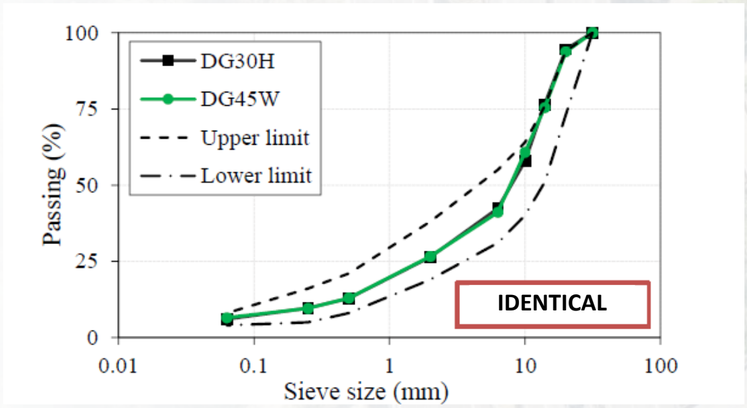
Mixtures	RAP [%]	Total Asphalt Binder [%]	Chemical Additive [%]
OG15H*	15	5.4	-
OG25W**	25	5.4	0.40

OG15H:* Open Graded 15% RAP Hot

(Reference mixture: in our construction specifications)

OG25W*: Open Graded 25% RAP Warm

RESULTS: **Base layers** (Dense Graded **45% RAP Warm** - DG45W)



Mixtures	RAP [%]	Total Asphalt Binder [%]	Chemical Additive [%]
DG30H*	30	4.4	-
DG45W**	45	4.4	0.40

DG30H:* Dense Graded 30% RAP Hot

(Reference mixture: in our construction specifications)

DG45W*: Dense Graded 45% RAP Warm

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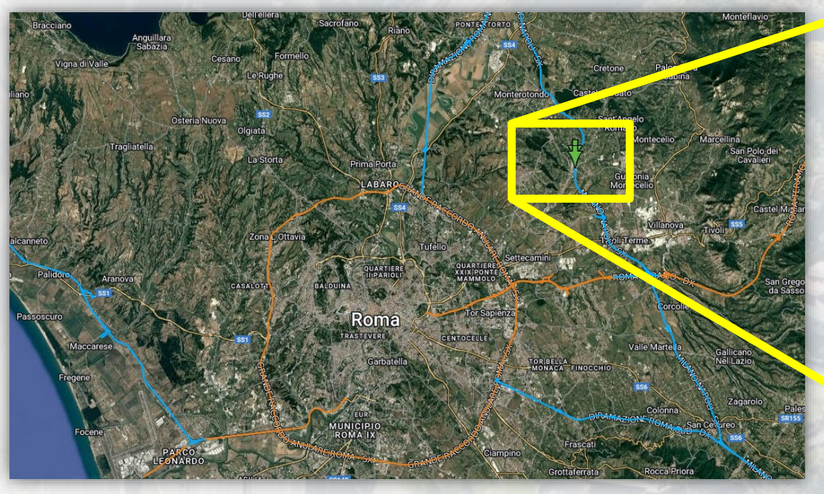
Production of the mixtures

Laying of asphalt concrete

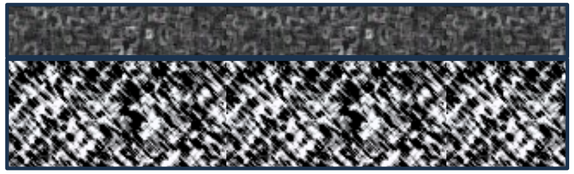
Test Field: A1 Highway (NB): from 550+400 to 550+800
(October '22)

In collaboration with:

amplia Infrastructures



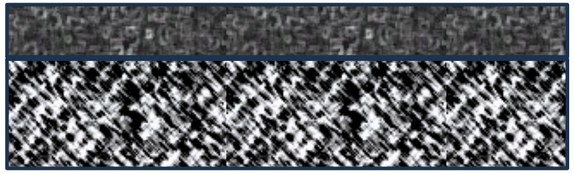
Hot mix asphalt section:
from 550+400 to 550+600



OG15H – 4cm

DG30H – 25cm

Warm mix asphalt section:
from 550+600 to 550+800



OG25W – 4cm

DG45W – 25cm

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Production of the mixtures: Results

Laying of asphalt concrete: Results

LABORATORY TEST RESULTS (Tradiotional and VECD Approach)

Type of samples	Mix	Laboratory tests (Traditional Approach)							Laboratory tests (VECD Approach)		
		Compaction Energy Index CEI	Indirect Tensile Stiffness Modulus ITSM	Indirect Tensile Test ITT	Semi Circular Bending SCB	Indirect Tensile Fatigue ITFT	Cantabro	TwoPoint Compaction Cohesion Test TCCT	Dynamic Modulus	Cycling Fatigue	Stress Sweep Rutting
Compacted samples in the lab	DG45W	OK	OK	OK	OK	OK	-	OK	OK	OK	OK
	DG30H	-	OK	OK	-	OK	-	OK	OK	OK	OK
	OG25W	OK	OK	OK	OK	-	OK	-	OK	OK	-
	OG15H	-	-	OK	OK	-	OK	-	OK	OK	-
Core drilling from experimentals laying	DG45W	-	OK	-	-	OK	-	-	OK	OK	OK
	DG30H	-	OK	-	-	OK	-	-	OK	OK	OK

OK: "The results meet the performance of the reference mixture"

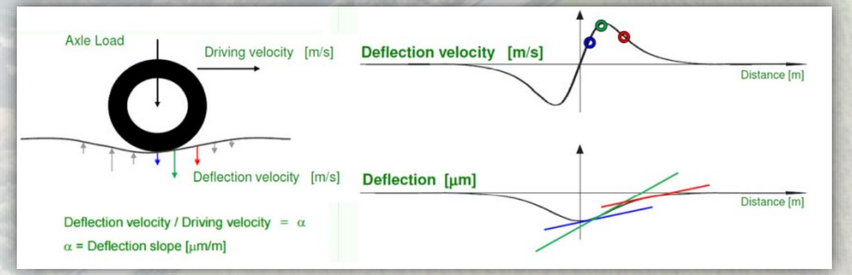
These results carried out clearly demonstrated the possibility of producing on a large scale using WMA technology, bituminous mixtures for both open and dense graded, containing high quantities of reclaimed material from the removal of old wearing courses in the highway sector (respectively, 25% and 45%).

HIGH PERFORMANCE VEHICLES RESULTS:

Traffic Speed Deflectometer

Sections	Residual Service Life
Section HMA	>30 Years
Section WMA	>30 Years

✓ Thanks to the use of the backcalculation we are able to know the "Residual Service Life" of the two sections.



Backcalculation of deflections using Traffic Speed Deflectometer

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Conclusions

Our mix design has allowed us to achieve the following objectives:

- **Increase in reclaimed asphalt percentages:** thanks to the use of the chemical additive, we have the ability to increase the amount of reclaimed material used. (until 45% of RAP).
- **Emission reduction (~15% CO_2):** decrease in production temperatures of the bituminous mixture within the plant by up to approximately 40°C.
- **Quality and functional standards:** warm mixtures, produced at lower temperatures (130°C ~ 140°C), meet the same quality and technical standards as hot mix asphalt (170°C).

Thanks to these studies and the tests conducted in the field, **warm mixtures with high percentages of reclaimed asphalt** are currently used for the routine **maintenance activities of the ASPI highways network**.

This way of working certainly leads to optimization of maintenance costs and a lower use of natural resources.

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MADRID 2025

Thank You

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