

SUSTAINABLE SOLUTIONS FOR ASPHALT PAVEMENTS:

A EUROPEAN APPROACH

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International Bitumen Emulsion Federation

International Conference for Road Engineers

THE IBEF

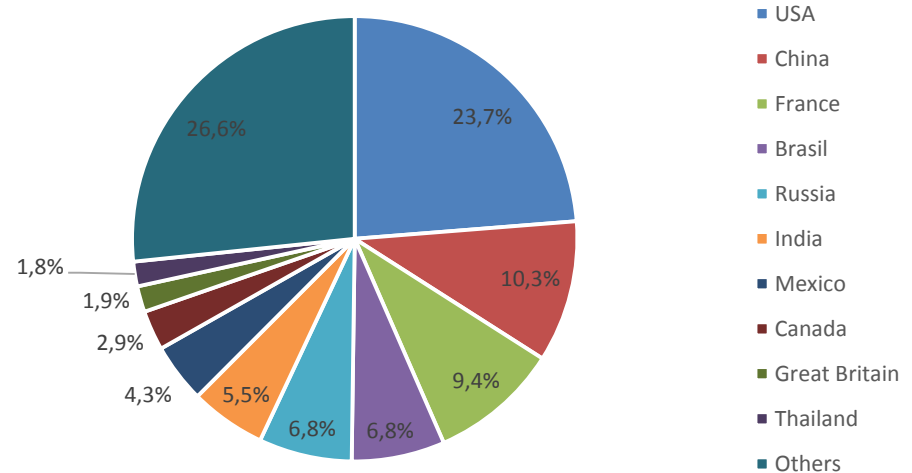
- International Bitumen Emulsion Federation
- Founded in 1996
- 21 countries represented
- A forum of exchange and promotion of best practices



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THE IBEF

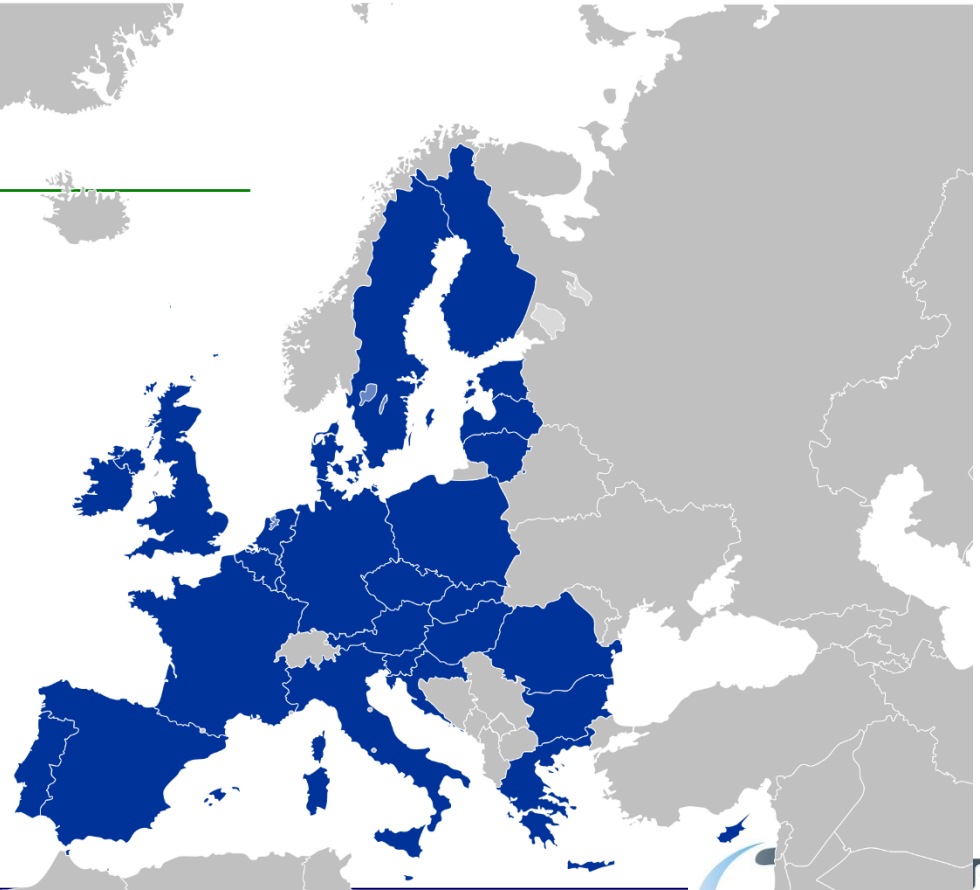
- International Bitumen Emulsion Federation
- Worldwide production: 8,137,702 MT (2016)
- Bitumen: 103,120,054 MT



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0. CONTENT

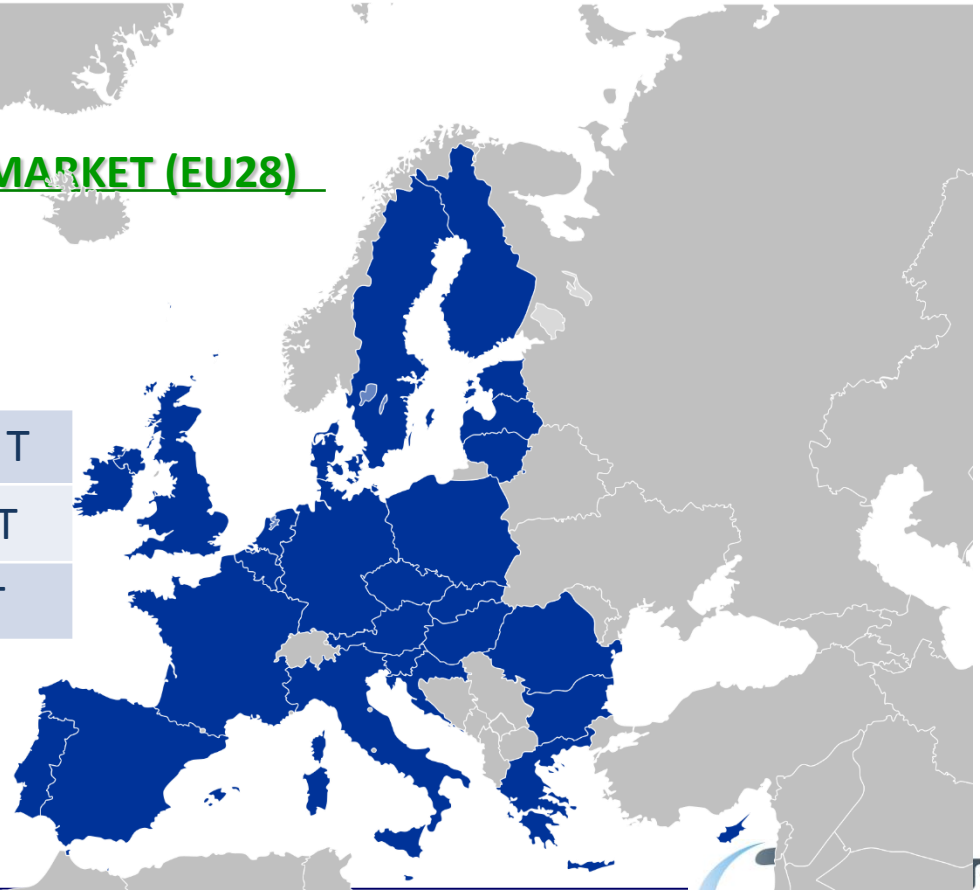
- Introduction to the European market
- Recycling
- Emulsion based systems
- Warm mixes
- Pavement design optimization
- Conclusions



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1. INTRODUCTION TO THE EUROPEAN MARKET (EU28)

Asphalt mixes	227.1 Mio T
Bitumen	11.7 Mio T
Emulsions	1.8 Mio T



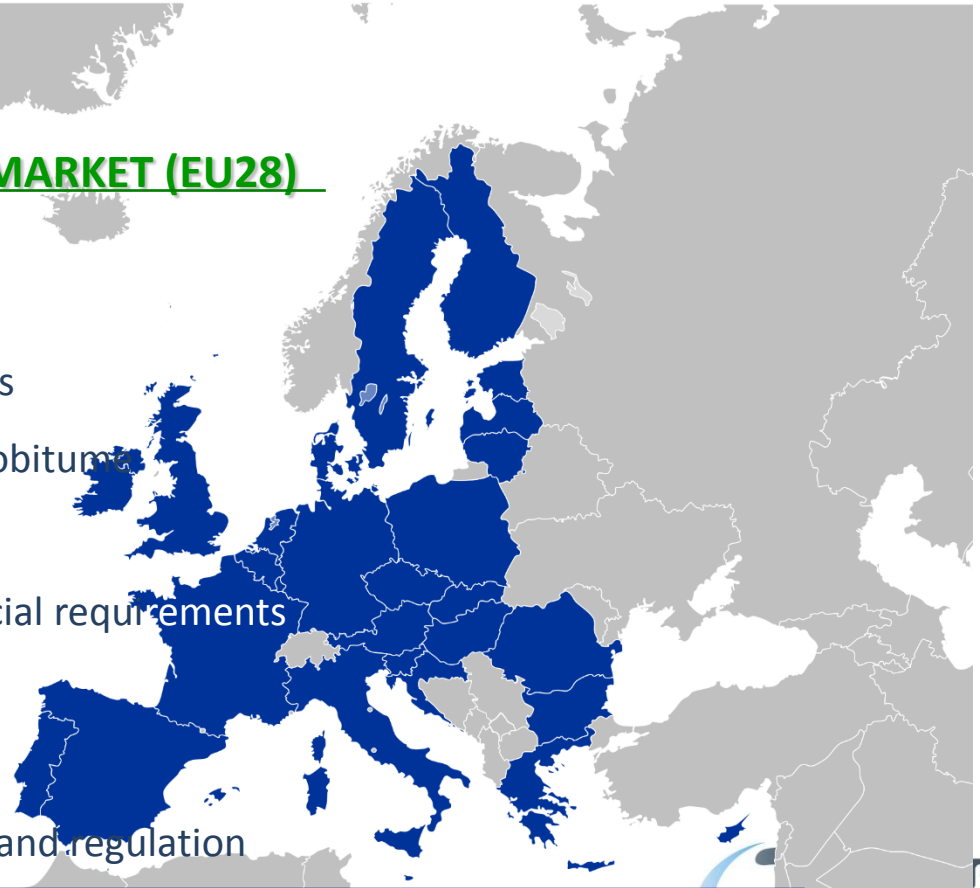
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1. INTRODUCTION TO THE EUROPEAN MARKET (EU28)

	EU 28	Korea	USA
Asphalt mixes	227.1 Mio T	26.2	340.0
Bitumen	11.7 Mio T	1.8	20.3
Emulsions	1.8 Mio T	0.07	1.9

1. INTRODUCTION TO THE EUROPEAN MARKET (EU28)

- A unified market
 - European standards and regulations
 - European organizations: EAPA, Eurobitume
- Some common drivers
 - Environmental, economical and social requirements
 - Budget restrictions
- With many national specificities
 - 28 countries with 28 sets of habits and regulation



1. INTRODUCTION TO THE FRENCH MARKET

- Focus on France
 - A large road network: 1 million km
 - A strong relationship between road authorities and the industry
 - Tools for innovation
 - 2009: a voluntary agreement gathering road agencies, consultants, counties, industry



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1. INTRODUCTION TO THE FRENCH MARKET

- Voluntary agreement including 10 goals from which:
 - Preserving non renewable resources
 - Reduce emissions of GHG and energy consumption
 - Improve the environmental performance of the road
 - Promote R&D and disseminate outcomes



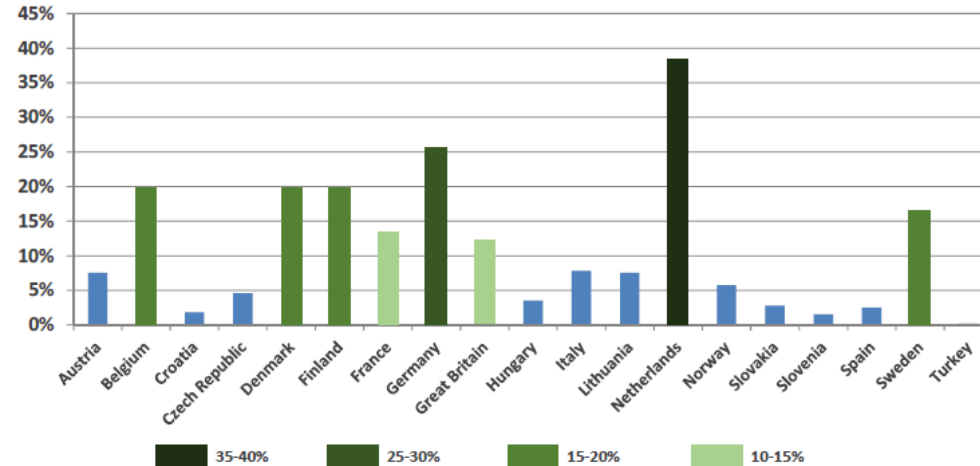
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1. RECYCLING

- Preserving non renewable resources
- Asphalt recycling
- In plant
 - Hot recycling
 - Cold recycling
- In place
 - Cold recycling
 - Hot in place recycling

use of RAP
with emulsion

with emulsion / cement



Danger

Jeju Island Korea - May 29 – June 1 2018

1. RECYCLING

- Preserving non renewable resources
- Circular economy
 - (Scrap tires), polyethylene
 - Slag, fly ash
 - Demolition, de-construction
 - Plant industry: rejuvenating oils
 - Asphalt extenders



2. EMULSION BASED SYSTEMS

- Reduce emissions of GHG and energy consumption
- A historical French leadership

	Bitumen	Emulsion	Ratio
France	2,406,000	765,000	31.8 %
EU 28	11,706,000	1,776,000	15.2 %
Worldwide	103,120,000	8,138,000	7.9%

2. EMULSION BASED SYSTEMS

- Reduce emissions of GHG and energy consumption
- Maintenance techniques
 - Surface treatments (70% of the emulsion uses)
 - Cold mixes
 - Recycling



2. EMULSION BASED SYSTEMS

- Reduce emissions of GHG and energy consumption
- Maintenance techniques
 - Surface treatments
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 - Recycling



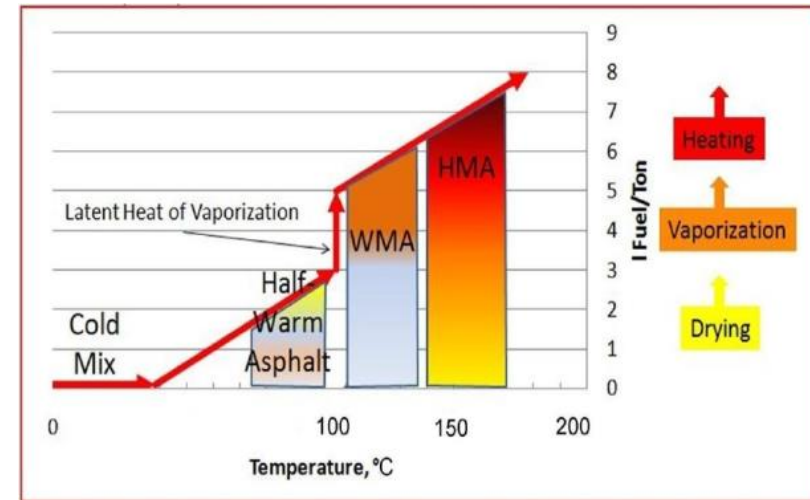
2. EMULSION BASED SYSTEMS

- Reduce emissions of GHG and energy consumption
- Maintenance techniques
 - Surface treatments
 - Cold mixes
 - Recycling: in place and in plant



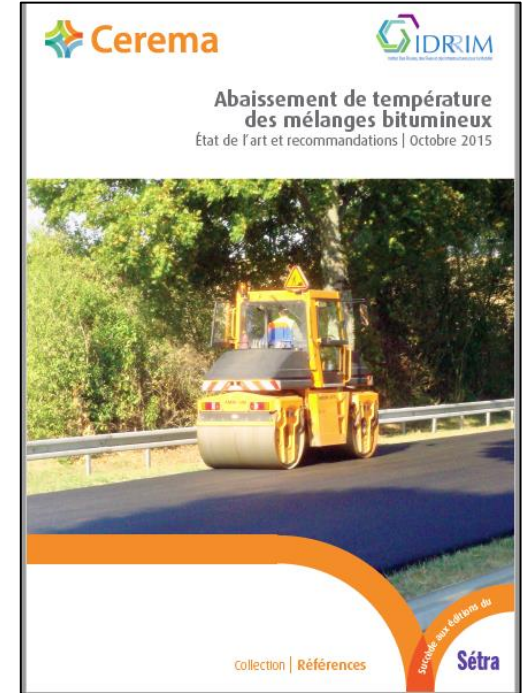
4. WARM MIX

- Asphalt mix to be produced, placed and compacted at 20 – 50°C lower than typical Hot Mix Asphalt
- Performances equivalent or higher than conventional Hot Mix Asphalt



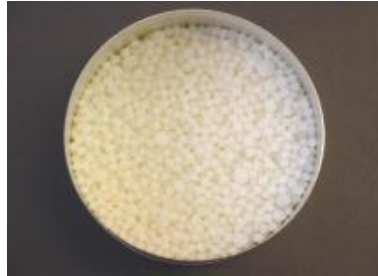
4. WARM MIX

- Reduce emissions of GHG and energy consumption
- Benefits
 - Better workability, extending the construction season and earlier opening of the road
 - Reduced potential for exposure to fumes and odors and a cooler working environment
 - Savings thanks to lower fuel consumption



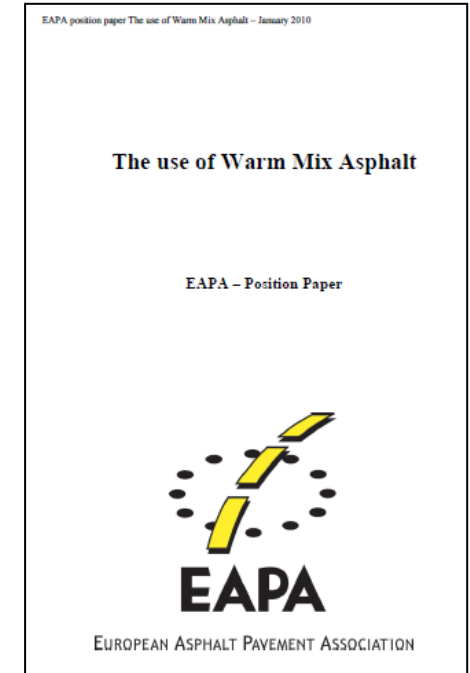
4. WARM MIX

- 3 main technologies
 - Foaming process : Addition of water that foams when in contact with the hot asphalt
 - Organic wax additive : Pre-blended or injected in bitumen to reduce viscosity
 - Chemical Surfactant: Liquid injected in line to improve workability



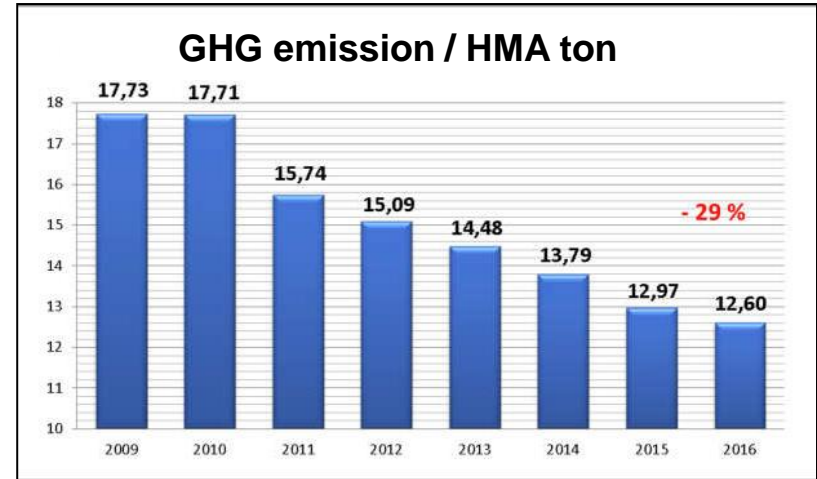
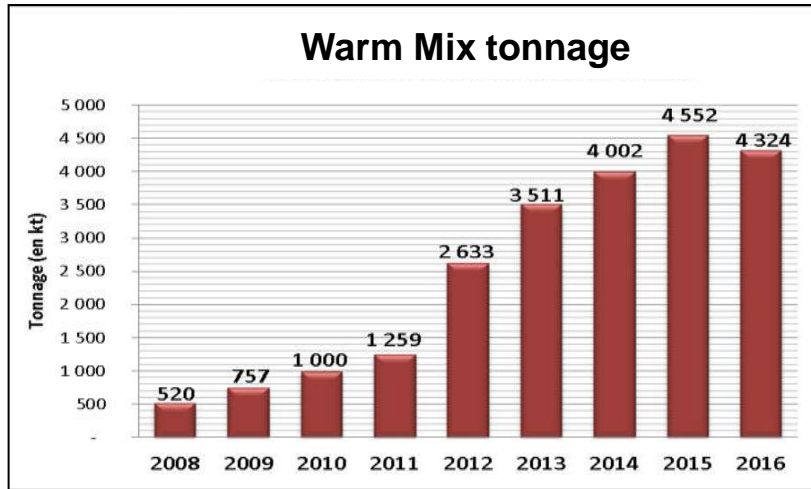
4. WARM MIX

- Efficient processes
- First experimentation in Europe late 1990's (Germany, Norway, France)
- Used on large scale since mid 2000's in Europe and North America



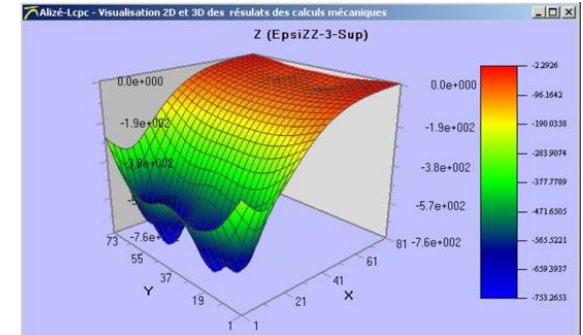
4. WARM MIX

➤ Some figures in France



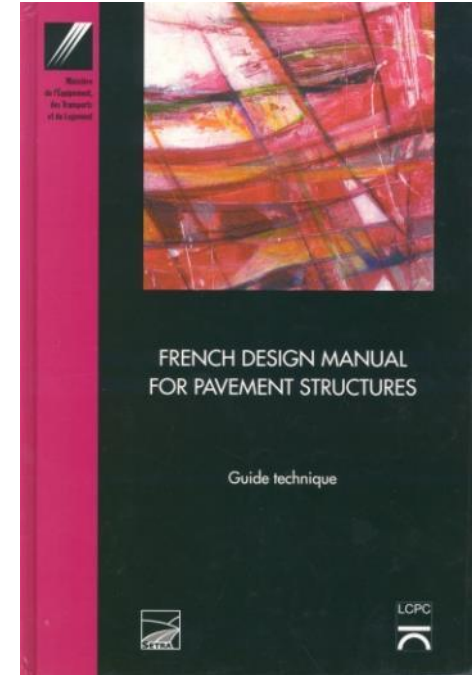
5. PAVEMENT DESIGN OPTIMIZATION

- Preserving non renewable resources
- Use of appropriate structural design method according to:
 - Effective load
 - Climatic condition
- Use of High Performances materials
 - For base course
 - For wearing course



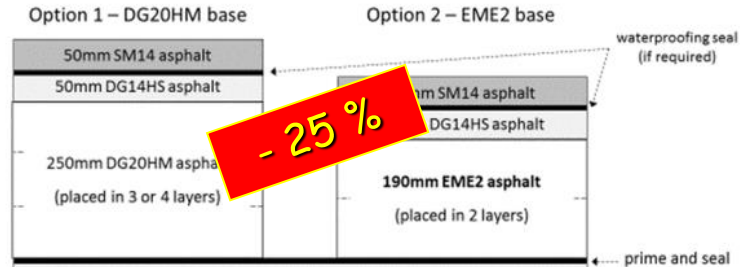
5. PAVEMENT DESIGN OPTIMIZATION

- Rational Pavement Design Method which take into consideration
 - The Accumulated Traffic (ESAL) and real axle load
 - The real performances of ALL layers especially
 - The Stiffness Modulus
 - The Fatigue Resistance
 - The climatic conditions, i.e. Equivalent Temperature



5. PAVEMENT DESIGN OPTIMIZATION

- High Modulus Asphalt for Base Course and Reinforcement
 - High Fatigue resistance and complex modulus
 - Used in France since 30 years and in Europe
 - Optimizing thickness according to pavement design



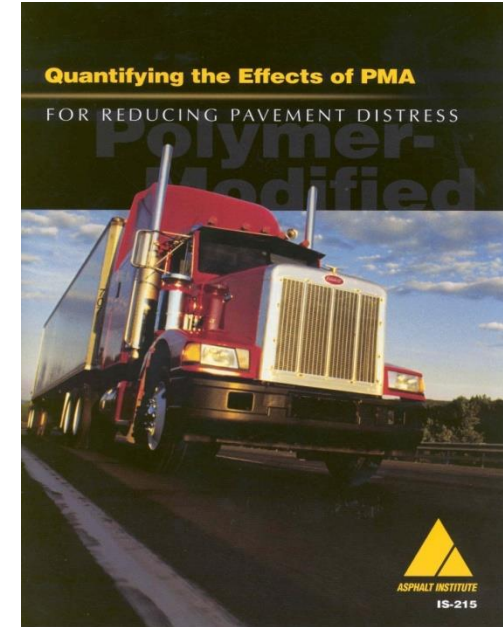
5. PAVEMENT DESIGN OPTIMIZATION

- Very Thin to thin overlay Asphalt for Wearing course
 - Typically 25 to 35 mm
 - Need high cohesive binder
 - High skid resistance
 - High rutting resistance
 - Low rolling noise
- Perfect product for maintenance works and overlay



5. PAVEMENT DESIGN OPTIMIZATION

- Benefits for SBS Polymer Modified Binder
 - Able to resist to (very) cold and (very) hot climatic conditions
 - Improve rutting resistance (by 40 %)
- Increase of service life for pavement with PMB based mix
 - From 10 to 20 years
 - Less routine maintenance to schedule



CONCLUSIONS

- The European market is a mature market
- Maintenance techniques have been developed and used for years
- There is no single solution: optimization is needed
- Bitumen emulsions have their share of the market
- The industry has gained a high expertise and is ready to share it

