JRS Fibers for Life.

Durable Pavements for Urban Environments

SMA (ABS) – Sustainable Multipurpose Asphalt

Swedish Asphalt Days 2024

Current Traffic Situation

The Challenges of Planning the Modern Road Network

- Increasing traffic volume
- Higher axle loads
- Noise reduction
- Use of recyclable materials
- Safety aspects
- Durability
- Drivers‘ comfort
- Need for economical technologies
- Budget constraints

Budget Constraints

- Stagnating or even decreasing funding for maintancance of existing road network
- Urgently needed maintenance activities are postponed
- Need for making the most out of the existing budget – stretch the $$$$

➡ Build it cheap

➡ **BUILD IT CHEAP AND YOU BUILD IT TWICE!**

Budget Constraints

A trend away from ABS towards ABT because

ABS is more expensive than ABT mixes

Valid for the initial costs only!

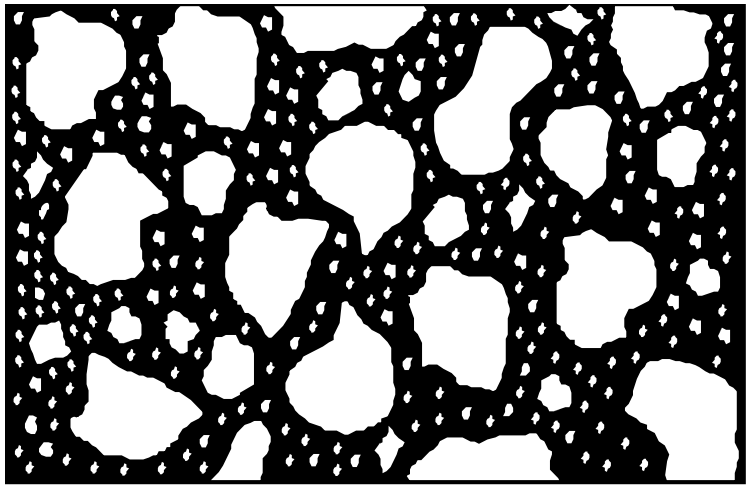
The Concepts

ABT

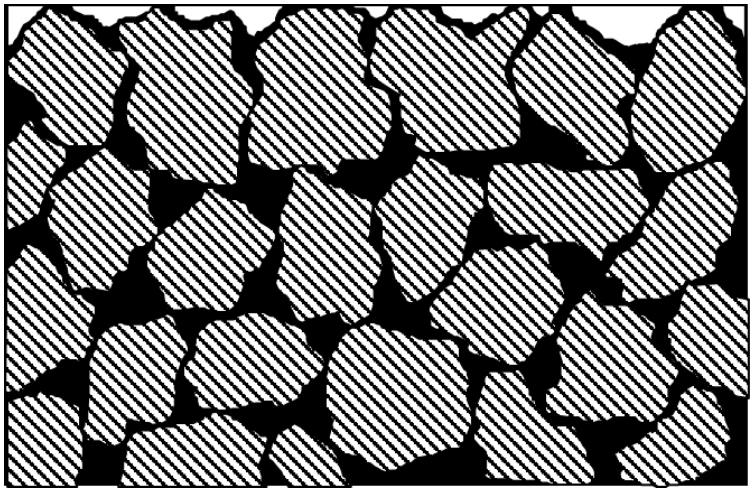
ABS

The Concepts

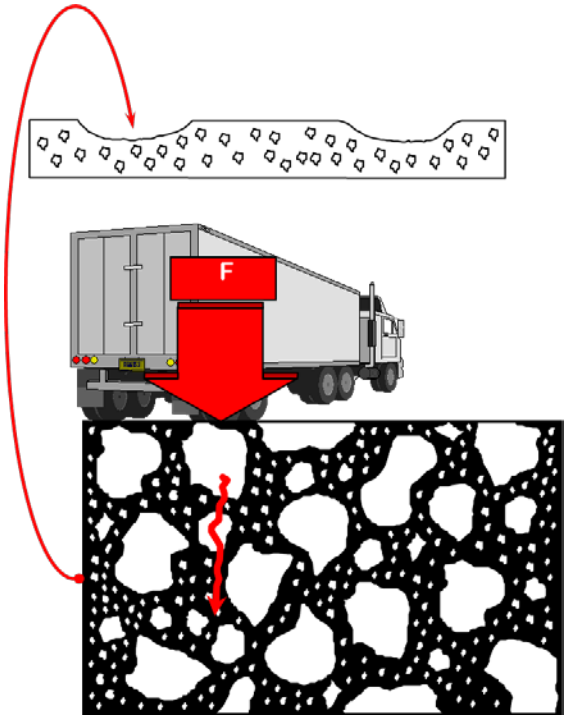
Dense Graded Mix
ABT



Gap Graded Mix
ABS



Stability in Dense Graded Asphalt Mixes



Better performance by:

- **The Mortar**

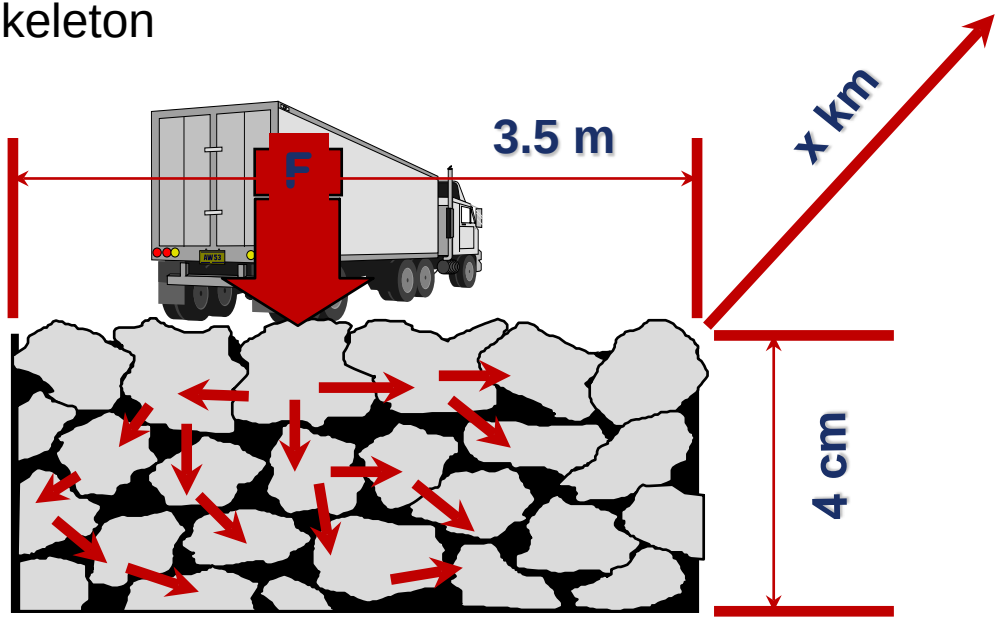
  Dryer mortar - higher stability

- **The Aggregate Composition**

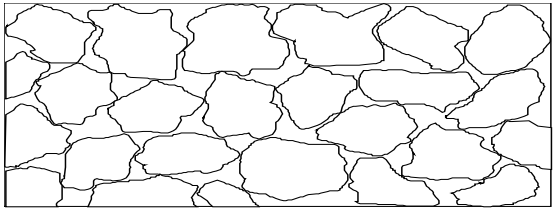
  Increase the amount in the biggest fraction - higher stability

ABS – The Concept

The stability in an ABS mix is obtained through the internal friction in the self-suporting stone skeleton



ABS – The Concept

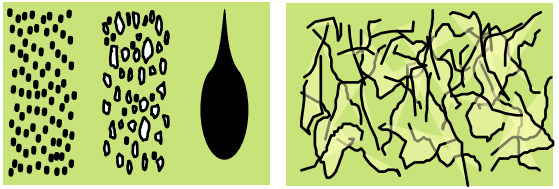


Stones

ABS

Sand / Filler / Bitumen

Fibers



Mastic

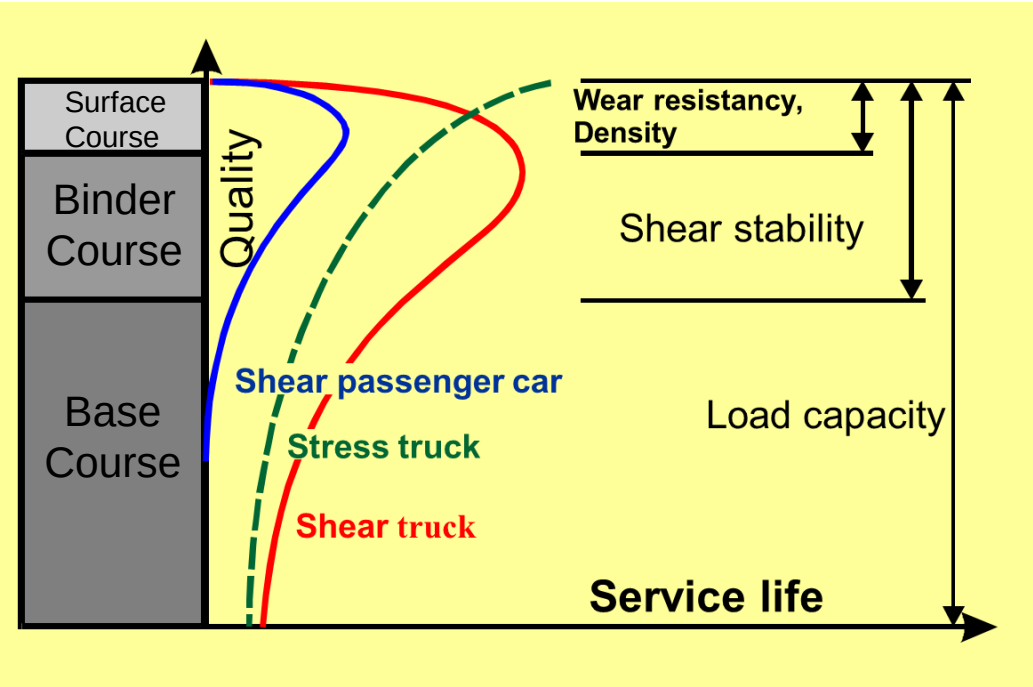
ABS – The Concept

- A self-supporting stone skeleton of crushed high quality coarse aggregates
- A binder rich mastic mortar
- Thicker binder films covering the aggregates
  - Reduced aging sensitivety – extended service life
- Low air voids, which make the mix practically impermeable
  - Less surface area for oxidation/aging – extended service life
- An efficient stabilization of the mastic in order to prevent its segregation from the coarse particles

ABS – The Benefits

- High resistance to permanent deformation
- Excellent skid resistance
- Reduced waterspray
- Elimination of aquaplaning
- Increased visibility of road markings
- Incorporation of reclaimed asphalt pavement (RAP) is possible
- Superior durability
- Low noise level
- Decreased life-time-costs

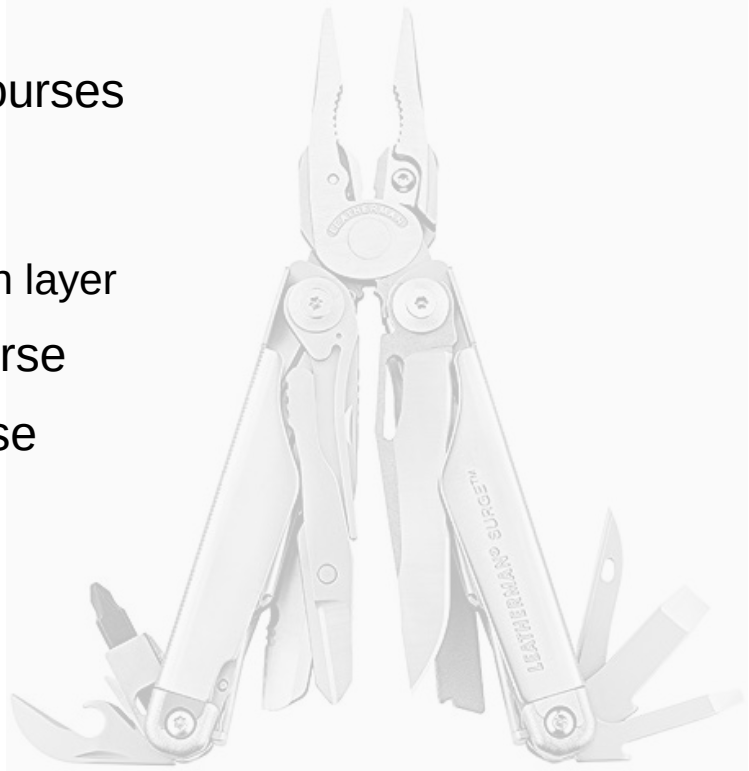
Load Distribution on a Pavement



ABS – A Multi Tool

ABS – A Multi Tool

- ABS wearing courses
  - ABS
  - ABS plus
  - ABS (ultra) thin layer
- ABS binder course
- ABS base course
- ABT Duopave
- (PA)



ABS – A Multi Tool

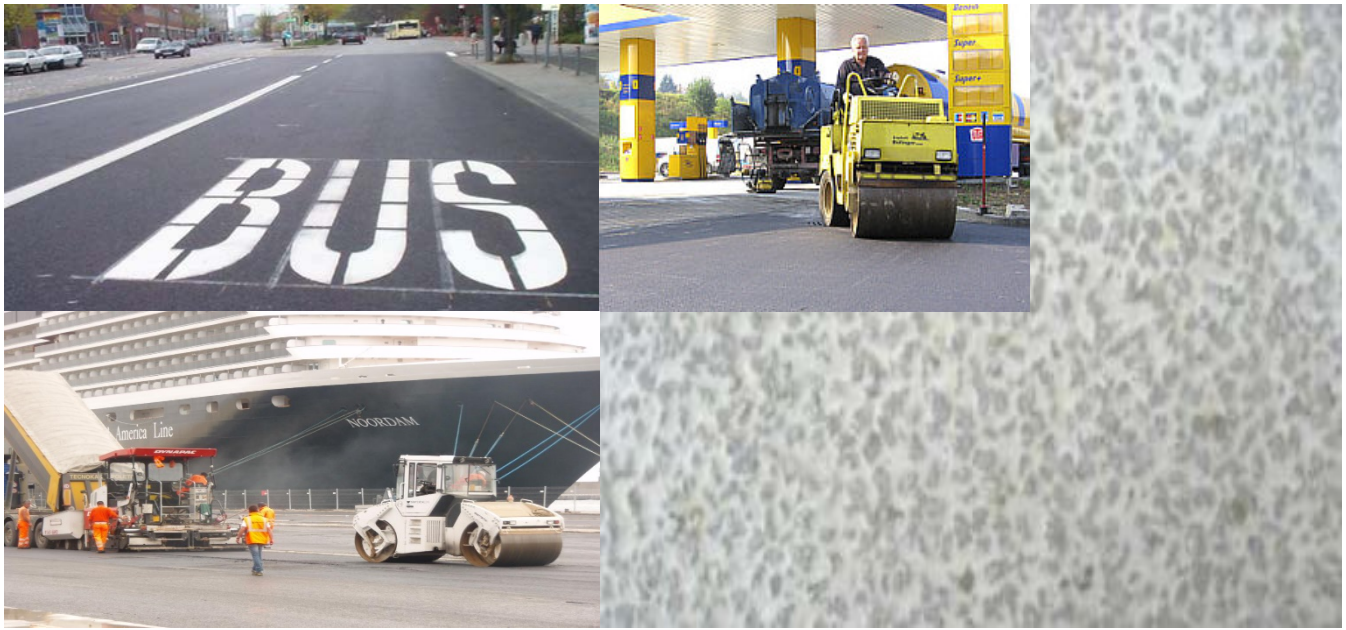
ABS surface course

Noise reducing ABS plus

ABS binder course

„Standard“ Road Applications

Bus Lanes & Industrial Areas



Container Terminal Bremerhaven

A9/A99 Allianz Arena, Munich

Frankfurt Airport – 3 x Runways

Buckingham Palace - London

Formula 1 Racetrack Hermanos Rodriguez – México

Urban Road Network

Urban Road Network – The Challenges

- Limited funding
- Noise reducing surfaces
- Long durability
- Minimize traffic disturbance

Urban Road Network – The Solution

ABS 8

ABS 5

The Solution – ABS Thin Layers

- Limited Funding
  - Paving thickness 1,5 to 3,0 cm
  - With one ton of asphalt mix up to 25 m² of surface course can be paved
  - Initial costs similar to ABT mixes

The Solution – ABS Thin Layers

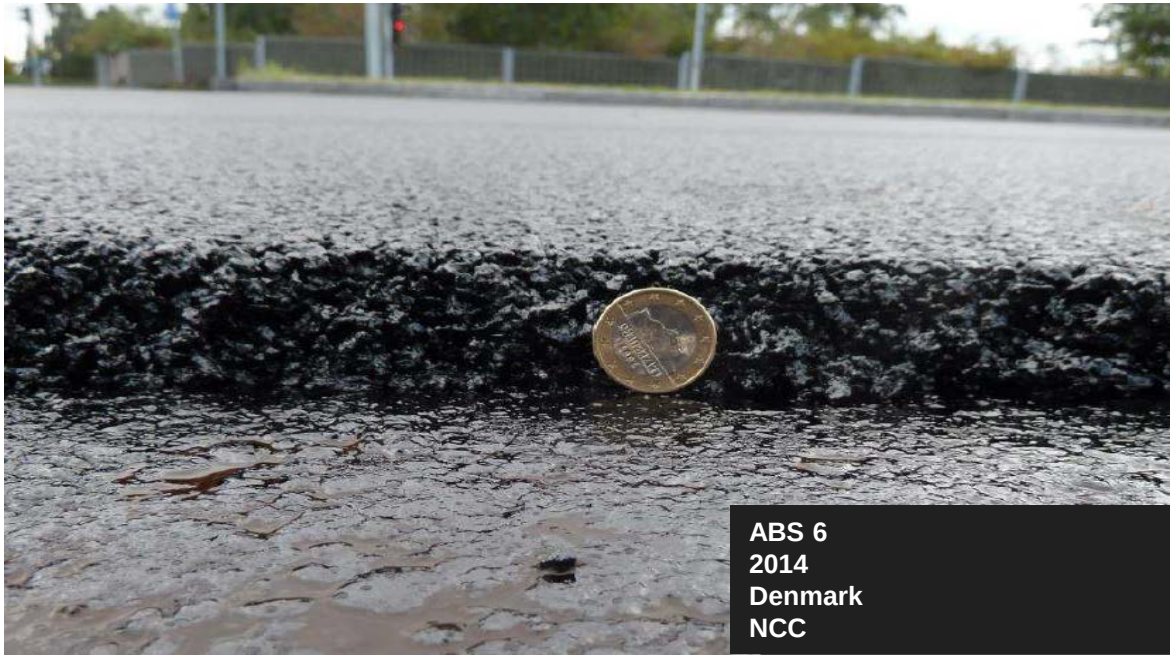
- Noise reducing surfaces
  - Coarse texture „captures“ rolling noise
  - Reduction of up tp 5 dB(A)

- Extended durability
  - No to minor rutting due to thin layer. Burden is carried by the binder/base layers
  - Good relaxation properties due to high binder content – no cracking
  - Reduced aging due to thick binder films covering the aggregates

The Solution – ABS Thin Layers

- Minimize traffic disturbance
  - Faster paving – even possible during night
  - Compaction-friendly asphalt mix
  - Ease of manual paving
  - Earlier opening to traffic due to faster cooling, hence reduced down time

Projects



ABS 6
2014
Denmark
NCC

Projects

Berlin / Germany - ABS 8; Year of construction: 2012

Projects

Hamburg / Germany - ABS 8

Projects

Hannover / Germany - ABS 5

Projects

Munich / Germany - ABS 5

Projects

Denmark - ABS 6

Projects

Heerenveen / Netherlands - ABS 5

Projects

Olympic Village – Rio de Janeiro – Olympic Games 2016

Economical Situation

A trend away from ABS towards ABT because

ABS is more expensive than ABT mixes

Valid for the initial costs only!

Economical Situation

Life Cycle Cost Analysis

	ABS	ABT
Initial costs	Higher	Lower
Maintenance	Late	Early
Rehabilitation	Late	Early
User delay costs	Lower	Higher
Life-time	Higher	Lower
Life-time-costs	Lower	Higher

Economical Benefits - Durability

Secondary roads			
Type	15% Lowel level	European average	85% Higher level
ABT	10	15	20
AC-TL	10	15	20
AC-VTL	10	12	14
2L-PA [1])	10	11	12
ABS	16	20	25
HRA	20	25	30
Mastic-A	18	24	30
Soft-A	8	12	25

Source: EAPA

Economical /Ecological Benefits – The Proof of Life

Two test sections

- First in 2002, 1.500 m long, ABS with pen bitumen; reference mix ABT with pen bitumen
- Second in 2013, 1000 m long, ABS with PMB; reference mix ABT with PmB

Section I

Description

- Highway: Autopista central
- Year: 2002 (milled and repaved in 2021)
- Stretch: from km 17+500 to km 16+000
- Asphalt mix:
  - 5 cm ABS 11
  - Reference mix: 6 cm ABT 11
- Traffic: 12,000 heavy vehicles/day

Economical Aspects of Section I: Maintenance

HDM4 vs. Real data (section I)

[Highway Design and Maintenance Standards Model – PIARC]

Reference Mix: ABT 11	VOLUME OF WORK																			
Actividades	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Crack sealing [ml]				240				180		340			130		410			130		380	1.810
Milling & repaving [m²]						2.265			906		3.172			906						453	7.702
Repaving [m²]																9.062					9.062

ABS 11	VOLUME OF WORK																				
Actividades	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Crack sealing [ml]					92		184			290	310	156		210				250			1.492
Milling & repaving [m²]															703						703
Repaving [m²]																			9.062		9.062

Crack sealing: -18 %; Milling and repaving: -91%!!!

Economical Aspects of Section I: One Full Cycle

Initial construction plus maintenance

HDM4 vs. Real data (segment I)

[Highway Design and Maintenance Standards Model – PIARC]

Tabla 70. Coste de construcción y conservación de tramo en estudio (9.000 m^2)

Tipo Mezcla Rodadura	Total construcción,	Total	Total, USD
6 cm ABT 11	86.798	223.476	310.274
5 cm ABS 11	113.399	82.057	195.456
Diferencia %	+31%	-63%	-37%

Initial construction | Maintenance | Total

Section II

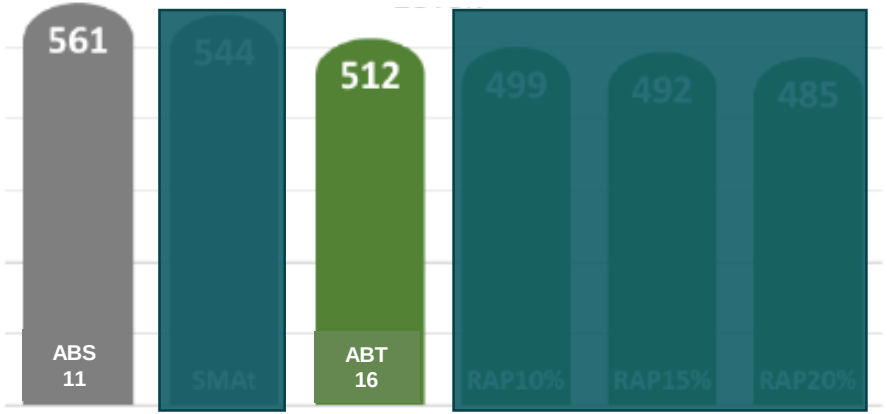
Description

- Highway: Autopista central
- Year: 2013
- Stretch: from km 1+600 to km 0+600
- Asphalt mix:
  - 3 cm ABS 11; bitumen content 6,8 % (PmB)
  - Reference mix: 5 cm ABT 16; bitumen content 5,3 %
- Traffic: 12.000 heavy vehicles/day

Ecological Aspects - Sustainability

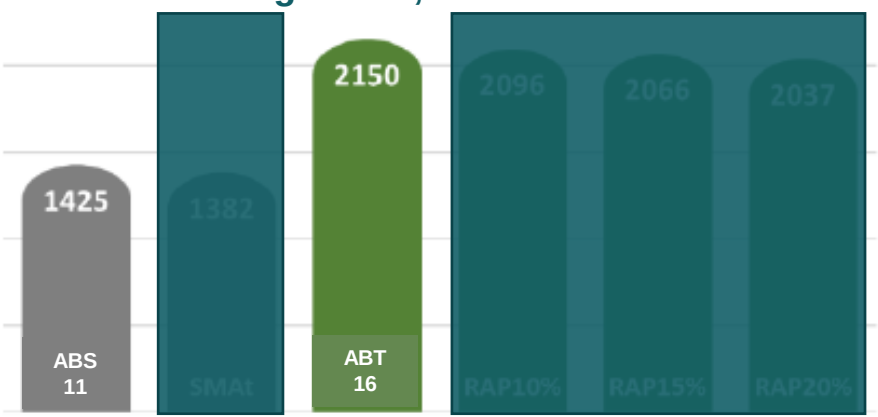
Assessment of the environmental impact with Eurovia's GAIA II software

Green House Gas Emissions (kg CO_2eq)
Production of 10 t



Production: +10 %

Green House Gas Emissions (kg CO_2eq)
Paving 100 m; 3 cm vs. 5 cm



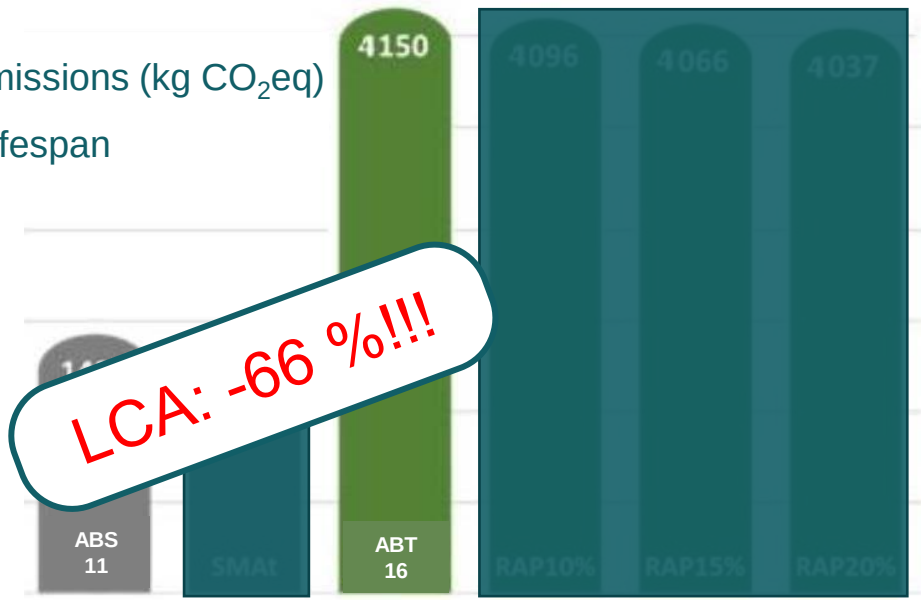
Paving: -34 %!!!

Ecological Aspects - Sustainability

Assessment of the full life cycle environmental impact with Eurovia's GAIA software

Green House Gases Emissions (kg CO_2eq)

3 cm vs. 5 cm; double lifespan



Conclusions

- ABS mixes offer great savings
- Savings in terms of money over the pavement's service life
- Incorporation of reclaimed asphalt pavement (RAP) is possible
- ABS represents the most sustainable option for asphalt paving

ABS - The Multi Tool

Durable – Sustainable –Environmentally Friendly

JRS Fibers for Life.

Thanks a lot for your kind attention