



Hrvatsko asfaltno društvo



Croatian asphalt association

Praksa gospodarenja i održavanja cesta u Francuskoj

Pavement Management and Maintenance Practices in France

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**Međunarodni seminar ASFALJNI KOLNICI 2016
International seminar ASPHALT PAVEMENTS 2016
Opatija, 06.–07. 04. 2016.**

0. CONTENT

1. Introduction: the 2 main keys of pavement performance
2. Importance of road asset management
3. A well known process!
4. Tools and concepts to monitor and evaluate the roads
5. Adapted road techniques for maintenance
6. Brake the barriers to progress
7. Conclusion

1. INTRODUCTION: THE 2 MAIN KEYS OF PAVEMENT PERFORMANCE

Back to basics (with up-to-date technologies & tools):
the **best innovation** so far...

The right technique, at
the right time



Quality & performance
of the works



2. IMPORTANCE OF ROAD ASSET MANAGEMENT

- Road is a **social & industrial** hot topic
- **Back bone of the economy** still today
- Road **safety** issues



-1€ on maintenance



+ 2 to 3€ on exploitation costs



2. IMPORTANCE OF ROAD ASSET MANAGEMENT

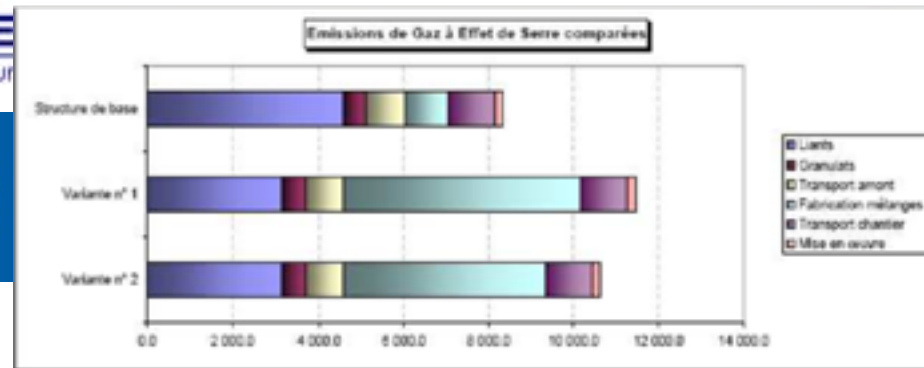
- Solutions must also be found to do **better with lower money,**



- Environment and social **requirements** are heavier and heavier.



Green house gas effect



2. IMPORTANCE OF ROAD ASSET MANAGEMENT

California governor seeks money for fixing roads as gas tax value plunges



POLITIK MATERIALSTÄRkung

So schlecht ist der Zustand der deutschen Straßen



News ECONOMY / INFRASTRUCTURE

Survey reveals potholes in Finnish road maintenance



Photo: ZIMBABWE/REUTERS

Zimbabwe motorists endure gaping potholes



Carreteras llenas de trancones por falta de inversión






2. IMPORTANCE OF ROAD ASSET MANAGEMENT

- French road **network**:

1 M km

National roads & highways	20 000 km	1,9%
Regional & county roads	378 000 km	36,8%
Municipality roads	630 000 km	61,3%

Total	1 028 000	100%
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- Replacement cost
(& depreciation)

2 000 Md €

**Maintenance of this huge
asset is a key issue !**

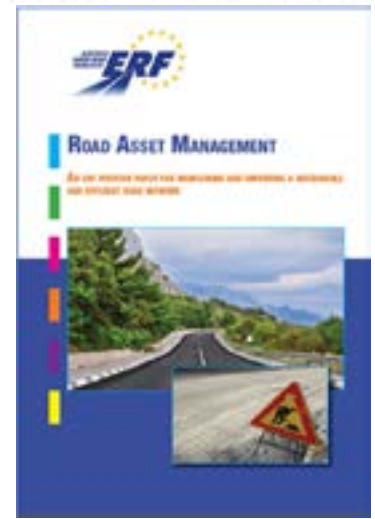




3. A WELL KNOWN PROCESS!

PPRS Paris 2015 - European Manifesto: Need For Road Maintenance

Lack of knowledge that instruments are available

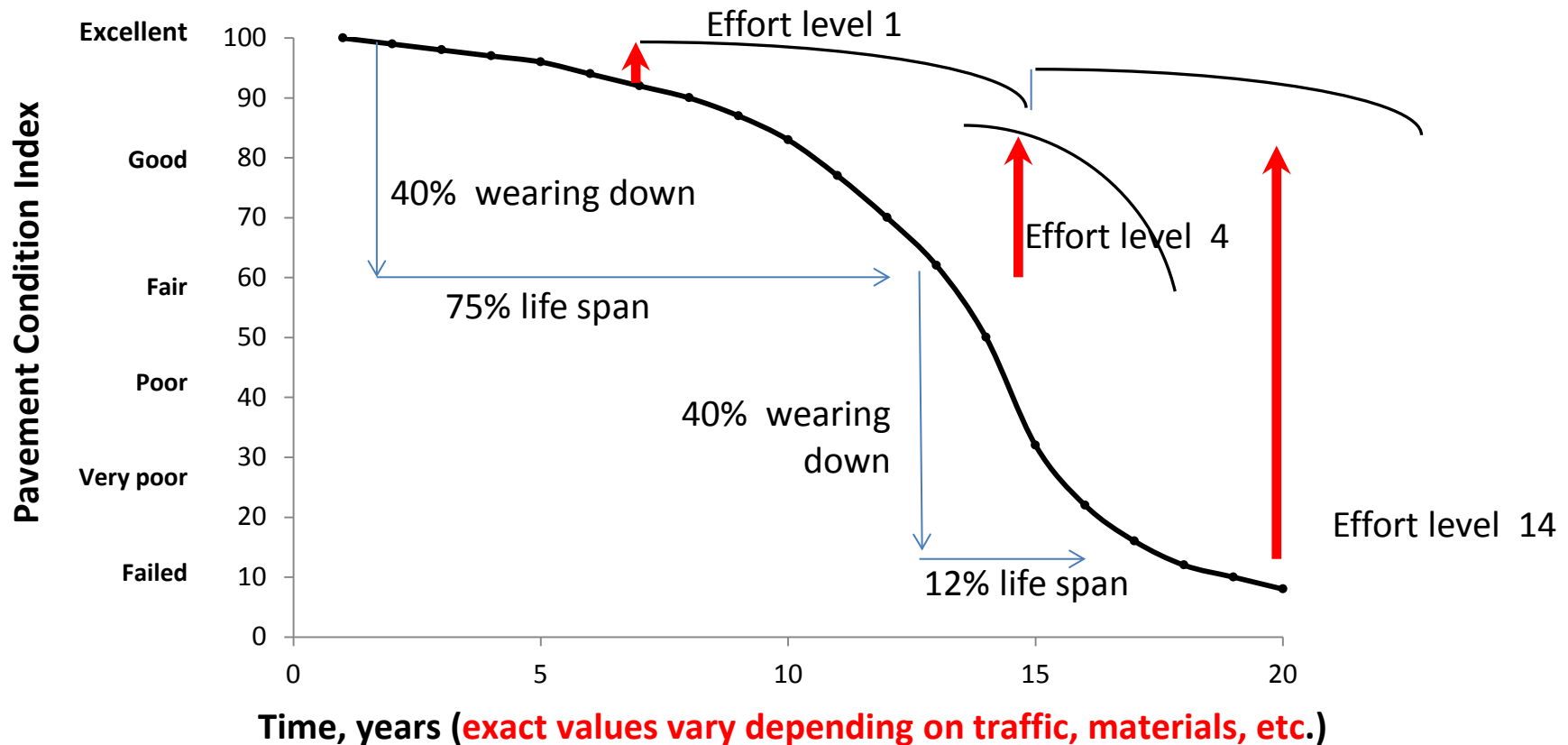


⇒ No need to develop new concepts
 ⇒ transfer of information and raising awareness

<http://www.erf.be/images/Road Asset Management A Manifesto to keep Europe moving.pdf>



3. A WELL KNOWN PROCESS!



“well maintained road deteriorates less quick than ones which are not ...”

“Regularly investing in maintenance saves money...”

3. A WELL KNOWN PROCESS!

- Lots of common sense



- ❖ Loads & traffic adapted to the road
- ❖ Adapted road technique to the need

- Do not forget the old practices



- ❖ Drainage (water & frost/defrost effect),
- ❖ Cleaning & debushing,
- ❖ Cracks filling, potholes...



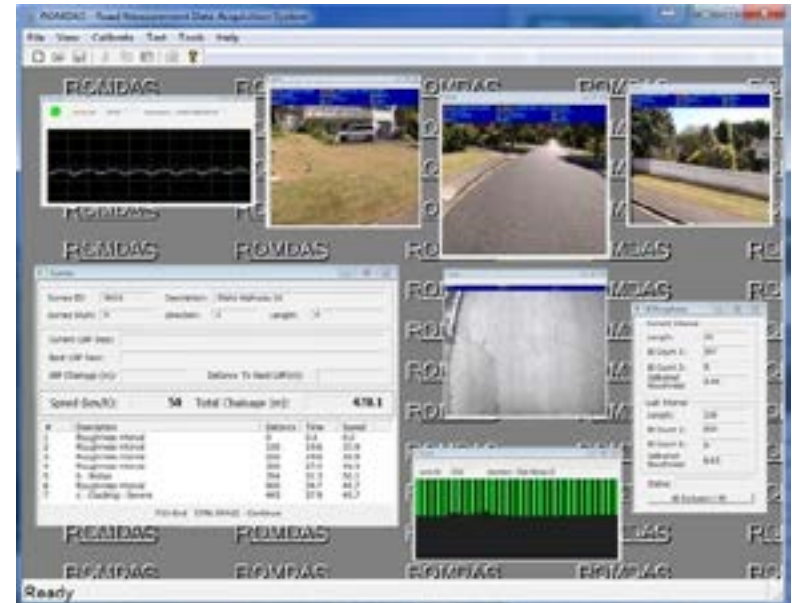
The road forward

4. TOOLS AND CONCEPTS TO MONITOR AND EVALUATE THE ROADS PAVEMENTS

1 | KNOW INFRASTRUCTURE ASSETS & ITS STATUS



PAVEMENT ASSESMENT



http://www.irfnet.eu/images/Road-Asset-Management-for_web_site.pdf

4. TOOLS AND CONCEPTS TO MONITOR AND EVALUATE THE ROADS PAVEMENTS

2 | DETERMINE THE FINANCIAL APPRAISAL OF INFRASTRUCTURE ASSETS



Remise à niveau - Travaux à réaliser										
N° de tronçon	N° de voie	Surface	Solution de chaussée	Type de travaux	Prix des travaux de chaussée	Solution de rive gauche	Prix de rive gauche	Solution de rive droite	Prix de rive droite	Coût total
1	vc101	864.00	rechargement	BB 120kg	52704	pas de travaux	0	pas de travaux	0	52704
2	vc106	450.00	rechargement	BB 120kg	27450	pas de travaux	0	pas de travaux	0	27450
3	vc106	984.00	rechargement	BB 120kg+bc	60024	pas de travaux	0	pas de travaux	0	60024
4	vc1	770.00	reprofilage	ECF	23100	renfort de rive	1250	renfort de rive	1250	25600
5	vc1	170.00	reprofilage	BB 50kg	6205	pas de travaux	0	pas de travaux	0	6205
6	vc1	215.00	reprofilage	BB 50kg	7847.5	pas de travaux	0	pas de travaux	0	7847.5
7	vc109	405.00	imperméabilisation	enduit bicouche	6075	pas de travaux	0	pas de travaux	0	6075
8	vc3	816.00	TP+imper	BBTM	29560	renfort de rive	1750	pas de travaux	0	30310
9	vc3	1 518.00	rechargement	GE+bicouche	83490	pas de travaux	0	pas de travaux	0	83490
10	vc3	1 925.00	rechargement	BB 120kg+bc	117425	pas de travaux	0	pas de travaux	0	117425
11	vc104	2 856.00	TP+imper	scellement+bc	71400	pas de travaux	0	pas de travaux	0	71400
12	vc107	460.00	reprofilage	BB 50kg	16790	renfort de rive	3750	pas de travaux	0	20540
13	vc107	345.00	reprofilage	BB 50kg	12592.5	renfort de rive	3825	pas de travaux	0	16417.5
14	vc108	958.00	reprofilage	ECF	16740	pas de travaux	0	pas de travaux	0	16740
15	vc2	1 260.00	pas de travaux		0	pas de travaux	0	pas de travaux	0	0
16	vc2	5 890.00	pas de travaux		0	défilage	1500	pas de travaux	0	1500
17	vc6	1 230.00	pas de travaux		0	pas de travaux	0	pas de travaux	0	0
18	vc6	300.00	imperméabilisation	enduit bicouche	4500	pas de travaux	0	pas de travaux	0	4500
19	vc6	190.00	creation	GNT	11210	pas de travaux	0	pas de travaux	0	11210
20	vc103	750.00	imperméabilisation	BBTM	18750	pas de travaux	0	pas de travaux	0	18750
21	vc103	450.00	reprofilage	BB 50kg	16425	pas de travaux	0	pas de travaux	0	16425
22	vc103	1 200.00	reprofilage	BB 50kg	43800	pas de travaux	0	pas de travaux	0	43800
23	vc103	780.00	TP+imper	BBTM	27300	pas de travaux	0	pas de travaux	0	27300
24	vc102	450.00	TP+imper	scellement+bc	11250	pas de travaux	0	pas de travaux	0	11250
25	vc102	300.00	rechargement	GE+bicouche	16500	pas de travaux	0	pas de travaux	0	16500
26	vc102	300.00	TP+imper	BBTM	10500	pas de travaux	0	pas de travaux	0	10500
27	vc102	375.00	TP+imper	BBTM	13125	pas de travaux	0	calibrage	4375	17500
28	vc102	525.00	TP+imper	BBTM	18375	pas de travaux	0	pas de travaux	0	18375
29	vc102	675.00	TP+imper	scellement+bc	16875	pas de travaux	0	calibrage	1750	18625
30	vc102	540.00	TP+imper	ECF	14580	pas de travaux	0	pas de travaux	0	14580



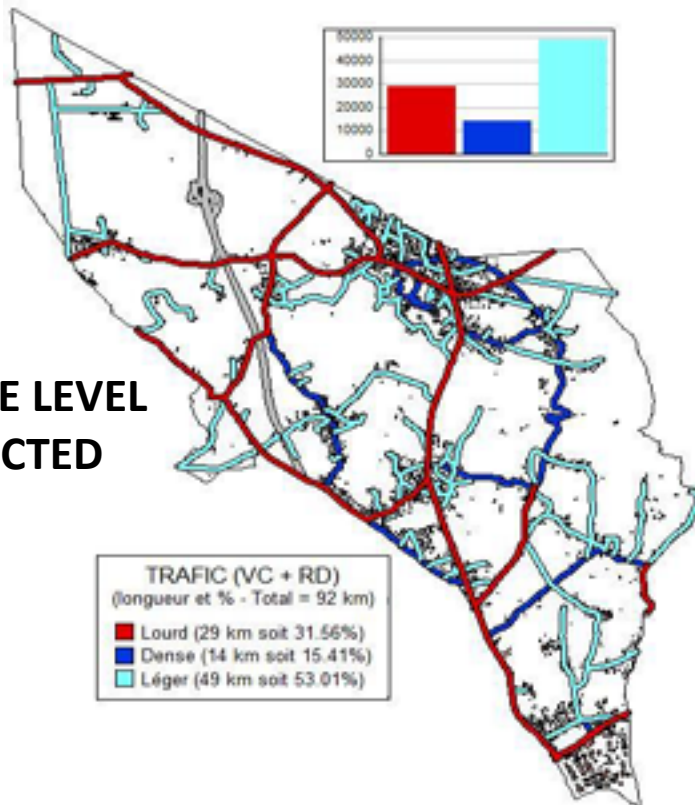
www.shutterstock.com - 185852408

4. TOOLS AND CONCEPTS TO MONITOR AND EVALUATE THE ROADS PAVEMENTS

3 | PRIORITIZE SERVICE LEVELS AND EMERGENCIES

4 | AND OPTIMIZE MAINTENANCE TECHNIQUES

SERVICE LEVEL EXPECTED



Stratégie mise étalée

177166 204332 176394 179755 178731

N° voie	N° tronçon	1998	1999	2000	2001	2002
vc101	1	X				
vc106	2			X		
vc106	3					X
vc1	4		X			
vc1	5				X	
vc1	6				X	
vc109	7				X	
vc3	8	X				
vc3	9			X		
vc3	10		X			
vc104	11	X				
vc107	12	X				
vc107	13			X		
vc108	14				X	
vc2	15					X
vc2	16					X
vc6	17					X
vc6	18			X		

Fermer

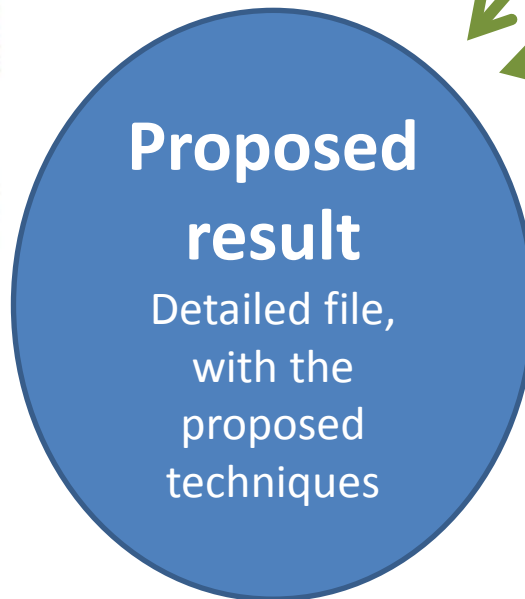




4. TOOLS AND CONCEPTS TO MONITOR AND EVALUATE THE ROADS PAVEMENTS

TRACC

Techniques Routières Adaptées au Changement Climatique
 Técnicas de Construcción de Carreteras Adaptadas al Cambio Climático
 Técnicas Rodoviárias Adaptadas às Alterações Climáticas



4 criteria:
 Environment
 Technique
 Social acceptability
 Costs

3 strategies:
 New works
 Curative maintenance
 Preventive maintenance

Project analysis
 Itinerary
 Climat
 Type of works
 Urban / rural
 Traffic
 Type of existing road
 Level of performance
 Status of the existing road (quality)



4. TOOLS AND CONCEPTS TO MONITOR AND EVALUATE THE ROADS PAVEMENTS

Example on a typical county road (data *Conseil Général Gironde – France*)

PREVENTIVE APPROACH

- Regular surface maintenance
- 2 to 3 €/m² every 5 to 7 years
- Network maintenance cost 0,40 €/m²/an,
- Constant satisfactory service level, answering to growing social demand



CURRATIVE APPROACH

- Good service 8 – 10 years
- 2 to 3 euros / m² yearly
- Heavy degradations
- Heavy rehabilitation required
- Very low service level quickly

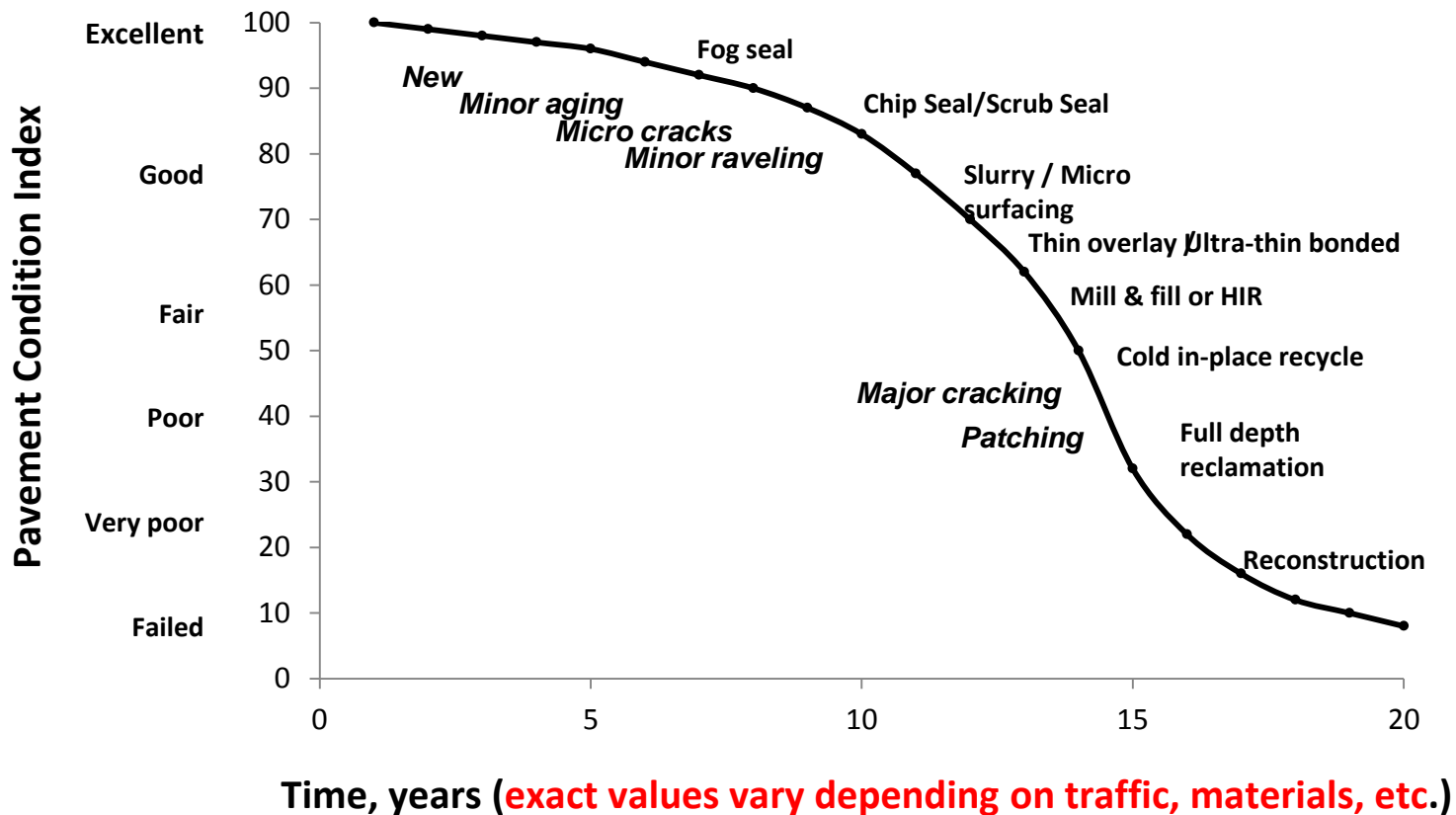


5. THE ADAPTED ROADS TECHNIQUES

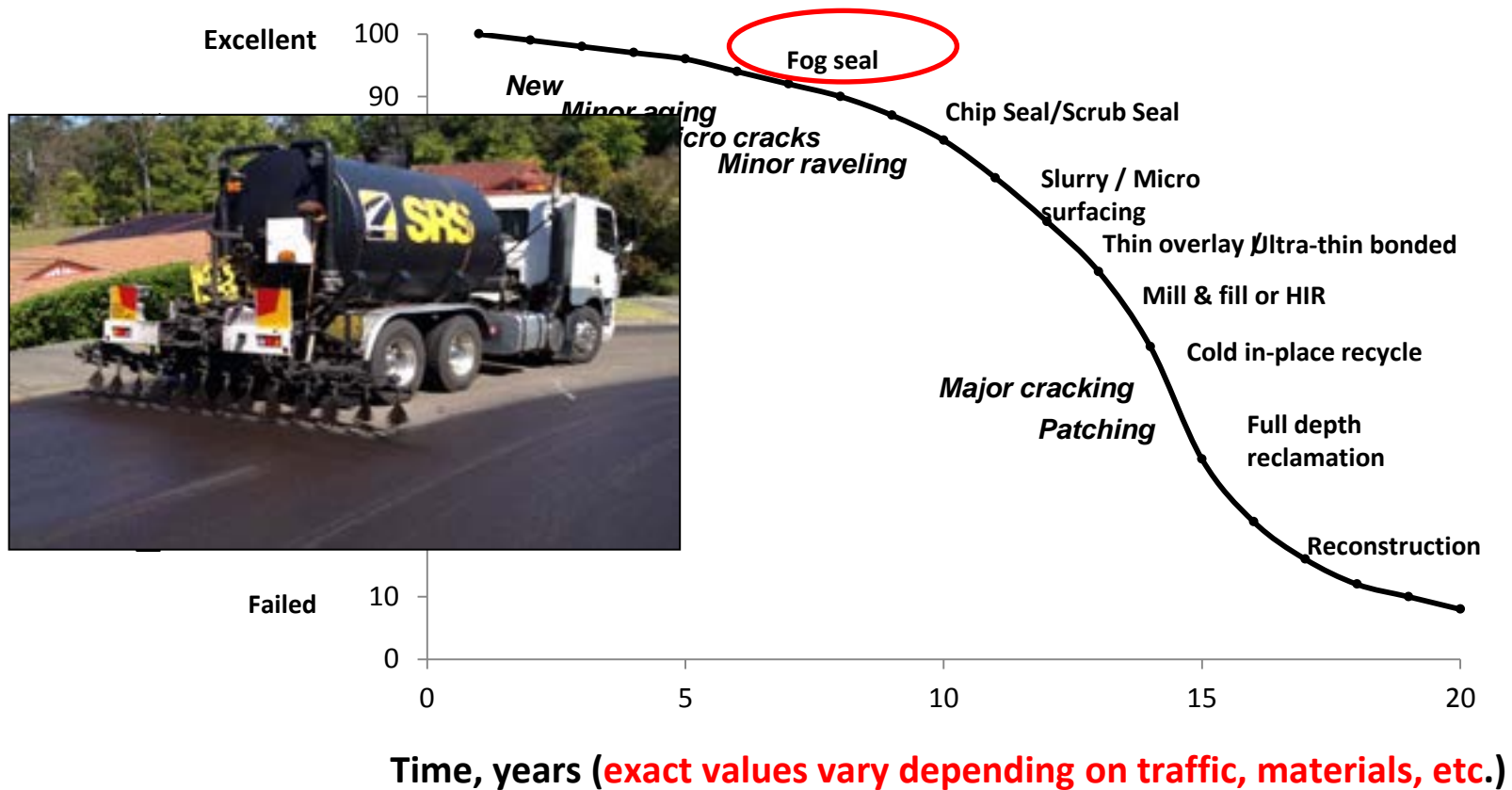
- The right technique at the right time:

... WELL DESIGNED,
WELL PERFORMED,
& WELL CONTROLLED!

“the innovation!”



5. THE ADAPTED ROADS TECHNIQUES



5. THE ADAPTED ROADS TECHNIQUES

- Rejuvenating emulsion is added to reinforce the adhesion between aggregates and binder and to improve flexibility of the asphalt pavement
- Bitumen emulsion is added, small voids, cracks and voids between the stones are filled up



5. THE ADAPTED ROADS TECHNIQUES

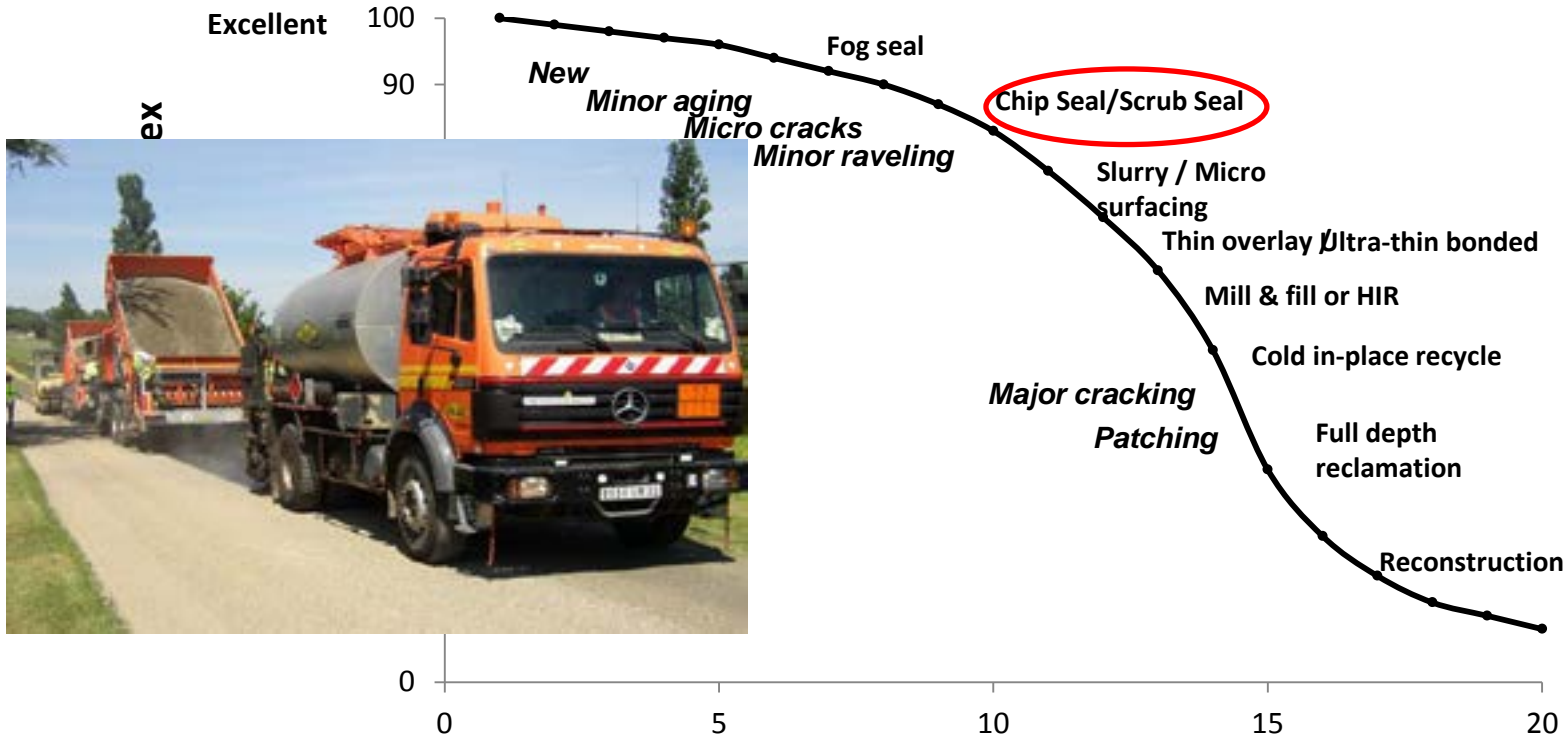
- FOG SEAL

Before

After



5. THE ADAPTED ROADS TECHNIQUES



Time, years (exact values vary depending on traffic, materials, etc.)



5. THE ADAPTED ROADS TECHNIQUES

- A “good old” technique, but totally up-to-date, and regularly improved (equipment, designs, emulsions...),
- The best “money for” value technique,
- Answering a strict design protocol & application procedures,

SURFACE DRESSING



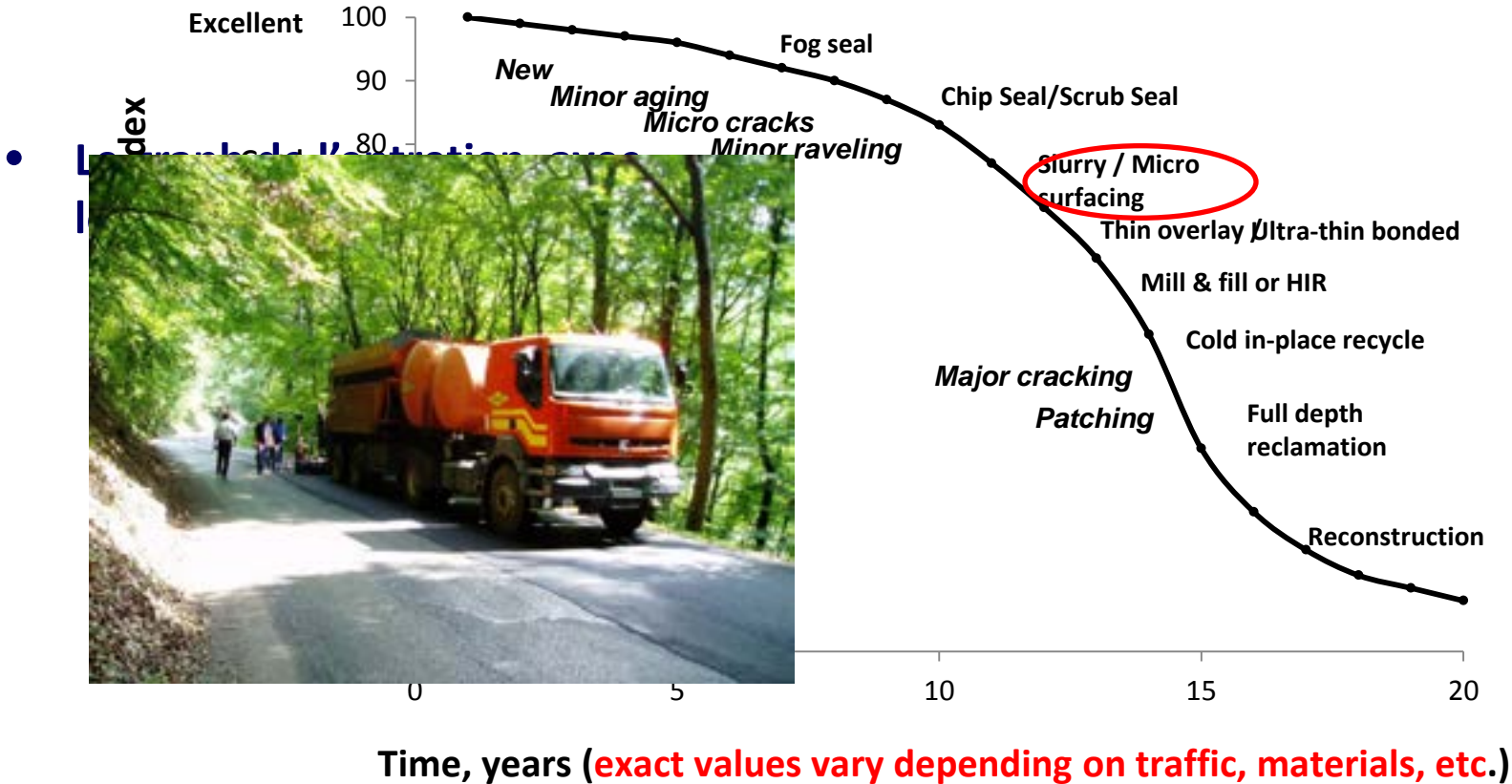
5. THE ADAPTED ROADS TECHNIQUES

- Adapted solutions for various traffic conditions & supports types,
 - ❖ Answering clear norms (EU),
 - ❖ Reinforced with fibers,
 - ❖ With PMB emulsion based,
 - ❖ Adapted aggregates grading curve
 - ❖ ...

SURFACE DRESSING



5. THE ADAPTED ROADS TECHNIQUES



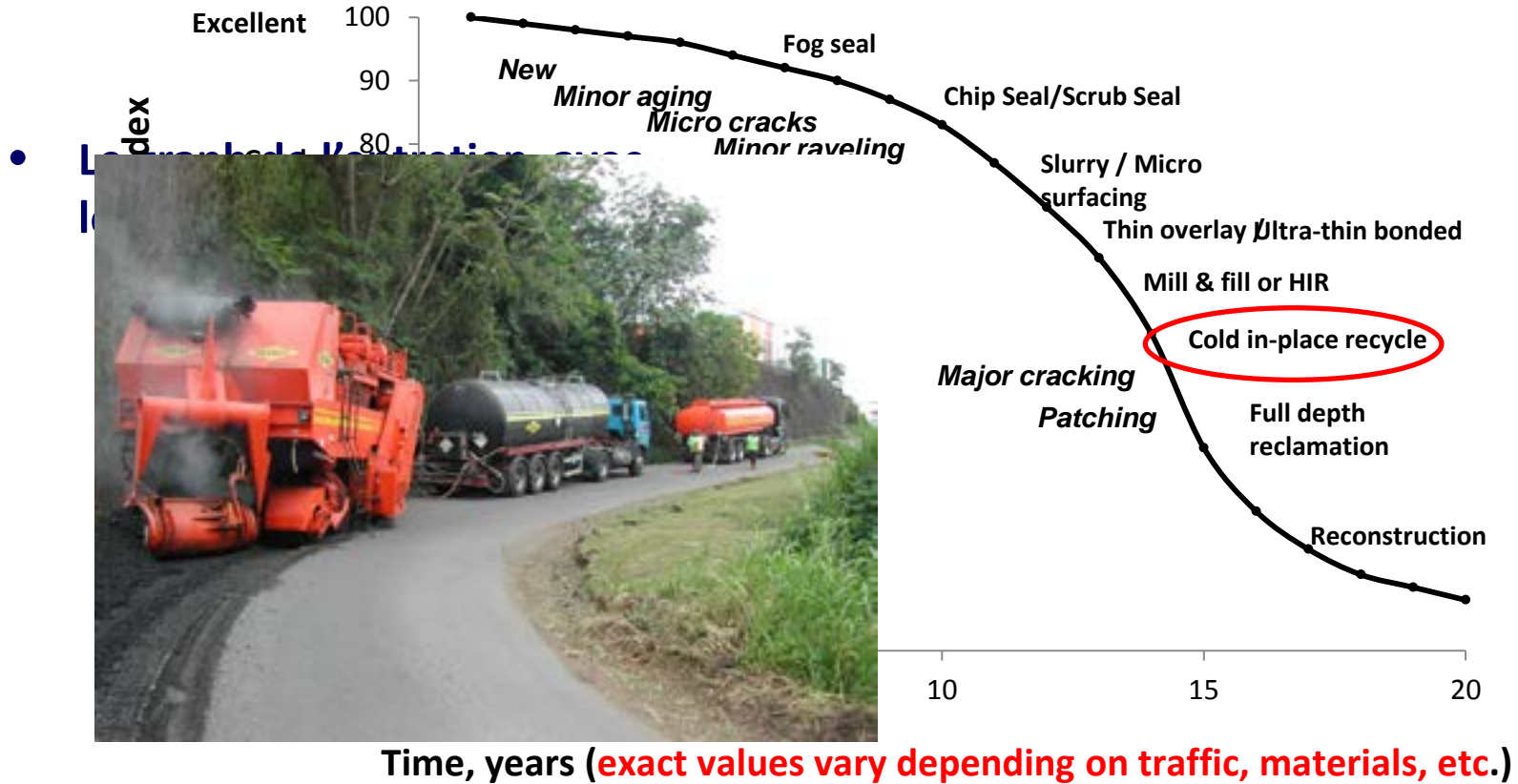
5. THE ADAPTED ROADS TECHNIQUES

- Used on roads, Highways, Runways, Urban road, Parking, Cycle paths as wearing course
- Quick installation and reopening to the traffic, Low inconvenience to road users
- Low thickness – no threshold issue, Flexible operations, No loose material
- Cold technique + very thin layer: energy savings and natural resources preservation

MICRO SURFACING



5. THE ADAPTED ROADS TECHNIQUES



5. THE ADAPTED ROADS TECHNIQUES

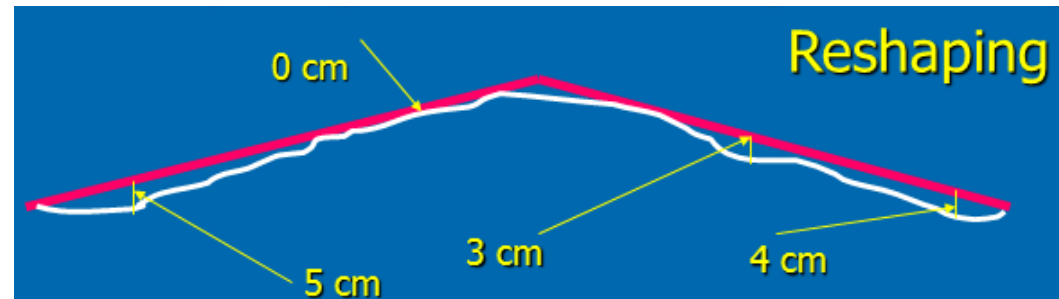
In plant cold recycling



5. THE ADAPTED ROADS TECHNIQUES

Gravel emulsion

- Cold mix,
- Asphalt levelling or base course with emulsion (from 0 up to 9cm),
- Best repair method on badly damaged roads,
- Cold product : flexibility of use, extended transport distance, possible laying with grader in one single layer,
- No traffic interruption,
- Manufacturing, transportation, & compaction: conventionnal



5. THE ADAPTED ROADS TECHNIQUES

Gravel emulsion

- Used in road reprofiling, on shoulders
- Or in reinforcement.



5. THE ADAPTED ROADS TECHNIQUES

Hydro regeneration

- Pavement roughness renewal,
- For skid resistance,
- For excess bitumen removal,
- For users' safety.



Cost: 1,3 € / m²
Extra +3 to 4 years
Before new surface dressing



5. THE ADAPTED ROADS TECHNIQUES

Cracks filling

- General & regular campaigns,
- Key phase,
- Basic technique,
- But so important.



5. THE ADAPTED ROADS TECHNIQUES

(Warm) asphalt

- Energy savings at the production,
- GHG: 15 to 20% of reduction,
- Easy to install on each HMAP,
- Good workability,
- Users, neighbors & workers' safety & comfort improvement,
- UE normed, worldwide spread technique (USA leader).



**Less CO2,
less energy,
no fume**

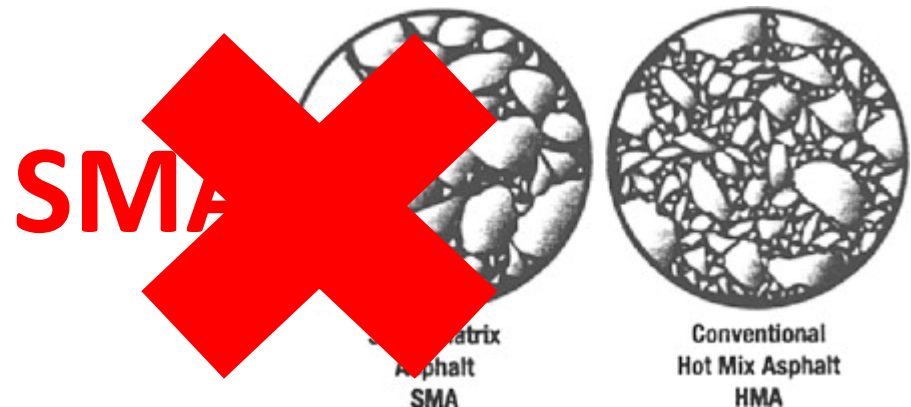
5. THE ADAPTED ROADS TECHNIQUES

Medium-to-thin layer asphalts

- Thickness 3 to 5 cm, 0/10 or 0/14,
- **5,4%** bitumen (PMB),
- Using PMB, reinforced sometimes,
- Often discontinuous formulas,
- Costs reduction,
- Good skid resistance,
- Users' comfort.

RUFLEX®

NFP 98-150, from 1992



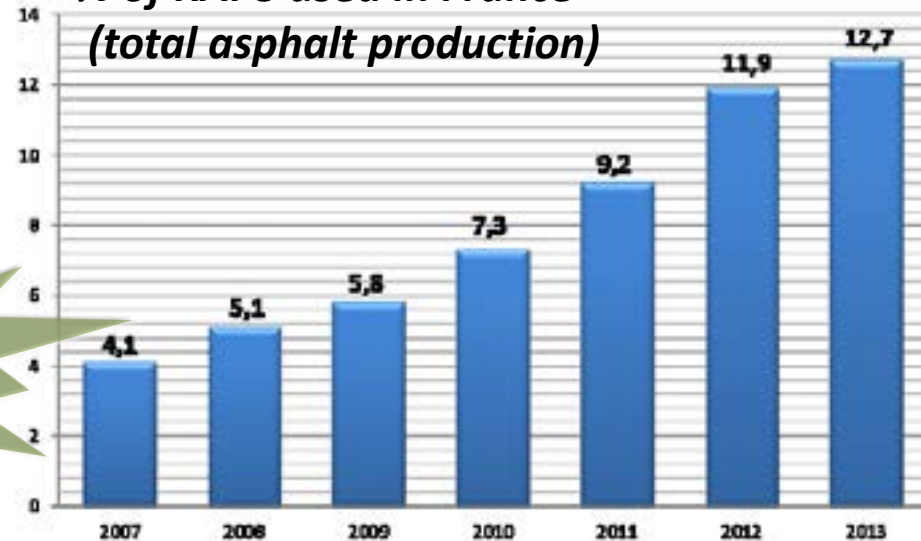
5. THE ADAPTED ROADS TECHNIQUES

Use of RAPs in asphalt

- Valorization of the existing pavement,
- Reduction of use of raw materials,
- Up to 10% allowed by UE norms without new recipe,
- Possible (with adequate study), to go up to 50%



*% of RAPS used in France
(total asphalt production)*



Savings

5. THE ADAPTED ROADS TECHNIQUES

PATA

- General maintenance,
- For potholes and localized patching works,
- Adapted emulsion,
- Totally coated mixes,
- Easy working and important productivity.



Cost: 1,3€ /m²
Years won before
road surface renewal

5. THE ADAPTED ROADS TECHNIQUES

Cold storable mixes



Compomac in France (2014):
264 000 t produced

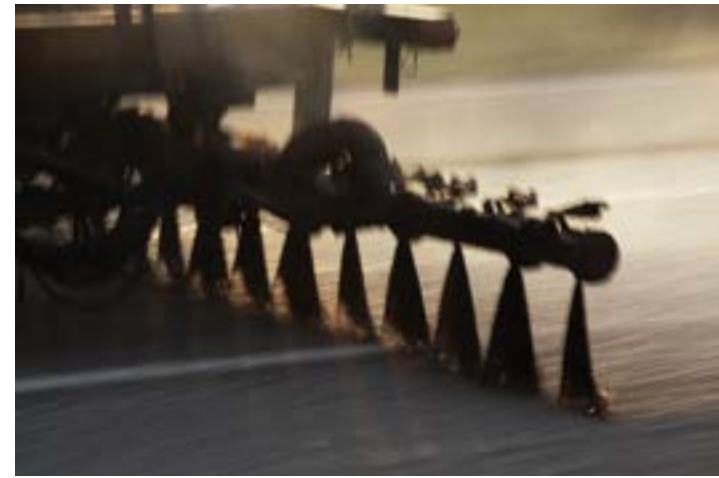
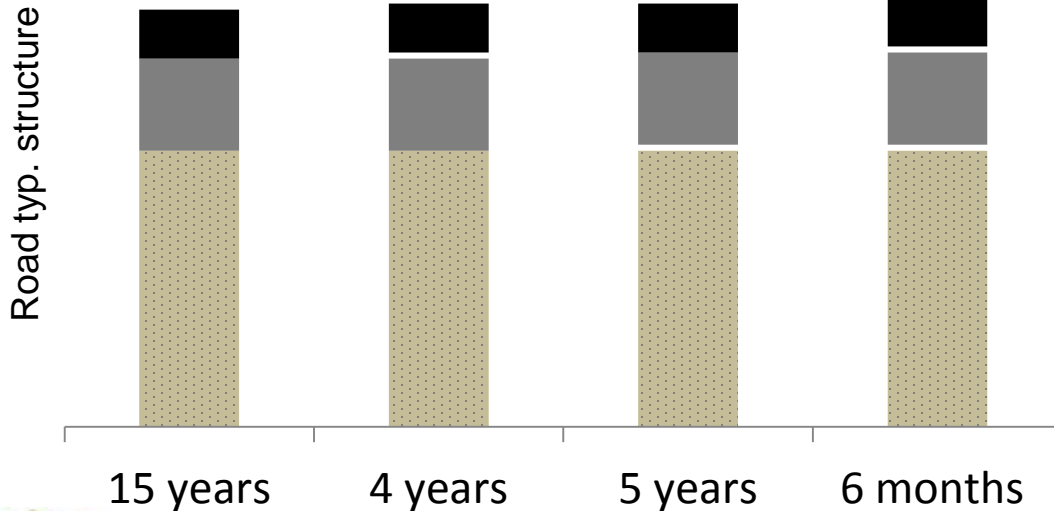
Immediate opening to traffic



5. THE ADAPTED ROADS TECHNIQUES

Back to basics with emulsion:
a must for pavement
performance & preservation

tack & prime coat

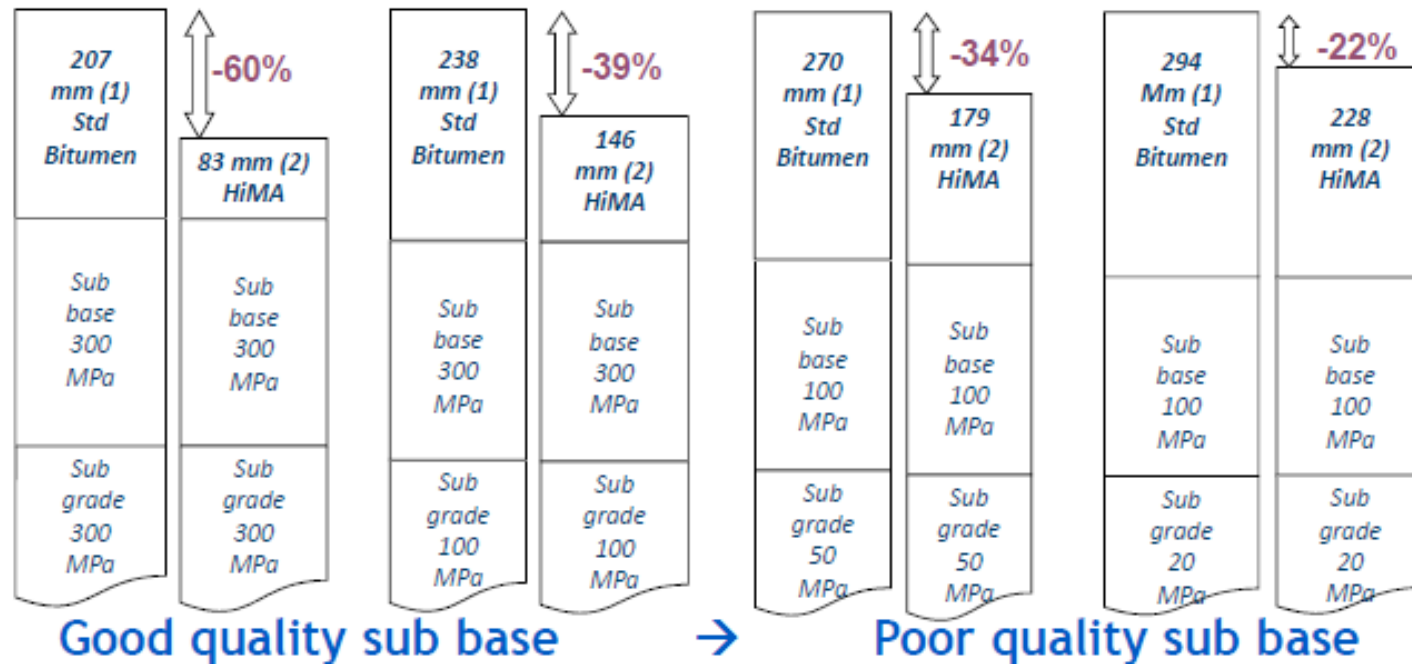


5. THE ADAPTED ROADS TECHNIQUES

Highly modified pavements

- Based on a strong site investigation,
- Good materials,
- And adapted design tools,
- Maintaining or even improving performance results,
- While decreasing the pavement thickness (as well as resources, cost & energy consumption)

Design Examples



5. THE ADAPTED ROADS TECHNIQUES

Design evolution required

- Taking into account the evolution of the norms, traffic aggressiveness,
- As well as the quality of raw materials,
- Our designs must evolve, to meet the requirements, by working closely with the road industry,
- And owners must evolve from “buying a recipe, to buying a result”



6. BRAKE THE BARRIERS TO PROGRES

- Old habits,
- Lack of training and education,
- Lack of performances on works performed,
- Lack of skilled entrepreneurs,
- Not opened to alternative solutions,
- Weight of procedures.

CE?



6. CONCLUSION

- **Pavement Performance, Preservation and Asset Management is a hot topic,**
- **Solutions, techniques and products are known and exist, following EU norms,**
- **They are used in many countries, but not everywhere,**
- **Politicians and road users are the main partners of the game,**
- **With the road industry, who must move ahead.**





THANK YOU

Guillaume BASTIEN

