



Stimulating Investment in Sustainable Construction



European Minerals Forum 25th November 2009

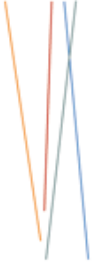


Solutions for making the European Transport Network more sustainable

➤ Sustainable mobility.

Increased transport by rail and (inland) waterways, by better intermodality and better access to these modes of transport.

➤ Construction and Maintenance of infrastructure in a more sustainable way.



Construction of infrastructure to obtain Safe and Sustainable Mobility

Some of challenges for the ROAD CONSTRUCTION INDUSTRY

- Achieving 100% of re-use pavement materials,
- Promoting recycling of demolition waste and by-products to save natural resources (non renewable),
- Recycle 60% of RAP materials instead of 20% today in the asphalt plant,
- Better use of materials by enhancing durability and lasting pavements solutions, to achieve less traffic disruption,
- Reduce emissions of green house gas and energy consumption by selection of durable solutions,



Safe and Sustainable Construction

Examples of construction processes who contribute to answer these challenges:

↗ Cold In-Place Recycling

↗ Warm Asphalt Mix

↗ Air Quality Improvement

Cold in-place recycling benefits

STRONG ECONOMICAL AND ENVIRONMENTAL INCENTIVES

- Saving of natural resources (virgin aggregates, bitumen)

➤ Reduction of:

- *Waste (landfill)*
- *Transport costs and nuisances*
- *Trucks on the roads -more safe*
- *Energy costs (transport, heating of aggregates)*
- *Traffic disruption*
- *Emissions (cold technique, transport)*

➤ On average, savings may be estimated as follows:

- *Energy and aggregate costs: up to 20 %*
- *Gaseous emissions (CO₂, SO₂): around 20 %*

Cold in-place recycling



Single equipment for milling + mixing + laying.

- Emulsion or foamed bitumen
- Addition of cement or hydrated lime



FOLLOW-UP OF REFERENCE JOB SITES

- *Evolution of stiffness with time (on extracted cores)*

Cold in-place recycling machine

Single equipment for milling + mixing + laying



Cold in-place recycling future prospects

How to develop the technique further :

➤ Mastering of mechanical properties

Better understanding of the domain of applicability, improved material design Significant progress has been made but:

- Must be converted into standard practice,
- Failure criteria and adequate tests are still missing.

➤ Specific pavement design methods are still needed.

➤ Great progress to be expected from better laying and compacting methods

- Selection of adequate equipment depending on recycling depth and materials,
- Improved compaction equipment and compacting scheme,
- Compacting aids (specific additives ?).

Carbon foot print - Decision Support

➤ Quantify and optimise not only economical but also environmental benefits



GAÏA
B.E.

BILAN DES IMPACTS ENVIRONNEMENTAUX DES CHANTIERS

Chantier : RD 925

Client : Conseil Généra Service des Ma

Maître d'œuvre : Conseil Généra

Date de remise du rapport : Le 4 avril 2007

Émission de GES (kg CO₂ equ) changement climatique P - I

| | |
|-----------------------------------|-----------------|
| TOTAL CONSOMMATION | -345 179 |
| Dont matières premières + déblais | 10 357 |
| Dont transport vers centrale | -37 976 |
| Dont fabrication | -323 734 |
| Dont transport local | -29 067 |
| Dont mise en œuvre | 35 242 |

Tableau détaillé des résultats

| Proposition / Base | Base | Proposition | P - B |
|--|------------|-------------|-------|
| Épaulement des ressources ADP (kg equ) | 26 045 | 19 474 | -25% |
| Consommation granulats (t) | 29 382 | 18 044 | -39% |
| Tonnage total apporté (t) | 31 940 | 20 593 | -36% |
| Recours aux ressources naturelles (%) | 85 | 62 | -27% |
| Consommation des ressources énergétiques (Mj) | 21 241 100 | 13 011 430 | -39% |
| Transport global | 2 251 106 | 1 375 547 | -39% |
| Transport local routier (t/km) | 1 239 455 | 85 948 | -31% |
| Emission de GES (kg CO ₂ equ) changement climatique | 1 170 527 | 825 348 | -29% |

COMMENTAIRES

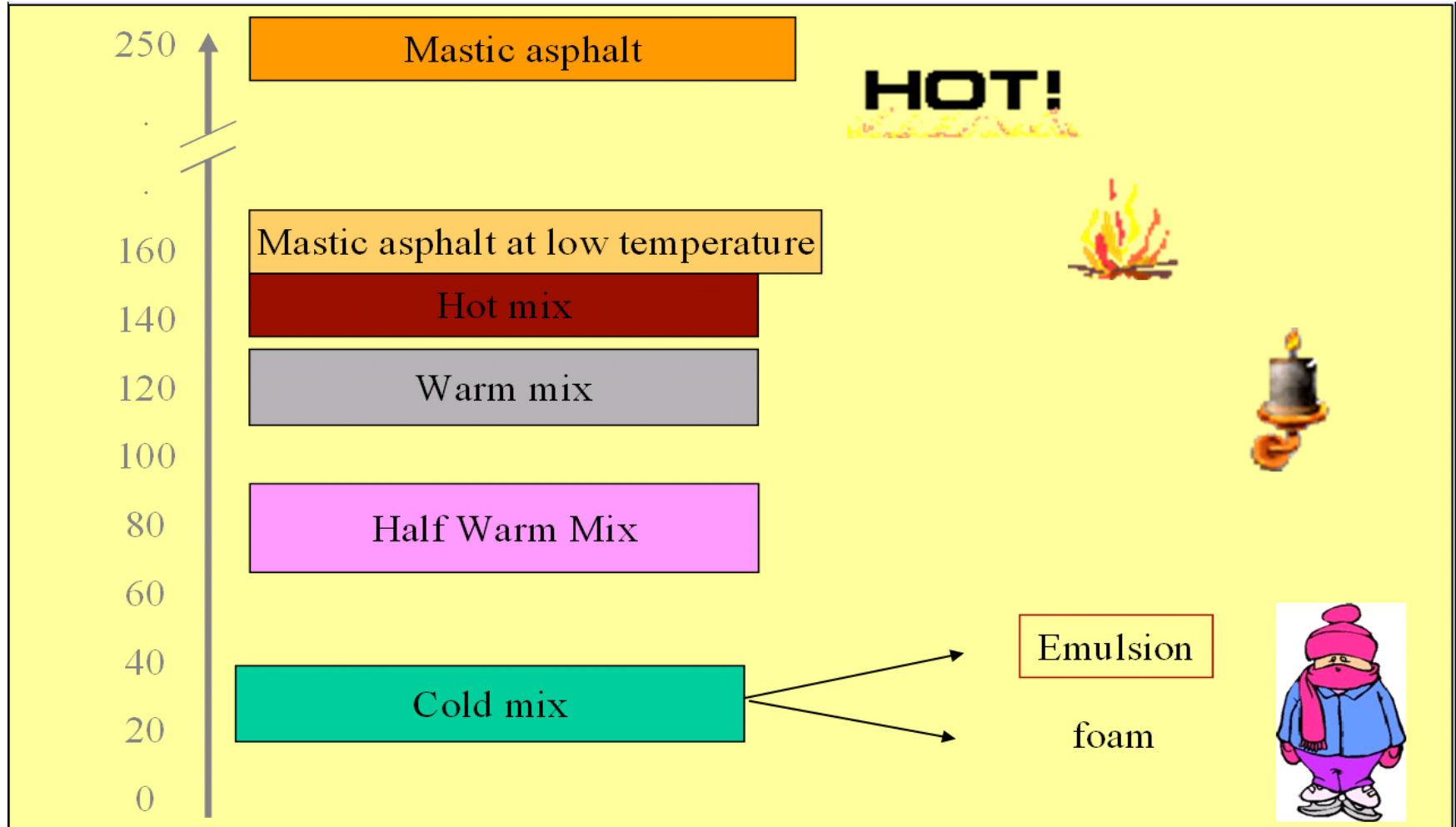
La proposition Recycloviva est gagnante sur tous les indicateurs :

- Ressources/matériaux : consommation granulats réduite de près de 40% et environ 30% des ressources utilisées sont des ressources recyclées
- Énergétiques : consommation énergétique réduite de 40 %
- Émissions : Émissions de Gaz à Effet de Serre diminuées de 30%, soit 345 tonnes de CO₂ évitées !
- transports réduits d'un tiers avec près de 900 000 de tonnes/km évitées!



Choix des indicateurs parmi une liste de 16 indicateurs environnementaux

W.A.M. Warm Asphalt Mix



W.A.M. Market Challenges

➤ Hot mix asphalt production in Europe : 300 millions tonnes

➤ France: 40 millions tonnes

➤ Germany: 70 millions tonnes

➤ USA: 600 millions tonnes

➤ Production temperature of hot mix asphalt : 150 to 180°C

➤ Fumes emissions : NO_x, COV, SO_x, CO_x

➤ Increasing of smell issues and environmental restriction

Benefits of W.A.M.

- Lower mixing temperature
- Low energy consumption
- Reduction of the energy costs (10 - 40 %)
- Reduction of green house gasses
- Minimize fumes, emissions and smells
- Lower laying temperature
- Reduction of workers exposure to fume at the plant and paving site
- Same performance characteristics of the mix
- Potential for longer haul distances and stable workability
- Earlier opening for traffic and less disruption
- Reduction of bitumen ageing inducing longer durability of the pavement



Paris 17^{ème}: Thin Asphalt Concrete 0/10 with PmB



Emissions into the atmosphere

U.A.M. A 81



↗ Reduction of the emissions into the atmosphere

- ↖ NO₂ : - 20%
- ↖ SO₂ : - 19%
- ↖ CO₂ : - 23%
- ↖ COV : - 19%



↗ Reduction energy use

- ↖ Diesel : - 28% (1.5 l/t)

How to stimulate the W.A.M. ?

- Increase knowledge with clients and industry

- Promote advantages of W.A.M.

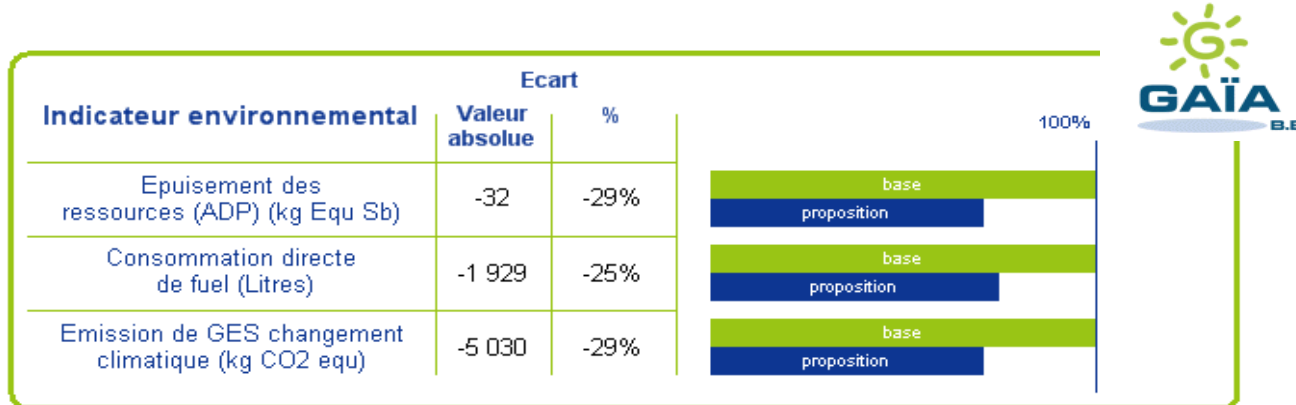
- Develop easy tool to calculate environmental effects and carbon foot print like Gaia.

- Convince politicians and road authorities

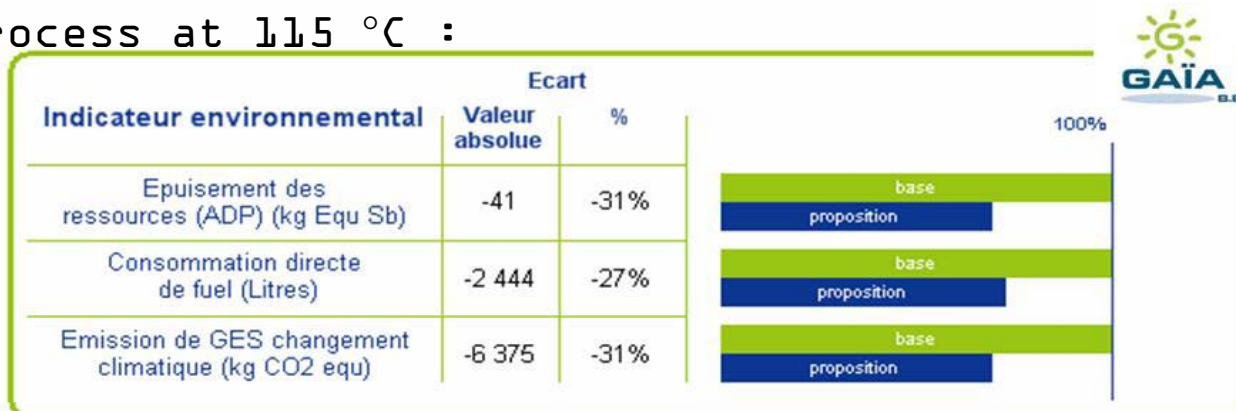
- Provide proof of performance and durability

Carbon foot print environmental study

1. Comparison between a A.C produced at 160 °C and a A.C produced with the Evotherm DAT® process at 110 °C :



2. Comparison between EME (High Modulus mix) with 20/30 produced at 170 °C and a EME produced with the Evotherm DAT® process at 115 °C :



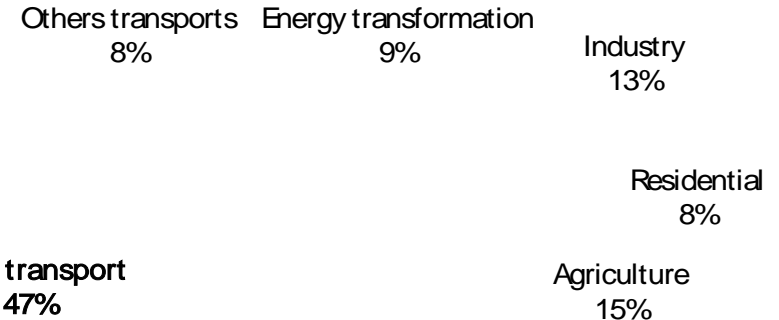
Construction process for Air Quality Improvement using photocatalysis technology

- Vertical application
- Horizontal application

Nitrogen oxides pollution (NOx)

(High temperature combustion of fossil fuels)

➤ Origins of the pollution



➤ Legislation

| | Limit values | Respected limit values dates |
|--|---|------------------------------|
| Limit value per hour for human health | 200 µg/m ³ NOx (no over passing 18 times during a calendar year) | January 1st, 2010 |
| Limit value per year for human health | 40 µg/m ³ NOx | January 1st, 2010 |
| Limit value per year for nature protection | 30 µg/m ³ NOx | July 19th, 2010 |
| Air quality objectives | 40 µg/m ³ | |

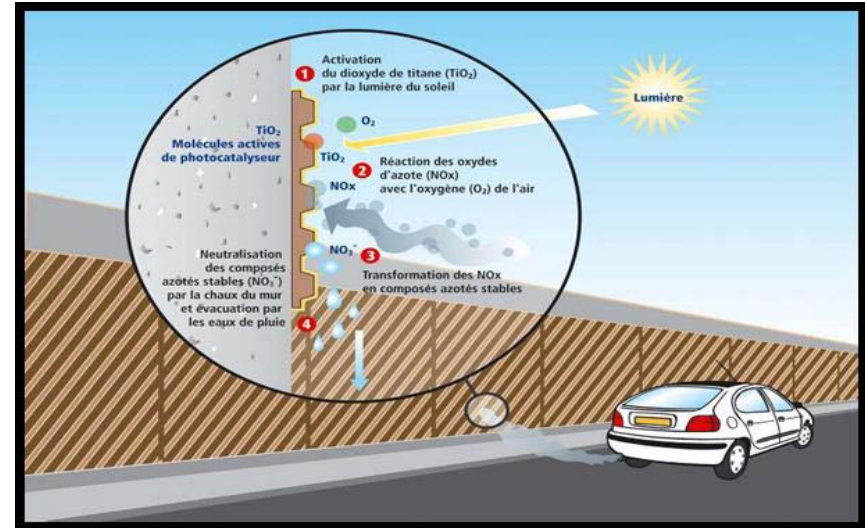
➤ Effects :

- Harmful for humans when inhaled
- Formation of acid rain and "summer fogs"

➤ Drastic measures : decrease of speed limits, reduce traffic...

Sound-barriers application-Photo-catalysis Technology

- Barriers made of **wood concrete** including depollution agents
- **Double depollution**: chemical and noise
- **Ideal location** close to high traffic zones with recurrent pollution peaks
- Test protocols performed with French public authorities
- **Environmental adaptation** (colors, materials...)
- **References**: Lannion, Paris, Manchester...
- **Innovation prizes** (Innovation Vinci Prize, Oxygen Awards...)



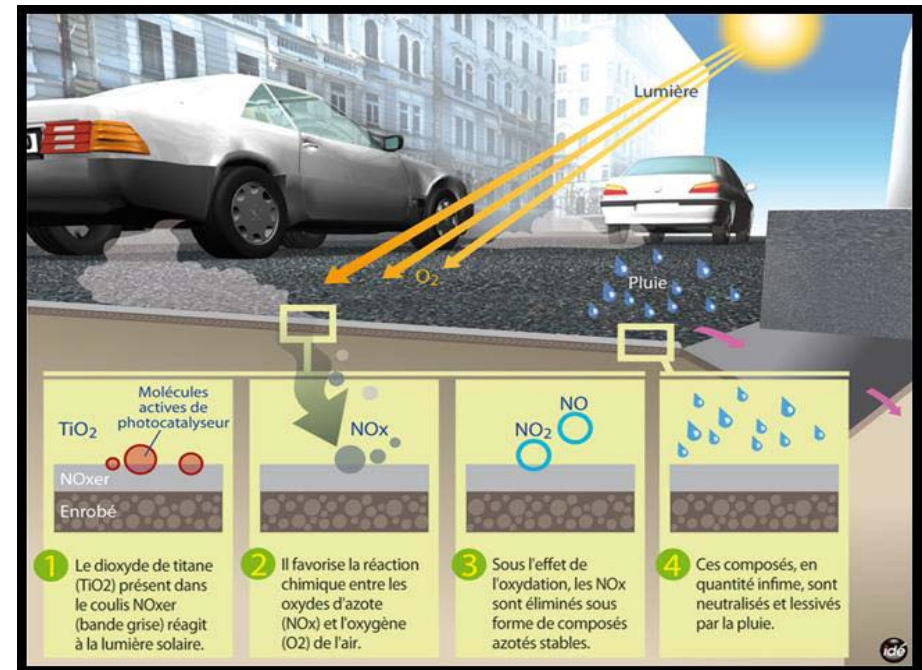
Horizontal application. Pavement reducing pollution Photo-catalysis Technology

➤ Depollution roads constitution:

- Porous asphalt mix
- Percolation of cement slurry with special photo-catalyst, TiO_2

➤ Technical advantages:

- Close to pollution source
- Improvement of road mechanical proprieties (structure) and road safety (lane differentiation)
- Different colours available
- Improvement of outdoor air quality and indoor vehicle air quality
- Sustainable process



➤ Adapted for:

- All urban roads
- Footway
- Cycle path
- Central reservations
- Squares
- Shoulders
- Tunnels...

Horizontal application. Pavement reducing pollution Photo-catalysis Technology



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DINAN
MONTLOUIS

FREJUS

ALES

AUDINCOURT

BRY s/ Marne

HENNEBONT

BOUGIVAL

PERPIGNAN

CAGNES

MONTGERON

SOCATOP

BONDUES

HENNEBONT

SOCATOP

CASTILLON

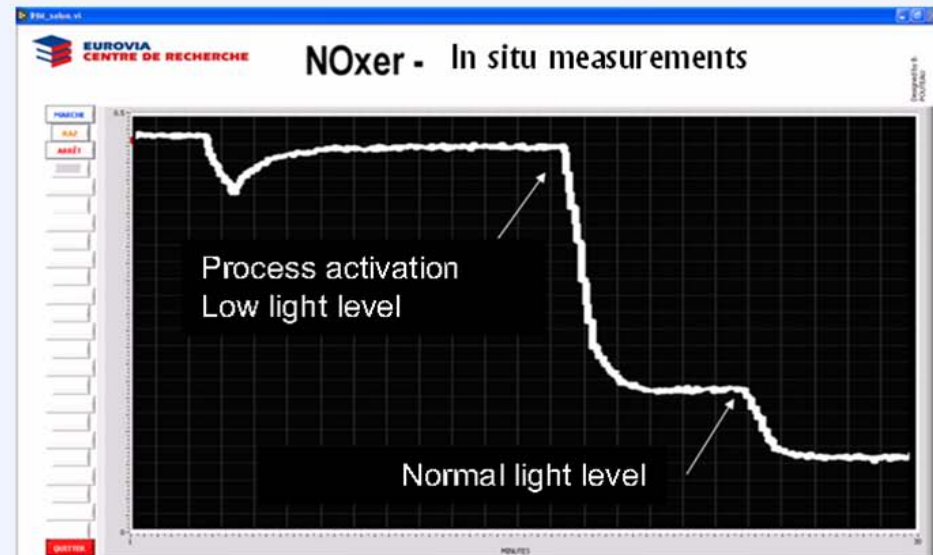
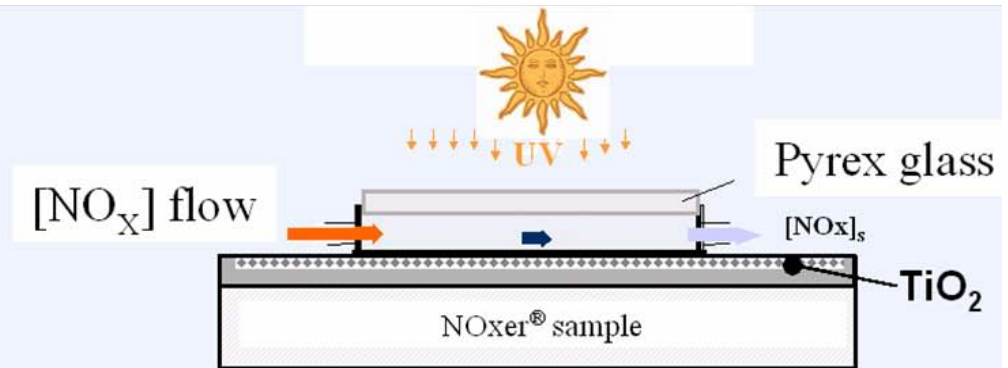
MADRID

AUDINCOURT

BRY s/ Marne

More than 35 000 m²
pavements laid by our
specialized teams

Development of In situ measurement protocols



Eliminated NO_x quantities (fixed test parameters) > 4 mg / m² / hour

Other applications

➤ Paving blocks

- Industrial applications



➤ Precast concrete embankment facing

- Industrial applications

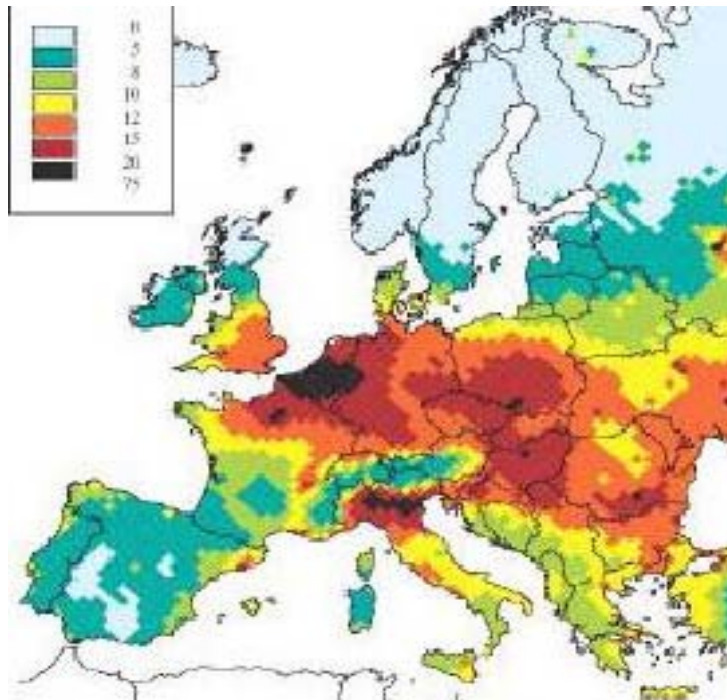


➤ Paints

- Outdoor application : all existing road cement infrastructures (central reservation, sound barriers...)
- Indoor applications with new catalyst and light adaptation: tunnels...



Reduce PM10 Fine particles from traffic



Reducing Traffic Noise in a sustainable way

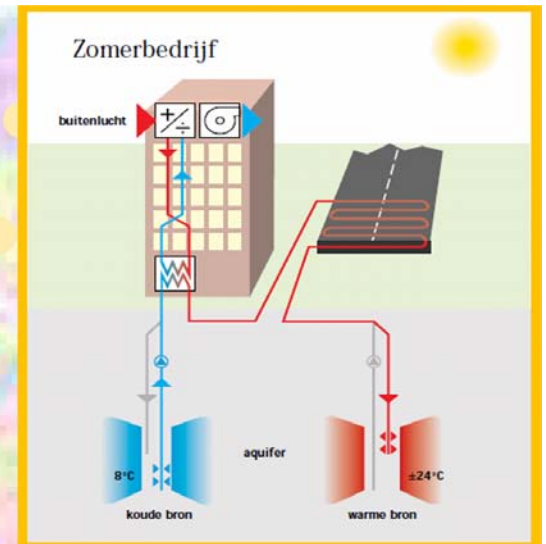
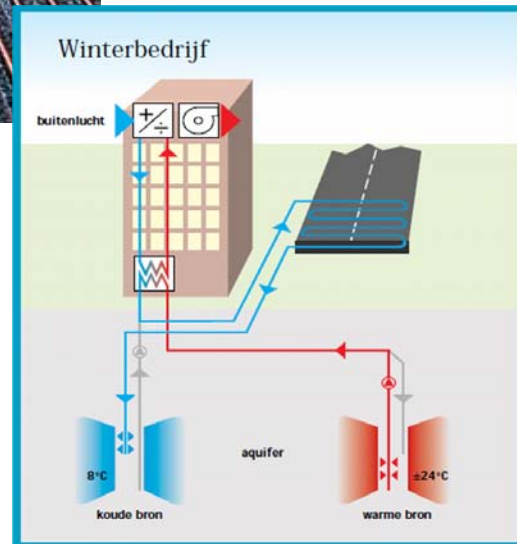


➤ Two Layer Porous Asphalt provide layer lasting reduction and lower noise generations, while maintaining drainage capacity.

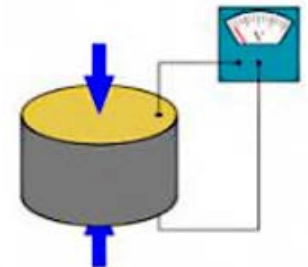
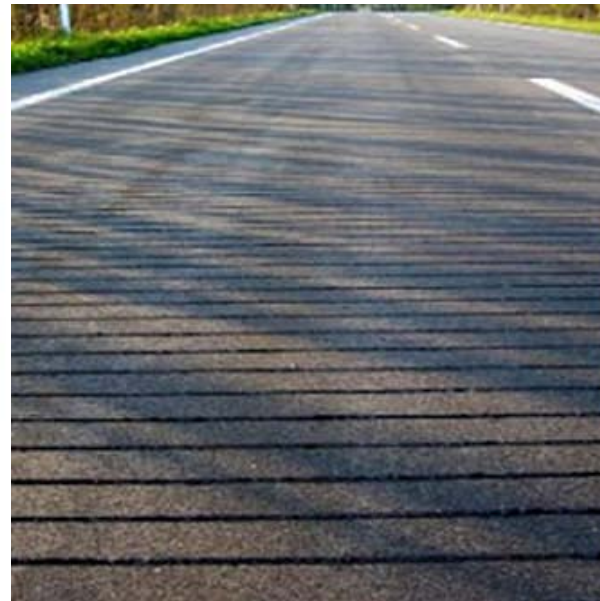
Better use of existing infrastructure by ETS or additional lanes



Use of energy which is « received » by the road (heat pump)



Use of energy which is « received » by the road (piezo-technology)





Conclusions

- Many technologies are available to contribute to more sustainable infrastructure.
- More commitment from clients and road authorities is needed to promote and apply these technologies.
- More tools are required to demonstrate and implement environmental advantages.



Safe and Sustainable Construction

THANK YOU FOR YOUR ATTENTION !