Pavement Preservation: What about Energy and GHG

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What About Energy and GHG?

- The Agenda

  - Basics  Colas = Cold Asphalt
  - COLAS Eco-software
  - Some results
  - Some examples of PP
  - Conclusions
Sustainable development: «development that meets the needs of the present without compromising the ability of future generations to meet their own needs.»
Sustainable pavement:

“A safe efficient and environmentally-friendly pavement which meets the needs of present-day users without compromising those of future generations.”
Reducing energy consumption,

Reducing impacts on the greenhouse effect (GHG emissions),

Optimizing the use of natural resources

Limiting pollution (air, water, ground, noise, etc.),

Improving health, safety and risk prevention,

Ensuring a high level of user comfort and safety
COLAS ideas

How can we impact in our business?

- HMA plants
- Quarry plants
- Emulsion plants
- Operations
- Permits, rules, ethics,....
COLAS ideas

How can we impact in our business?

- **Energy**
  - Moisture at the HMA Plant
  - Power Peaks,…

- **GHG**
  - Optimizing burners for example

- What about the structure and the techniques?
COLAS projects

- Paper on: The Environmental Road For the Future
- PIACR meeting in Durban, RSA in 2003
Hypotheses of the study

Transport of materials

Raw materials extraction

Local extraction of ore:
Crude oil extraction from Middle-East or Venezuela

Transport of raw materials

Production of materials

Transport of materials

300 km

75 km

150 km

500 km

Refinery

Quarry - Pit

Cement works

Steel works

Mixes Manufacture

20 km

Transport of mix to worksite

Roadworks:
Construction of the road
Maintenance and rehabilitation over a 30 years period.
Energy consumption per ton of laid material

- Laying
- Transport
- Manufacture
- Aggregates
- Binders

P. Dorchie: Adaptation to North American context
GHG emissions per ton of laid material

- **Laying**
- **Transport**
- **Manufacture**
- **Aggregates**
- **Binders**

Options:
- Bituminous asphalt concrete
- Warm mix asphalt concrete
- Cold mix asphalt
- Emulsion bound aggregate
- High modulus asphalt concrete
- Aggregate with hydraulic road binders & "kJ"
- Aggregate with hydraulic road slabs without dowels
- Continuous reinforced concrete
- Untreated in-situ with lime + cement
- Thermorecycling with 10% RAP
- Thermorecycling with 20% RAP
- Thermorecycling with 30% RAP
- Thermorecycling with 50% RAP
- Roadbase asphalt concrete with 30% RAP
- Roadbase asphalt concrete with 50% RAP
- Emulsion in-situ recycling
During the whole life of the road structure, road construction impact is negligible compared to traffic.

98.0 to 99.5%

0.5 to 2.0%
2003:
- « The environmental road of the future »

The first corner stones

2004 - 2005:
- Several studies carried out with adaptations to local conditions

« Clients are no longer satisfied with an impersonal brochure, but want to assess the real environmental impacts of their projects »

2006: Development of « EcologicieL »
- User-friendly tool based on Excel sheets,
- User adjustable data (distances, structures, mix-designs),

2008:
- New version based on users' feedback to be released
- Regional versions (Northern Europe, North America)
Comparisons as an example

- **Structure 1**: 1 1/2" HMA; 5" Cold In place Recycling
- **Structure 2**: 3 1/2" HMA
- **Structure 3**: 3 1/2" HMA; 6" crushed stone base
GHG emission per pavement structure in equivalent CO₂ (kg/m²)
Energy consumption per pavement structure (MJ/m²)

Structure 1

Structure 2

Structure 3

Legend:
- Binders
- Aggregates
- Mix manufacture
- Transport
- Laying
Another example in Quebec

<table>
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<tr>
<th>Techniques used</th>
<th>Unit</th>
<th>Quantities</th>
<th>Total MJ MJ</th>
<th>Total CO2eq tonne</th>
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<td>96 888</td>
<td>365 849 088</td>
<td>58 898</td>
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<tr>
<td>Alternate 1 Cement Concrete</td>
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<td>Alternate 2 High modulus HMA</td>
<td>tonne</td>
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Paper presented at the TAC meeting in Toronto Sept 08
Other examples with PP

- Not done yet
  - Worst first syndrome

- IRI vs. fuel consumption
  - IRI → fuel consumption
  - PP may be more relevant linked to this fact
  - A way to save the users money (users= tax payers)
Innovative techniques

- Racked-in chip seal in Alberta with Fiber reinforced system
ECO-EFFICIENCY PORTFOLIO: SENSITIVITY ANALYSIS / BASF

- **Cold-mix micro-surfacing**
- **Modified hot-mix asphalt**
- **Hot-mix asphalt**

**Costs**
- **Cold-mix micro-surfacing**
- **Modified hot-mix asphalt**
- **Hot-mix asphalt**

**Environmental impact**
- **base case**: 7 years
- **Increasing maintenance intervals**: 8, 9, 10 years
- **Low eco-efficiency**: base case, 10 years
- **11 years**
- **12 years**
- **13 years**

**Base case, 10 years**
Other Actions for Energy

- Cut-backs
  - Asphalt Cement and Kerosene
  - Replacement by vegetal flux
  - Hot applied

- Emulsion
  - Replacement of the flux by vegetal flux
  - Cost is higher but...

- British Columbia carbon tax on fossil fuels
Innovations

VEGECOL

- Plant-based binder
- 120C – 245F
- Energy not so good
- CO2 excellent
Energy in Road Construction

- We are part of a larger picture
- We can participate at our level
- Partnership for innovations
  - Promote new ideas
  - Create the path for it
Contractors point of view

What do we do?

- Step by step
- Contractor versus market
- Recycling (no paper tools, RAP, PCC,…)
- Ambassadors in every company in the USA
- Cars policy
- Tracking of energy (fuel, gas, natural gas,…)

- Training to save energy (moisture in HMA plant)
Conclusions

- Difficult times = opportunities

- PP is one:
  - Cold in place recycling
    - Technically sound
    - Energy and GHG efficient
  - Chip seals
    - Flux
  - Micro surfacing
  - Thin and ultra thin overlays
Conclusions

- Performances based products
  - European standards for Chip seals and Micro surfacing
  - Enhance quality of the work

- Innovation promotion
  - Partnership between contractors and owners
  - Energy based?
  - GHG based?