Sustainability and Pavement Preservation

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VP Quality Assurance & Technical Support
The Agenda

- Quick presentation of COLAS SA
  - R & D in COLAS
- Ecologiciel
- In place recycling & treatment
- How to implement innovations or new techniques
- Conclusions
COLAS (COLd ASphalt) in 2008

- **ID Card**
  - Turn Over 12.8 Billion Euros / 19 Billion $
  - 74,000 personnel in 40 countries
    - 8,000 in North America
  - Aggregates 118 Mt
  - HMA 52 Mt
  - Emulsion 1.5 Mt
Breakdown of Group activity

in millions of €

- **Roads**: 7,712 (66.1%)
- **Building materials**: 1,472 (12.6%)
- **Civil engineering, Pipes, Mains**: 901
- **Safety, Signing**: 291
- **Waterproofing**: 517
- **Building**: 404
- **Railways**: 376

Concessions:
- 16.7% Cofiroute
- Adelac (A41)
- Mars (Reims tramway)
1,400 profit centers in 40+ countries
110,000 projects around the world
Scientific & Technical Campus
South West of Paris
Research and Development

Applied research network:

- 1,000 engineers, research specialists and technicians worldwide
  - 250 in North America
- 1 Campus for Science and Techniques, certified ISO 9001 and ISO 14000
Some examples of products
European Approach

- More and More Performance based compared to the USA
- Innovations are part of the business
- Some owners promote it
- Patents, trademarks, …
Environment is part of our business

- Thin and ultra thin overlay
- No more tar use even for fuel resistant properties
- Noise abatements systems

- Quarries
- HMA plants
- Emulsion plants
- Recycling
What about recycling?

- Cold in place recycling
- RAP
- Recycling centers (PCC, ballast, …)
Positive actions

What do we do?

- Step by step
- Contractor versus market
- Recycling (no paper tools, RAP, PCC, ...)
- Ambassadors in every company in North America
- Cars policy
- Tracking of energy (fuel, gas, natural gas, ...)
- Training to save energy (moisture in ACP plant)
How to evaluate the effect of recycling?

2003

- Paper on the environmental road for the future
  - Comparisons between techniques

PIACR Durban
Energy Consumption for the Manufacturing and placement of Main Road Technologies

- Hot Mix Asphalt (HMA)
- High modulus HMA
- HMA with 15% RAP
- Crushed aggregate 0-20 mm
- Aggregate 0-112 mm
- Cement Concrete
- Continuous reinforced concrete
- Stabilized materials emulsion + cement
- Stabilized materials emulsion
- Crushed in place concrete slab (rubblizing)
- Reclaimed or milled materials

Energy Consumption: 600 MJ per Tonne

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GHG Emissions during Manufacture and Placement of Main Road Technologies

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How to evaluate the effect of recycling?

- 2006
- Internal software ECOLOGICIEL
  - Eco alternatives
  - Optimization of RAP
  - CO₂ eq
Energy Consumption in MJ per m²
For the construction of the Pavement for 100,000 AADT over 30 years

<table>
<thead>
<tr>
<th>Material</th>
<th>MJ/m² of pavement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete slab</td>
<td>600</td>
</tr>
<tr>
<td>Reinforced CS</td>
<td>700</td>
</tr>
<tr>
<td>HMA</td>
<td>400</td>
</tr>
<tr>
<td>Stabilization emulsion + HMA</td>
<td>300</td>
</tr>
<tr>
<td>Stabilization Em + Cem + HMA</td>
<td>200</td>
</tr>
<tr>
<td>Rubblizing + HMA</td>
<td>100</td>
</tr>
</tbody>
</table>
GHG Emission in $C0_{2eq}$ per m2
For the construction of the Pavement
for 100,000 AADT over 30 years

kG of CO2 / m2 of pavement

- Concrete slab
- Reinforced CS
- HMA
- Stabilization emulsion + HMA
- Stabilization Em + Cem + HMA
- Rubblizing + HMA
Energy Efficiency and Innovative Construction Practices

What do we do?

- Step by step
- Analyze road structures
  - Paper done in 2003 PIACR in Durban
  - The environmental road of the future
  - Recycling in place is the best technique

- Ecologiciel
  - Calculation per m2 of two criteria
  - CO2 and Energy consumption
Per ton of HMA applied

1. Virgin HMA
2. 25% RAP HMA
3. 25% RAP WMA
Per ton of HMA applied

1. 1 ½” HMA + 5” CIR
2. 3 ½” HMA
3. 3 ½ “ HMA + 6” GB
Another example

Comparison of Greenhouse Gas Emissions

- Conventional
- Vegecol Black
- Vegecol Buff
- Vegecol Red
- Vegecol Green
- Vegecol Fibredec

Equivalent CO2, kg/m²

-Binder
-Aggregate
-Upstream transport
-Manufacture
-Downstream transport
-Laying

Equivalent CO2, kg/m²
First approaches

- Eco alternatives
  - Alternatives represent 5-8% of the tenders
  - Using a design software and properties of components
  - To show the gain in GHG per sy on a job

- The owner must be involved

- How to implement innovations or new techniques
How to implement innovations or new techniques?

**In Europe**
- Create the needs
  - Contest tenders
  - Performance based tender
  - Technical response to issues
  - Charter for innovations with funding

**In Canada**
- Value engineering (after the tender)
- Specific demands to answer issues
- 5-7 years warranteen projects (design included) per m2
- Promote actively a technique (environmentally friendly)
How to implement innovations or new techniques?

In Europe and elsewhere

- Industry promote also R&D labs,…..
- Long term commitment in a new technique
  - High investment (CIR, FDR, …)
  - Difficult to invest for one job
- Training to various PP techniques
- Performance based contracts
  - Technical monitoring
  - Training
  - Training
Initiatives

- Washington State
- New York State
- LEED for Building
- Green Highway
- PPP
Green Roads is a rating system designed to distinguish high-performance sustainable new or redesigned/rehabilitated roads.

It awards credits for approved sustainable choices/practices and can be used to certify projects based on point value.
## Green Roads Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Goal</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable Design</td>
<td>Reduce impacts due to alignment of the road.</td>
<td>10</td>
</tr>
<tr>
<td>Material &amp; Resources</td>
<td>Reduce impacts from material extraction, processing and transport.</td>
<td>11</td>
</tr>
<tr>
<td>Stormwater Management</td>
<td>Reduce impacts of polluted stormwater and treatment devices.</td>
<td>8</td>
</tr>
<tr>
<td>Energy &amp; Environmental Control</td>
<td>Improve human and wildlife health.</td>
<td>12</td>
</tr>
<tr>
<td>Construction Activities</td>
<td>Reduce impacts from construction activities.</td>
<td>9</td>
</tr>
<tr>
<td>Innovation</td>
<td>Encourage innovation in design.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
</tr>
</tbody>
</table>
# Materials & Resources (MR)

<table>
<thead>
<tr>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Waste Management</td>
<td>1</td>
</tr>
<tr>
<td>Reuse of Pavement</td>
<td>2</td>
</tr>
<tr>
<td>Recycled Content</td>
<td>4</td>
</tr>
<tr>
<td>Pavement Life Cycle Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Regionally Provided Material</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total Credits Available** 11
Example MR Credit

Recycled Content | 4 Credits

**One credit:** Use recycled content to a minimum of 20% in the HMA/PCC and 40% of the total material in the structure if base course is included in the project.

**Two credits:** Use recycled content to a minimum of 30% in the HMA/PCC and 50% of the total material in the structure if base course is included in the project.

**Three credits:** Use recycled content to a minimum of 40% in the HMA/PCC and 60% of the total material in the structure if base course is included in the project.

**Four credits:** Use recycled content to a minimum of 50% in the HMA/PCC and 70% of the total material in the structure if base course is included in the project.
Certification Levels

Green Road certified

- Green Road certified Silver: 19-25 credits
- Green Road certified Gold: 25-31 credits
- Green Road certified Evergreen: 32-37 credits
- Green Road certified: 38+ credits
Green LITES Labelling – NYSDOT
9/25/08

Green LITES *Project Design Certification Program*
Recognizing Outstanding Leadership In Transportation and Environmental Sustainability
September 2008

Certification Program for NYSDOT Designs Meeting Criteria for Sustainable Transportation Infrastructure using Environmentally Friendly Practices
Industry Response - HMA

ASPHALT

The Sustainable Pavement

Leading America in Recycling

Warm Mix Asphalt

Quiet Pavement

Perpetual Pavement

Porous Pavement

Lower GHG & fuel

Asphalt is the sustainable material for constructing pavements.

From the production of the paving material, placement of the pavement on the road, through recycling, asphalt pavements minimize impact on the environment, low consumption of energy in production and construction, low emission of greenhouse gases, and conservation of natural resources. The photo on the left illustrates the environment of asphalt paving.
Industry Response - Concrete

Click Here for Concrete Features Flavored by Mother Nature

Pervious Concrete

Concrete is environmentally friendly in a variety of ways. The ingredients of concrete (cement, aggregate, and water) are natural and require less kilowatt-hours to manufacture than the kilowatt-hours required for other construction materials. Quarries, the primary source of raw materials, can be safely reclaimed for new environmental or commercial use. Their use is related to a cleaner future.

As a nearly inert material, concrete is a great medium for recycling waste industrial materials. Many municipalities are now doing recycling in place of traditional concrete. Blast furnaces also recycle paper and metals, among materials that can be easily mixed into the concrete and then enhanced with special aggregate or recycled materials such as scrap tires and old asphalt. Large amounts of concrete are used as a fuel in the manufacture of cement and coal, and materials such as scrap steel, scrap copper, and coal can be recycled for use in concrete.

Another reason to pursue a more environmentally friendly finish for concrete is the impact on transit construction. Concrete is mixed with energy needs and grows in parts of the country. In addition to using more water, cement production can also be a significant contributor to the overall amount of concrete produced. As a result, decisions on where to locate concrete plants are influenced by the transportation system. For example, a 60% increase in concrete is expected in the next decade, with the majority of new plants being located near existing airports and major transit hubs.
Industry Response – AEMA

- Emulsion techniques
  - may be handled safely
  - no odors, fumes, smoke or dust
  - preserve the environment
    - protects air quality
    - recyclable
  - low cost techniques
    - quick application time
    - low energy consumption
  - many pavement preservation techniques are emulsion-based
ISSA Outlook

“Environmentalists, taxpayers and legislators will be pleased to know that ISSA member contractors are responsible for making their roads last longer, keeping them safer, and requiring the use of fewer raw materials”.

Industry Response - *ARRA*

**ARRA techniques**
- most environmental friendly flexible pavement rehabilitation technique.
- reuse existing non-renewable material
- heating of material is not required
- haulage of material on or off site is not required, i.e. less disturbance to traffic

**Environmental Benefits**
- Per 2-lane km, CIR/CIREAM emits approximately 50% less GHG, consumes 62% less aggregates, and costs 40-50% less when compared to a conventional mill and overlay treatments
- Since the implementation of CIR/CIREAM contracts, MTO has reduced GHG emissions by:
  - 54,000 t of CO₂
  - 440 t of NOₓ
  - 9,400 t of SO₂
- And saved 740,000 tonnes of aggregates
Pavement Preservation

“Long-term strategy that enhances pavement performance by using an integrated cost-effective set of practices that extend pavement life, improve safety and meet motorist expectations”

The Right treatment, to the Right road at the Right time
Conclusions

- Environment should be more than permits
  - Included in the pre tender or engineering approach
  - Consultants?
- Numerous initiatives in the USA
  - In place recycling should be more used!
  - Promotion of innovations / training (DOT and Industry)
- Industry needs long term commitment
- Quality must be there
  - Needs for the road networks
  - Budget
Conclusions

- Vegetal binders at 250F
- FDR in the UK
Conclusions