Energy and Emissions Reduction: Impact on Road Construction

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The Agenda
- Construction Company and Environment
- Emissions and RAP
- Conclusions

Environment is part of our business
- Thin and ultra thin overlay
- No more tar use even for fuel resistant properties
- Noise abatement 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)
**MOISTURE CONTROL**

**Best Operating Practices:**

- Stockpiles
- Dryer

**Stockpiles Moisture Control:**

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Rear</th>
<th>Difference</th>
</tr>
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<tbody>
<tr>
<td>Sand</td>
<td>5.6</td>
<td>15.5</td>
<td>9.9</td>
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<tr>
<td>Screenings</td>
<td>6.0</td>
<td>10.5</td>
<td>4.5</td>
</tr>
<tr>
<td>No. 78</td>
<td>1.4</td>
<td>2.9</td>
<td>1.5</td>
</tr>
<tr>
<td>No. 67</td>
<td>0.8</td>
<td>1.5</td>
<td>0.7</td>
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<tr>
<td>RAP (1/2&quot;)</td>
<td>5.7</td>
<td>7.7</td>
<td>2.0</td>
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Source data: ASTEC

**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 10% RAP
- Crushed aggregate 0-20 mm
- Aggregate 0-15 mm
- Concrete
- Continuous reinforced concrete
- Stabilized materials (cement, emulsion)
- Crushed in place concrete slab
- Reclaimed or milled materials

Savings on ENERGY, PRODUCTION RATES and MATERIAL LOSS cover PAVING COSTS in ONE YEAR.
GHG Emissions during Manufacture and Placement of Main Road Technologies

Energy Consumption in MJ per m²
For the construction of the Pavement for 100,000 AADT over 30 years

Energy Efficiency and Innovative Construction Practices

How to evaluate the effect of recycling?

- 2006 Internal software ECOLOGICIEL
  - Eco alternatives
  - Optimization of RAP
  - CO₂ eq

Per ton of HMA applied

-virgin HMA
-25%RAP HMA
-25%RAP WMA
Per ton of HMA placed

<table>
<thead>
<tr>
<th></th>
<th>Virgin HMA</th>
<th>15% RAP HMA</th>
<th>25% RAP HMA</th>
<th>25% RAP WMA</th>
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<tr>
<td></td>
<td>43 kg/t</td>
<td>39 kg/t</td>
<td>35 kg/t</td>
<td>32 kg/t</td>
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<tr>
<td></td>
<td>95 lbs/t</td>
<td>86 lbs/t</td>
<td>77 lbs/t</td>
<td>71 lbs/t</td>
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<td></td>
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<td>-9.5%</td>
<td>-19%</td>
<td>-25%</td>
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</table>

Per 1 million tons

- From virgin HMA to 25% RAP HMA
  - 24 Lbs \times 10^6 t = 12,000 t
  - Equivalent to 1000 pick ups F 150 for one year
  - 450 M t ?
  - US Market
  - 5.4 M t de Co2 or 450 000 pick up per year !!!

Pavement Preservation

The right technique at the right time on the right road

- Chip seals
- Micro-surfacings
- Thin HMA overlay
- Cold in place recycling
- Full depth Recycling
- COLD APhalt Emulsion patent 1927

Pavement Preservation

Innovation with new products:

- FIBERMAT fiber reinforced chip seals
- Vegetal based products
- Flux, road markings

Also like in the UK: City of Portsmouth

- 25 years contract on 350 miles of streets
  - 5 years for reconstruction
  - 25 years of PP
  - So we have the same issues as owners
  - Except this is our money (or bank)
Pavement Preservation

- Emulsion based products
  - Safe
  - Environmentally friendly
- Multiple uses:
  - Chip seals
  - Micro surfacing
  - Cold mix
  - Cold in place recycling...
- Do not forget: tack coats and bond coats

How can we justify maintenance works and CO₂?

Paper at TAC 2009 in Vancouver

- Evolution of the IRI so Increase of consumption
  - Therefore more GHG consumed
- So the idea is to justify PP by reducing CO₂ consumption
  - Cap and trade

Evolution of IRI

Consumption Increase by 1.5%

Evolution IRI / CO2

For traffic higher than 20 000 AADT

7 years maintenance program linked to IRI

Save energy compared to the PP work done
Conclusions

- Environment should be more than permits
- Environment is part of our business
  - Responsible development in COLAS
- Traffic represents 98% of CO2 on the life of the pavement
- But we can help!

Conclusions

- How to implement environmental data in tenders?
- How to implement innovations?
- Eco alternatives?
  - They do it in Europe on certain jobs
- Pavement Preservation is a key
  - Sustainable
  - Key for keeping the network in shape
    - Forget the worst first!

Conclusions

- Vegetal binders at 250F

Conclusions

- Clear HMA with clear oil based binder in Yukon, Canada