

**Energy and Emissions Reduction:
Impact on Road Construction**

COLAS Inc.

Francois CHAIGNON
VP Quality Assurance & Technical Support

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The Agenda

- Construction Company and Environment
- Emissions and RAP
- Conclusions

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COLAS Inc.

COLAS NORTH AMERICA

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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

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What about recycling?

- Cold in place recycling
- RAP
- Recycling centers (PCC, ballast, ...)

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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)

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MOISTURE CONTROL

Best Operating Practices:

Stockpiles
Dryer

MOISTURE CONTROL

Stockpiles Moisture Control:

Stockpile average moisture content in the 0 - 4' level

	Front	Rear	Difference
Sand	5.6	15.5	9.9
Screenings	6.0	10.5	4.5
No. 78	1.4	2.9	1.5
No. 67	0.8	1.5	0.7
RAP (1/2")	5.7	7.7	2.0

Source data: ASTEC

MOISTURE CONTROL

Stockpiles Moisture Control:

Wilder Plant - Barrett Paving Materials KY

PLACE STOCKPILES ON SLOPED AND PAVED SURFACES TO LET WATER DRAIN AWAY.

Savings on **ENERGY, PRODUCTION RATES** and **MATERIAL LOSS** cover **PAVING COSTS** in **ONE YEAR**.

MOISTURE CONTROL

Stockpiles Moisture Control:

Wilder Plant - Barrett Paving Materials KY
Roof over RAP

Milton Plant - HRI - PA
Covered FA piles & cold-feeds

Shelters over screenings or RAP piles pay off too

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

Energy in MJ per tonne

Hot Mix Asphalt (HMA) 600

High modulus HMA 600

HMA with 15% RAP 90

Crushed aggregate 0-20 mm 90

Aggregate 0-112 mm 90

Cement Concrete 1100

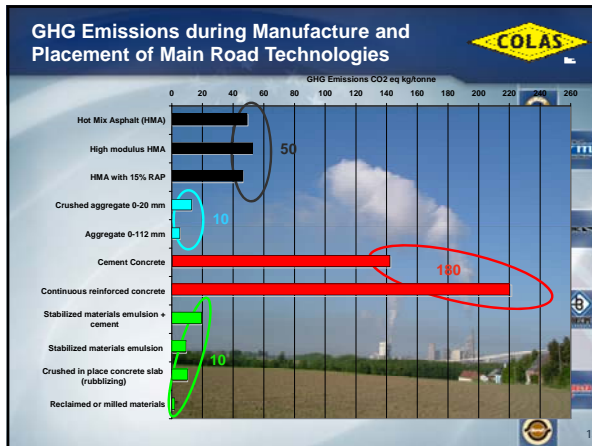
Continuous reinforced concrete 1100

Stabilized materials emulsion + cement 1100

Stabilized materials emulsion 1100

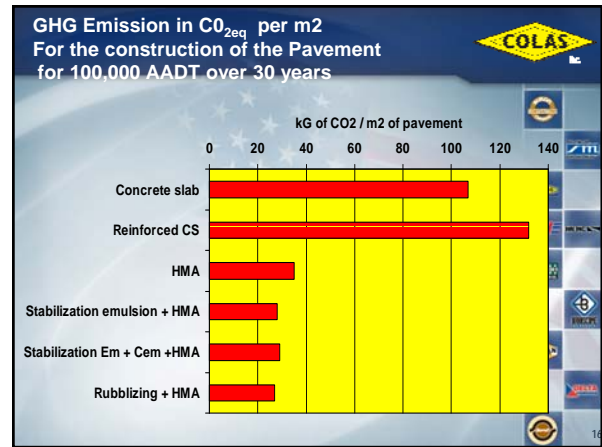
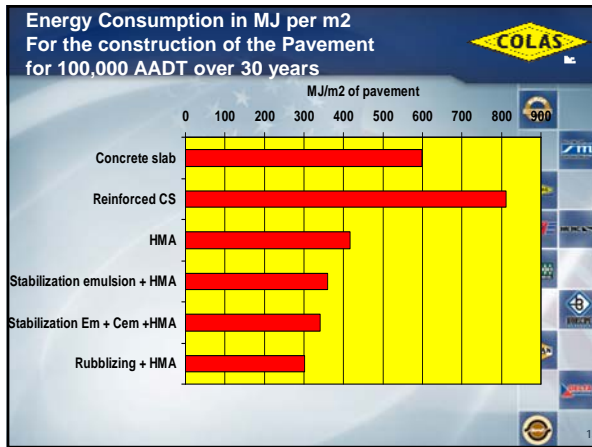
Crushed in place concrete slab (rubblizing) 1100

Reclaimed or milled materials 1100



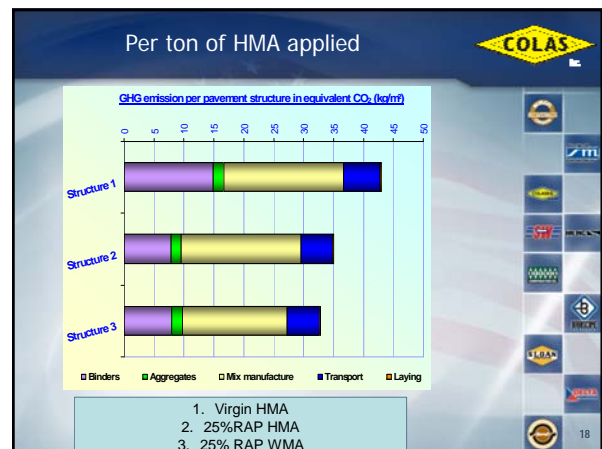
How to evaluate the effect of recycling?

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




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 placed



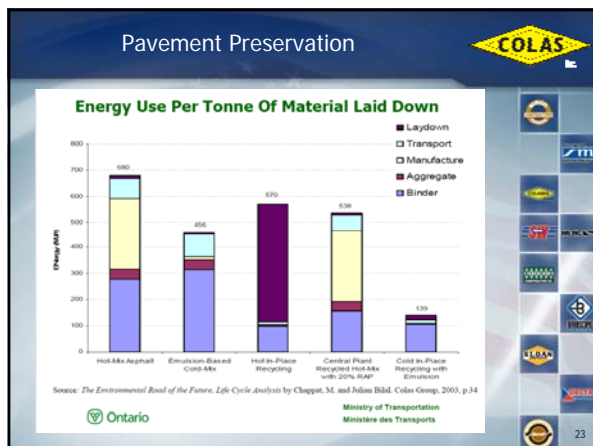
Material	43 kg / t	95 lbs / t	
Virgin HMA	43 kg / t	95 lbs / t	
15% RAP HMA	39 kg / t	86 lbs / t	- 9.5%
25% RAP HMA	35 kg / t	77 lbs / t	- 19%
25% RAP WMA	32 kg / t	71 lbs / t	- 25%



- ### Per 1 million tons
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- From virgin HMA to 25% RAP HMA
 - 24 Lbs X 10⁶ t = 12 000t
 - 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 !!!
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- ### Pavement Preservation
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- 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 ASphalt Emulsion patent 1927
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- ### Pavement Preservation
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- 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)
- 
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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





Pavement Preservation

- 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



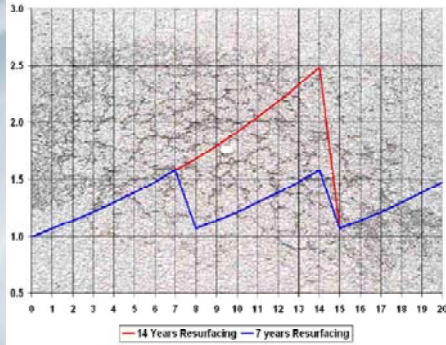
IRI = 1



IRI = 2.5

Consumption Increase by 1.5%

Evolution of the IRI



Evolution IRI / CO₂

AADT	Energy saved due to better IRI in MJ	Energy used due to the 7 year resurfacing scenario in MJ	Balance of energy saved in MJ	% of global energy saving over 14 years due to fuel consumption by traffic
10000	79 403 225	51 356 000	28 047 225	0.112%
20000	158 806 450	51 356 000	107 450 450	0.216%
30000	238 209 675	77 134 000	161 075 675	0.216%
40000	317 612 900	102 712 000	214 900 900	0.250%
100000	794 032 225	154 096 000	639 936 225	0.267%
180000	1 429 258 047	206 424 000	1 222 834 047	0.273%

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

