An innovative high-rate continuous recycling solution, applicable to hot-mix and low temperature asphalt concrete

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Topic: Innovations and techniques
Innovation in construction and road maintenance
Tendencies in mix production

- **Recycling**: 3 classes
  - low ratio: 10 to 20%
  - middle class: 30%
  - high rate: 50% and more

- **Temperature**: 3 classes
  - standard: 150°C and more
  - low: 120-130°C
  - very low: ± 100°C
Our targets

- 2012 and 2020 (EEC and local targets)
- Example: France, 2012 and stimulus plans
  - 60% of RAP available must be recycled
  - -33% / greenhouse gas emissions
Equipment available

- Asphalt plants must be upgraded
- New designs are necessary (both for continuous and batch plants)
- For the high rate, new concepts must be built, and checked
ERMONT TSR

**Principles**

- Virgin aggregates overheated in a continuous drum-mixer (TSM or RF)
  - RAP heated and dried in a specific drum (TSR)
  - Heated aggregates and RAP mixed with bitumen in a continuous twin-shaft mixer

**Requirements**

- Homogenous RAP
- Important quantities of RAP
  - Milling of a well known source (base course of a highway to be maintained)
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- Recycling rate 50%
  - T°C RAP 130°C
  - T°C Virg. Agg 175°C
  - T°C Mix 160°C

- Recycling rate 70%
  - T°C RAP 130°C
  - T°C Virg. Agg 210°C
  - T°C Mix 160°C

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RAP metering
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Dryer drum TSR

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Twin-shaft mixer
ERMONT double continuous drum

- Double drum and recycling bin

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Recycling highway A 28

BBM
- GB 0/14
- GB 0/20

Fraisage 1 (Recyclage)

Fraisage 2 (Stock)

Couche de forme

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Rebuilding A 28

- 50% recycling
  (ERMEL / BBME)
- Rebuilding in 9 steps
A few figures (A28)

- Milling 1: 105 000 m²
- Milling 2: 102 000 m²
- Base 0/14: 23 000 t
- Surface dressing: 40 000 m² (emergency lane)
- ERMEL 50: 24 000 t
- BBME 50: 16 000 t
- Tack coat: 285 000 m²
- Wearing course: 34 000 t
Binder contents

- Target: 5.83 (NF)
- Tests: 5.75 (0.137)
- N.B.: 5.83 ppe = 5.51%
# Temperature controls

## ASPHALT PRODUCTION TABLE (T/h)

<table>
<thead>
<tr>
<th>Moisture content of new aggregate</th>
<th>% RAP (w= 3%)</th>
<th>% RAP (M.C = 3%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>W = 2%</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>W = 3%</td>
<td>278</td>
<td>282</td>
</tr>
<tr>
<td>W = 4%</td>
<td>255</td>
<td>256</td>
</tr>
<tr>
<td>W = 5%</td>
<td>237</td>
<td>232</td>
</tr>
</tbody>
</table>

- T Gas - T RAP = 7°C \( \Delta T \) (\( CO_2 = 4\% \))
- \( CO^2 : 178 \text{ mg} / \text{ m}^3 \) with heavy oil
  vs 500 as a target
Saving energy and GHG

Consommation énergétique par structure (MJ/m²)

Émission GES par structure en CO₂ équivalent (kg/m²)

Δ = - 17.7%

Δ = - 15.6% soit # - 305 t de G.E.S pour le chantier

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A low energy case: RD 28 in France, 3 500 t

- In July 2009:
  same concept with the process COLAS 3 ELT
- Base: 50% RAP 0/14
  50% virgin 0/14
  35/50 LT
- Wearing course: BBSG 3 with 50% RAP 0/6
  35/50 LT
- $T^\circ = 130^\circ C$ (minus 35$^\circ C$)
Conclusion

• Recycling up to 70% at low temperature is the next step
• Regarding equipment, a mini burner is heating gas going into the bag house
• We are expecting a reasonable development of the HMA machine number