Field Validation of High Content Recycled Asphalt Concrete Mixtures with Accelerated Pavement Testing

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Situation in Switzerland

• Road network is “complete”: almost no new road construction, mainly maintenance and reconstruction
• Large amounts of recycling paving material (RAP) are produced
• Disposal in landfills is expensive
• Economic, ecological and political pressure to reuse more RAP
High percentage RAP in asphalt concrete?

- Wearing course **AC11S**: 60% RAP + rejuvenator
- Base course **ACT22S**: 75% RAP + rejuvenator

Promising lab results required in-situ validation
High percentage RAP in asphalt concrete?

- Wearing course **AC11S**: 60% RAP + rejuvenator
- Base course **ACT22S**: 75% RAP + rejuvenator

Promising lab results required in-situ validation
MLS0 load simulator

- $v_{max} = 6 \text{ m/s}$
- Load length = 4.2 m
- Axle/2 $\leq 65 \text{kN}$

Electr. control

Transp. wheels

Corner jacks

Rails

Loading tires

Generator

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Test setup

- 65kN super single
- channelized
- 5000 passings/h
- 18km/h
- 4.2m

Load. length = 4.2m

- No environment control! (temp., rain)

<table>
<thead>
<tr>
<th>Load. length = 4.2m</th>
<th>Load. length = 4.2m</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 cm</td>
<td>6 cm</td>
</tr>
<tr>
<td>ACT22S</td>
<td>ACT22S+RAP</td>
</tr>
<tr>
<td>ACT11S</td>
<td>ACT11S+RAP</td>
</tr>
<tr>
<td>ACT16S</td>
<td></td>
</tr>
<tr>
<td>600k Cycles in 5 weeks (4.3 Mio ESALs)</td>
<td>400k Cycles in 3 weeks (2.8 Mio ESALs)</td>
</tr>
</tbody>
</table>

Granular 0/45

Subgrade (S2)

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Test setup

MLS10 load, loc. 2 (4.2m)
MLS10 loading location 1 (4.2m)

AC11S + RAP
ACT22S + RAP

20m
15m
Results
material for base course ACT22S

Cracking & rutting

First surface cracks in material without RAP

First surface cracks in material with RAP

Pumping of fines through bottom-up cracks

Cracks progression

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Results

material for wearing course AC11S

cracking & rutting

Fines from the bottom

Cracks progression in material with RAP

Cracks in material with RAP

600k

5m

1m

length cracks [m]

rut depth [m]

MLS10 load cycles [k]

AC11S+RAP
AC11S

9
Laboratory studies showed that high percentage RAP mixtures can reach similar mechanical properties as standard hot mix asphalt mixtures. However this APT work showed that:

- Under similar environmental and loading conditions, pavements with RAP cracked earlier and in a greater extent than standard materials
- Rutting in pavements with RAP was higher, but due to a pumping effect

Therefore:

- Future lab work should focus on improving blending of the old & new binder + rejuvenating agent in the asphalt plant.

Further:

- Lab findings should always be validated in the field before applying in real uses. APT is a cost-effective tool.