Opening specification to 100% RA in asphalt mix – Case study from Sweden

Henrik Arnerdal,
Swedish Transport Administration
• 2017 – Swedish Transport Administration made changes in the specification
  ✓ Restrictions in %RA are gone

• Changing a specification is easy – but how do we change the industry?
Road to success

- Cooperation within the asphalt industry
  - Workshop
  - Understanding
  - Regulations
    - Harmonized standards
  - Limitations
  - Liability
  - Trust

- Common target
  - Increased use of RA without sacrificing the quality of the pavements
Guide when using RA – example SMA

For mixes to be used in surface layer produced with PMB, RA is not accepted

Does the aggregates of the RA fulfill requirements? → NO → STOP

YES → Softening point, RA > 65 °C ?

NO → Traffic > 7000 ? → NO → STOP

YES → Traffic > 7000 ? → YES → > 10 % RA ? → NO → MIX DESIGN → YES → MIX DESIGN

NO → > 10 % RA ? → NO → TYPE TEST

Calculate final Soft. point to know what bitumen to add

AS REQUIRED? → YES → The producer confirms quality via DoP and CE-marking and have full responsibility of the product

Can only be used with rejuvenator

"New" softening point for RA <65°C

软化点，RA>65 °C ？

交通>7000 ？

> 10 % RA ？

Traffic > 7000 ？

Kenneth Lind, Swedish Transport Administration
Not without limitations

- PMB in surface layer – 0% RA, PMB in sub layers <10% RA
- The virgin bitumen must not be too soft
  - Surface layer – not more than 1 pen class softer than ordered
  - Sub layers – 2 classes softer
- RA with softening point >65°C must be rejuvenated before use
- Requirement is set on recovered binder from pavement

<table>
<thead>
<tr>
<th>Property</th>
<th>Test method</th>
<th>Unit</th>
<th>Ordered bitumen class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Softening point</td>
<td>EN 1427</td>
<td>°C</td>
<td>50/70</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>70/100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100/150</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>160/220</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>46-57</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>43-54</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>39-51</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>35-47</td>
</tr>
</tbody>
</table>
So far

- Different approaches
  - With rejuvenator up to 40-50% RA
  - Without rejuvenator 0-30% RA
- No reported pavement failures
• Skanska
  – Base layer AC22
    • 70/100
    • 50% RA
• Skanska
  – SMA16 - 70/100
  – RA 8/16, rejuvenated from SP (r&b) 54°C to 47°C
  – Final mix - 50% RA

<table>
<thead>
<tr>
<th>SECTION</th>
<th>DISTANCE</th>
<th>RA%</th>
<th>YEAR OF SERVICE</th>
<th>RUT DEPTH (MM)</th>
<th>MPD (MM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>max</td>
<td>left</td>
</tr>
<tr>
<td>1</td>
<td>300m</td>
<td>0</td>
<td>0</td>
<td>1,7</td>
<td>1,4</td>
</tr>
<tr>
<td>DIFF</td>
<td></td>
<td></td>
<td>1 winter</td>
<td>3,0</td>
<td>2,0</td>
</tr>
<tr>
<td>2</td>
<td>360m</td>
<td>50</td>
<td>0</td>
<td>1,6</td>
<td>1,1</td>
</tr>
<tr>
<td>DIFF</td>
<td></td>
<td></td>
<td>1 winter</td>
<td>3,1</td>
<td>1,7</td>
</tr>
<tr>
<td>3</td>
<td>600m</td>
<td>0</td>
<td>0</td>
<td>2,0</td>
<td>1,8</td>
</tr>
<tr>
<td>DIFF</td>
<td></td>
<td></td>
<td>1 winter</td>
<td>2,8</td>
<td>2,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0,8</td>
<td>0,7</td>
</tr>
</tbody>
</table>
Thank you

henrik.Arnerdal@trafikverket.se
+46 (0)10-124 40 88