RECYCLING OF ASPHALT

Environmental and sustainability issues

Dr. Martin Hugener
Road Engineering / Sealing Components
EMPA Dübendorf
No problems?

If recycling material is coming from old roads, how can this material cause problems in a new road?
.. some problems

• knowledge on dangerous substances has changed: polycyclic aromatic hydrocarbons (PAH) in tar, asbestos

⇒ environmental laws and regulations have changed

• dangerous substances have been added illegally: PCB, waste oil, ......

• in pavements substances are immobilized - during recycling they can be “reactivated”
### Sources of emissions

<table>
<thead>
<tr>
<th>Recycling steps</th>
<th>Type of emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milling, demolishing</td>
<td>• dust, leaching</td>
</tr>
<tr>
<td>Storage, processing</td>
<td>• dust, leaching</td>
</tr>
<tr>
<td>Paving</td>
<td>• hot: fume</td>
</tr>
<tr>
<td></td>
<td>• cold: leaching</td>
</tr>
</tbody>
</table>
Recycling of tar-containing asphalt

Background

• large amounts of tar have been used in Switzerland
• pavement layers contain between 0 and 100% tar
• tar contains large amounts of toxic PAH (Polycyclic Aromatic Hydrocarbons)
• >90% of RAP is recycled hot

Question

• concerning occupational health, which is the maximum tar content for hot recycling
Fume-Generator
Temperature dependence of fume emission

Temperatur [¡C] vs. Emissionen [mg/m³]

- 3.3% TB
- 33% TB

TPM
Main source of emissions
• **Money** it the most effective regulator

• Standards and laws are necessary

• Regulations and limit values are very different in europe

→”Waste-tourism”
Open questions

• is the harmonization of limit values sensible?
• can we avoid (or limit) the testing on harmful substances?
• what to do with contaminated RAP?
• how to improve the negative image of recycling materials (waste in EU)?
• Recycling products with CE-marking?
• How to avoid the “contamination” of asphalt with new harmful compounds?
Where is the knowledge?

• Jan van der Zwan, Ministry of Transport, NL
• K. Krass, Ruhr-Universität Bochum, D
• V. Mouillet, LCPC, France
• M. Hugener, Empa Dübendorf, CH
• A. J. Kriech, Heritage Research Group, USA
• I. Burstyn, Wageningen University, NL
• P. Bonnet, Institut National de Recherche et de Sécurité, Vandoeuvre, France