Asphalt Rubber: Research & Development in Italy

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**Asphalt Rubber** is a blend of asphalt cement and certain additives in which the rubber component is at least 15 percent by weight of the total blend and has reacted in the hot asphalt cement to cause swelling of rubber particles.

**Rubberized asphalt concrete (RAC)** is a material produced for hot mix applications by mixing asphalt rubber with graded aggregate (gap- or open-graded).


Benefits of Asphalt Rubber

- Mechanical Performances (rutting, fatigue/reflection cracking).
- Durability (aging resistance).
- Safety (skid resistance, splash & spray).
- Maintenance costs.
- Environment (re-use of waste tires, reduction in traffic noise).
Application of Asphalt Rubber in Italy

- Technology available since 2006.
- Main phases:
  - Asphalt rubber production set up at asphalt concrete plant;
  - Laboratory characterization of asphalt rubber;
  - RAC laboratory characterization (in progress);
  - Preliminary applications of gap- and open-graded mixes;
  - Pilot projects.
Practical Objectives of Asphalt Rubber in Italy

- prepare **technical specifications** based on the Italian experience both related to public administrations and private companies needs.

- **Statistical based approach** for laboratory investigation and production control to evaluate typical quality/design parameters.
R&D Experimental Evaluation
## R&D Experimental Evaluation: AR binder characterization

<table>
<thead>
<tr>
<th>Binder</th>
<th>PG</th>
<th>DSR</th>
<th>BBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/70 (asphalt)</td>
<td>64</td>
<td>70</td>
<td>-22</td>
</tr>
<tr>
<td>EVA soft</td>
<td>64</td>
<td>70</td>
<td>-16</td>
</tr>
<tr>
<td>SBS soft</td>
<td>70</td>
<td>70</td>
<td>-16</td>
</tr>
<tr>
<td>SBS hard</td>
<td>70</td>
<td>70</td>
<td>-22</td>
</tr>
<tr>
<td>50/70+18% CRM</td>
<td>82</td>
<td>70</td>
<td>-22</td>
</tr>
<tr>
<td>70/100+18% CRM</td>
<td>70</td>
<td>70</td>
<td>-28</td>
</tr>
</tbody>
</table>
R&D Experimental Evaluation: RAC characterization (ITSM)

Indirect Tensile Stiffness Modulus

- AR
- 70/100
- SBS Hard
- SMA

Modulo (MPa)

0 1000 2000 3000 4000 5000 6000 7000

5678 3997 3717 2169

RAC

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Prof. F. Canestrari - 28th June '07
R&D Experimental Evaluation: RAC characterization (fatigue)

The graph shows the relationship between stress (σ) in kilopascals (kPa) and the number of cycles. The different materials are compared: 70/100 asphalt, SBS Hard, Asphalt Rubber, and SMA. The graph indicates that Asphalt Rubber (RAC) has higher resistance to fatigue compared to the other materials.
R&D Experimental Evaluation: RAC characterization (rutting)

T = 60 °C

- AR @ 60°C
- BN @ 60°C
- BM @ 60°C

 Rut depth (mm) vs. time (min)

Equations:

- $y = 1.0326x^{0.4278}$  
  $R^2 = 0.9665$

- $y = 0.5987x^{0.2463}$  
  $R^2 = 0.9962$

- $y = 0.1283x^{0.2905}$  
  $R^2 = 0.8963$
R&D Experimental Evaluation: Further actions/needs

- Pilot projects.
- Acoustic analysis of RAC.
- In situ noise measurements.
- Long term monitoring.
- Water sensitivity analysis.
- Advanced mechanical modeling.
- ...
ASPHALT RUBBER APPLICATION: AN OPPORTUNITY FOR ITALIAN ROAD NETWORK?
Thank you for your attention
See you in Ancona

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