Cold recycling works and design of stabilised mixes for cold recycling of pavements in Estonia

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Background information

- The length of state road network in Estonia is 16 443 km
- 8477 km or 52 % of these roads are paved
- Approximately 100 km of asphalt-grouted pavements are repaired in Estonia annually.
Annually repaired pavements

Annually repaired asphalt pavements (km)

- 1995: 147 km
- 1996: 161 km
- 1997: 160 km
- 1998: 132 km
- 1999: 150 km
- 2000: 137 km
- Total: 887 km
Percentage of recycled pavements

Share of recycled pavements
Anually repaired pavements

KILOMETRES

YEAR


0 100 200 300 400 500 600 700 800 900 1000

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Causes necessitating the report are:

- Faults of longitudinal and cross section
- Uneveness in surfacing
- Longitudinal or cross cracks
- Insufficient bearing capacity
Shale-oil bitumen:

- Has good elongation features
- High adhesion with stone materials

But due to rapid agening:

- the bitumen in old surfacings has become extremely hard
- surfacings need softening
Important in designing the mix:

- The grain composition of the pavement being recycled
- The content and qualities of bitumen
An important conclusion

- The percentage of increase of amount of mineral aggregate (after milling) passing all openings of the mesh screen can be determined.
Figure 1 The change of the aggregate's gradation due to the milling the pavement

[Graph showing the relationship between passing percentage before and after milling.]
Regression analyses has derived ties between softening point and penetration of bitumen.

Figure 2 Relationship between the penetration and the softening point

1. Oil bitumen
2. Shale oil bitumen
Two different principles in the design of stabilised mixes.

1. Crushed asphalt is considered an independent grain material.
2. Crushed old asphalt is seen as composite material consisting of mineral aggregate and bitumen.
The amount of bitumen to be added depends on:

- The share of milled asphalt of the mixture, %
- Penetration of bitumen in the milled asphalt
- Bitumen content of the milled asphalt, % of weight of milled asphalt
- The proportion of material passing through the 0.063 mech screen opening of the designed rock material
Viscosity of new and old bitumen

- It is easy task when the new and old bitumen are viscous and their softening point can be determined.
- But in most cases the added bitumen is liquid shale oil bitumen.
The bitumen stabilised mixes in Estonia have norms:

- For permanent void content
- And moisture sensibility
All above factors are used in Estonia in the design of bitumen stabilised mixes. The correlations shown here consider the materials used in Estonia: therefore they can be different elsewhere. It is important, however, that there exists some mathematically expressed regularities, which enable to ease and speed up the design work.