INNOVATIVE TRIPLE SMA LAYER
FOR HEAVY DUTY PAVEMENTS

from idea to realisation

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Asfaltové vozovky – bezpečná cesta k prosperitě
Ageda

1. Introduction
2. New idea of asphalt pavements
3. Highly Modified Asphalt Binder (HiMA)
4. Triple SMA Layer for Heavy Duty Pavements
5. Realisation
TRIPLE SMA LAYER
from idea to realisation

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Roads for the Effective Refinement (EFRA) project

Construction site of EFRA Project. General view on the units and roads under construction.

517 mln EUR
Investment cost

STOP
Production of HFO

300 000 tons of PetCoke will be load and transport on the trucks outside the refinery.

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case study
### Idea of Perpetual Asphalt Pavements

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<tr>
<th>Layer Description</th>
<th>Thickness Range</th>
<th>Notes</th>
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<tr>
<td>WEARING COURSE</td>
<td>30-40 MM</td>
<td>Renewable wearing course (SMA, PA, …)</td>
</tr>
<tr>
<td>STIFF LAYER</td>
<td>100-175 MM</td>
<td>Stiff layer resistant to rutting (eg EME)</td>
</tr>
<tr>
<td>ELASTIC LAYER</td>
<td>75-100 MM</td>
<td>Elastic, fatigue resistant layer „ANTI FATIGUE“</td>
</tr>
<tr>
<td>SUBBASE</td>
<td></td>
<td></td>
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<tr>
<td>SUBGRADE</td>
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- **Area of high compression and shear:** 100 – 160 mm
- **Max. tensile strain:** ≤ 70 (+ 100) \(\mu m/m\)
- **Max. compressive strain:** ≤ 200 \(\mu m/m\)

Lit. e.g.: Newcomb at all, 2000
Binders used in the project. Highly Modified Bitumen (MODBIT HiMA)

HiMA are producing in accordance with requirements of EN 14023.
Why we have chosen HiMA to build new roads in Gdansk refinery?

In case of durability of asphalt pavements one of key aspect is to use the proper bituminous binder.

Properties of PMB acc. to EN14023

The difference of HiMA performance is especially well proven by testing the asphalt mix, or by using the performance related bitumen test method.
Performance related properties of bitumen - rutting

Highly Modified Bitumen 45/80-80 is showing the best values related to resistance to permanent deformation.

The results from DSR correlates with WTS rut rate (EN 12697-22)
Performance related properties of bitumen - fatigue

Fatigue characteristics of binders at 15°C, acc. to method TP 101-14, after EN 12607-1

\[ N_f = A(\gamma_{\text{max}})^B \]

Highly Modified Bitumen 45/80-80 was found as the best binder in case of resistance to fatigue

The results from DSR correlates with fatigue data received from asphalt test 4PBB (EN 12697-24)
### Original Asphalt Pavement

**Roads**

- 4 cm wearing course, AC
- 6 cm binder course, AC
- 10 cm base course, AC
- 10 cm subbase, aggregate 0/63
- 38 cm subbase, aggregate 0/63 (with geogrids)

- **Separation layer**, woven geotextile

### Original Concrete Pavement

**Squares**

- 23 cm concrete surface
- 8 cm base course, AC
- 10 cm subbase, aggregate 0/63
- 25 cm subbase, aggregate 0/63 (with geogrids)

- **Separation layer**, woven geotextile
PAVEMENT STRUCTURE – ORIGINAL PROJECT

- **Wearing course**: 4 cm, AC
- **Binder course**: 6 cm, AC
- **Base course**: 10 cm, AC
- **Subbase**: 10 cm
- **Aggregate 0/31.5; C90/3; CBR≥60% E2 ≥ 180 MPa**
- **38 cm subbase aggregate 0/63 placed on triaxial geogrid (hexagonal) E2 ≥ 100 MPa**
- **Separation layer**: woven geotextile
- **Subgrade soil**: E2 ≥ 50 MPa

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PAVEMENT STRUCTURE - TRIPLE SMA LAYER

- **5 cm, wearing course**: SMA 16 PmB 45/80-80
- **9 cm, binder course**: SMA 22 PmB 25/55-80
- **20 cm, subbase**: Aggregate 0/31.5; C90/3; CBR ≥ 60%; E2 ≥ 180 MPa
- **6 cm, anti-fatigue base course**: SMA 16 PmB 45/80-80
- **28 cm, subbase**: Aggregate 0/63 placed on triaxial geogrid (hexagonal); E2 ≥ 100 MPa
- **2.627 m² concrete pavement**

**TRIPLE SMA LAYER**

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Dynamic stiffness moduli [MPa]

Reduced frequency [Hz]
LEGEND:
- Pink: 3 layers of SMA
- Green: 2 layers of SMA
Fig 1., Fig.2. Paving of SMA 16 PMB 45/80-80 anti-fatigue base course
Fig 3. Paving control on site by using PQI sonde

Fig 4. Asphalt emulsion application
Fig 5. Paving of SMA 22 PMB 25/55-80

Fig 6. Layer of SMA 22 PMB 25/55-80
TRIPLE SMA LAYER FOR HEAVY DUTY PAVEMENTS

transport on binder course
Fig 6. Texture of SMA 22 PMB 25/55-80 (binder course)

Fig 7. Roughening of SMA 16 PmB 45/80-80 (wearing course)

Fig 8. End of paving Triple SMA Layer
THANK YOU FOR YOUR ATTENTION!