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Introduction Ooms PMB Products and services

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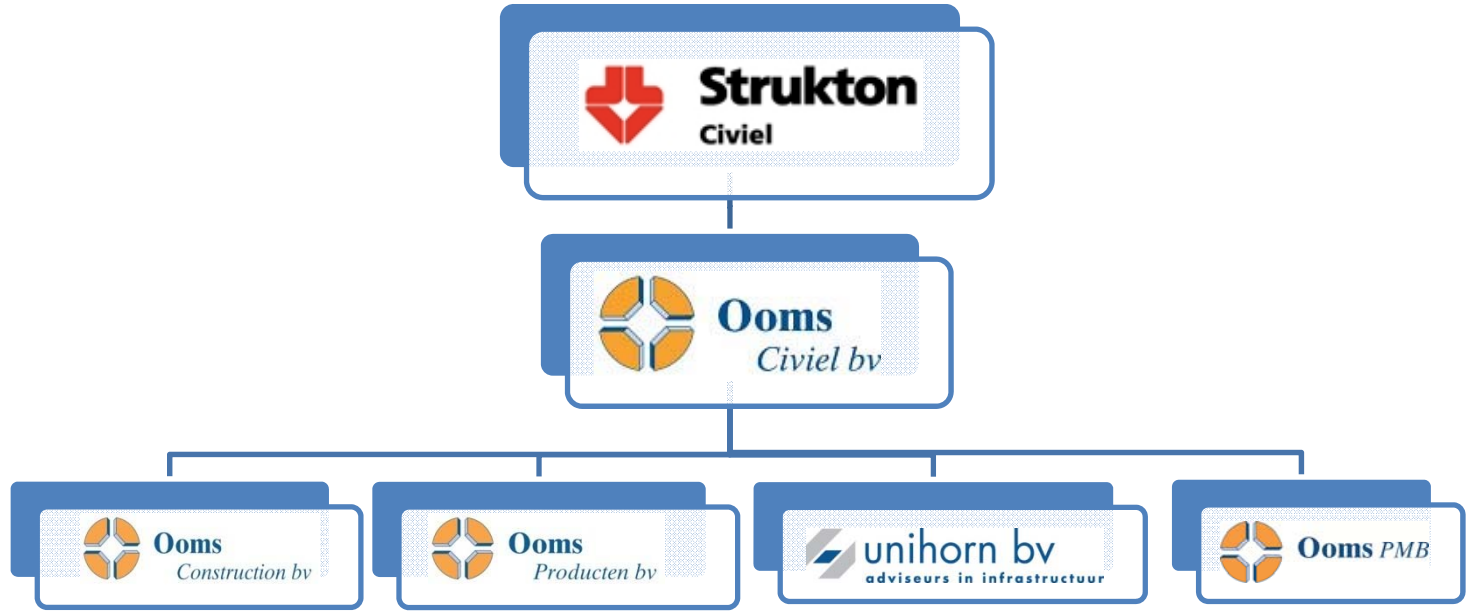

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Products

– Sealoflex® polymer modified bitumen

SEALOFLEX®

– GlasGrid® Asphalt reinforcement

GLASGRID® CG

Pavement Reinforcement System

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Sealoflex® technology

- Development started in the early seventies of the previous century
- Based on Styrene Butadiene Styrene (SBS) modification
- These polymers require certain special treatments
- The **Seal-O-Mat®** 'gelation' technology provides the required approach
- Stabilization of the polymer matrix chains into the bitumen maltene phase by chemical means
- Improved stress and thermal susceptibility features

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Sealoflex® advantages

- Less temperature susceptible
- Greater resistance to permanent deformation at higher temperatures
- Greater resistance to cracking and rutting at lower temperatures
- Improved fatigue resistance
- Improved adhesive / cohesive strength

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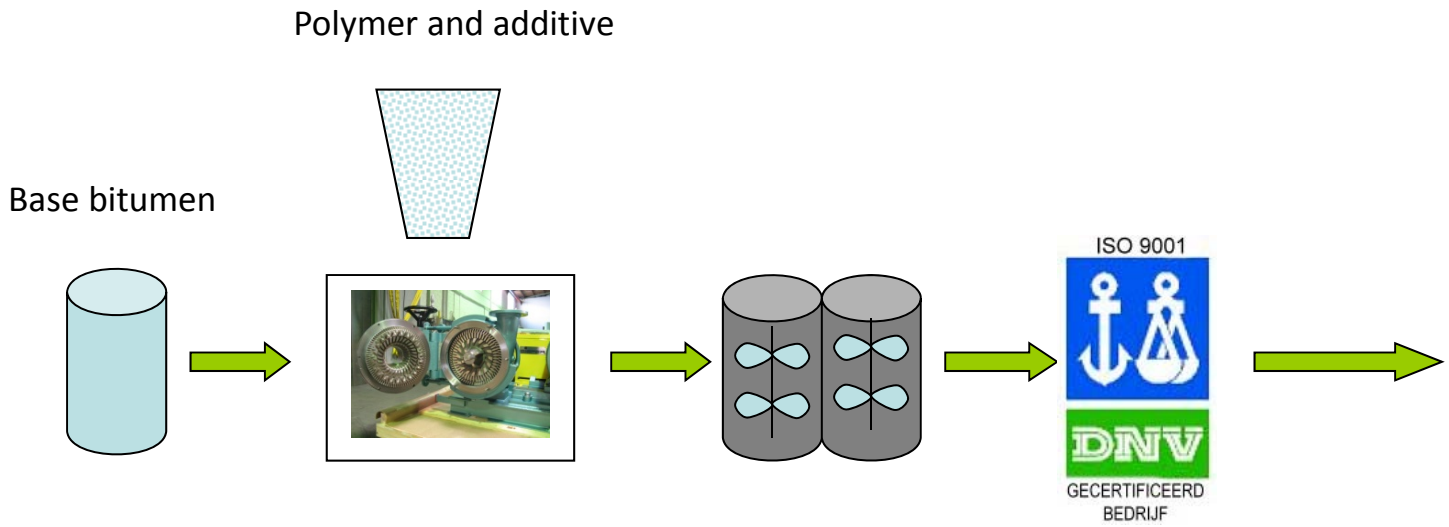
Sealoflex® process



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Sealoflex® processing plant

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Research Centre

Fully equipped laboratory

- Super pave binder testing (PG-Grade)
- Functional binder testing
- Mix design
- Functional mix testing

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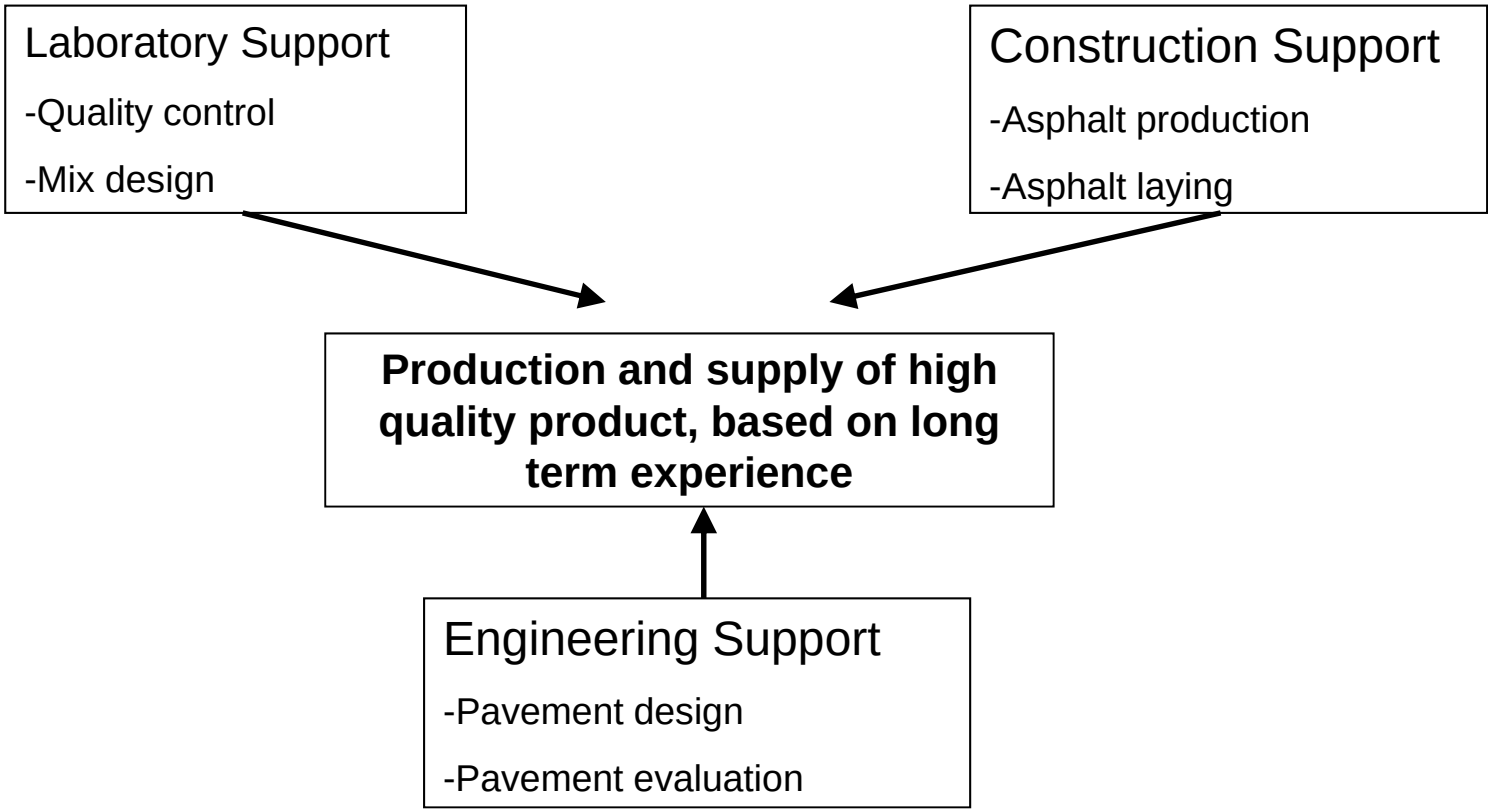
Our project approach



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Project: Buchardkai Terminal Hamburg

- **Scope**
  Development of heavy duty pavements with asphalt in 1997 (30.000m2)

- **Loads**
  - Automatic guided vehicles (AGV) 125 kN or more
  - Containers (corner loads/pressure) 65 kN

- **Sealoflex® 5-50 HS** was selected for its outstanding elastic properties and its very good behaviour at lower temperatures

- Relatively thin asphalt pavements were proposed (14-16 cm) instead of 26 cm before

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Project: Buchardkai Terminal Hamburg

- **Specifications of Sealoflex® 5-50 HS**

Test method	According to	Dimension	Sealoflex 5-50 HS
Penetration, 25 °C	EN 1426	mm x 0.1	40-70
Softening point R&B	EN 1427	°C	> 90
Breaking point Fraass	EN 12 593	°C	≤ -15
Viscosity, SR = 5/ s, 185 °C	EN 13 702-2	mPa x s	350-500
Force ductility, 5 °C Elongation till break Work capacity till break	EN 13 589	 cm J/cm²	 ≥ 25 ≥ 13.5
Elastic recovery	EN 13 398	%	≥ 90
Zero-shear viscosity 40 °C 60 °C	prEN 15 326	Pa x s	≥ 15 x 10^6 ≥ 5 x 10^6
Storage stability, difference in softening point R&B	EN 13 399	°C	≤ 2

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Project: Buchardkai Terminal Hamburg

- **Structure of the asphalt reinforcements**
  - Stone Mastic Asphalt (0/16S) 6 cm
  - Asphalt binder (0/16S) 8 cm
  - Gravel Load Bearing Layer (0/32) 30 cm

  Both asphalt layers contained Sealoflex® 5-50 HS

- **Evaluation after 10 years of use (by Prof. Dr. Ing, Damm)**
  - The surface areas are in an outstanding condition
  - Stacking block areas (4 containers high) : rutting depth <18mm, on average <10mm
  - Hardly any fretting in the structure of the rolling lane
  - Extension of normal service life by almost a factor of 2.5
  - Only area lasting longer than 10 years

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Project: Buchardkai Terminal Hamburg

- **Impressions after 10 years of use**

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Project: A45 Weston Favell – Billing trunk Road

- **Scope**

  Highly innovative surfacing treatments on the A45 Billing trunk road. The original reinforced concrete pavement had been overlaid 7 years earlier with a Safepave® surface layer. Works started in May 2008.

- **Design criteria required by the Highway Agency**
  - Shorten the 8 week program to 5 by not removing damaged concrete bays
  - Provide a design life of 95% crack free for more than 10 years
  - Provide texture depth and skid resistance to HA requirements
  - Provide a durable long life surfacing not prone to raveling/loss of texture with a total thickness of <50mm

- A combination of **GridSeal®** and **Sealoflex® SFB5-50 (HT)** was selected for the job

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Project: A45 Weston Favell – Billing trunk Road

- **Specifications of Sealoflex® SFB5-50 (HT)**

PROPERTY	TEST METHOD	SPECIFICATION	CLASS
Essential requirements			
Penetration at 25 °C	EN 1426	65 – 105 [0.1 mm]	6
Softening Point R&B	EN 1427	≥ 90 °C	2
Cohesion Force-ductility at 5 °C	EN 13589 / EN 13703	≥ 6.5 J/cm^2	2
Change of Mass after hardening	EN 12607-1	≤ 0.3% m/m	2
Retained penetration after hardening	EN 12607-1 / EN1426	≥ 60%	7
Increase in softening point after hardening	EN 12607-1 / EN1427	≤ 8 °C	2
Flash Point	EN ISO 2592	≥ 250 °C	2
Additional requirements			
Fraaß breaking point	EN 12593	≤ -15 °C	7
Elastic recovery at 25 °C	EN 13398	≥ 90 %	1
Storage stability Difference R&B $_{top}$ – R&B $_{bottom}$	EN 13399	≤ 2 °C	1

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Project: A45 Weston Favell – Billing trunk Road

- **Structure of the reinforcement**
  - 20mm levelling course over the concrete pavement
  - Installation of 56.000 m2 GridSeal® (GlasGrid® 8501 with 2.0 kg/m2 Sealoflex® SC-4 hot bitumen spray)
  - Overlay with 50mm Sealoflex® SFB5-50 HT 0/14 SMA surface course (6200 ton Polymer Modified Asphalt)

- **Performance and conclusions after one year**
  - A visual inspection was made after one year (control test section)
  - The combination of polymer modified SMA with GridSeal® reinforcement interlayer is performing very well (only 1 possible undefined crack)
  - Design is performing to the expectations of the designers and the client
  - The resulting benefits of the design included time, cost savings as well as improved bearing capacity

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Project: A45 Weston Favell – Billing trunk Road

- **Performance and conclusions after four year (April 2012)**
  - Within 4 years there is no discernible damage showing in the surface in the way
  - No cracking or other failure on the Sealoflex® sections
  - The Sealoflex® sections have retained its original high degree of texture

Project: Amsterdam Schiphol Airport

- **Scope**

  Supplied and laid more than 1,000,000 tons of Sealoflex® Polymer Modified Asphalt between 1990 – 2005 divided over 18 projects.

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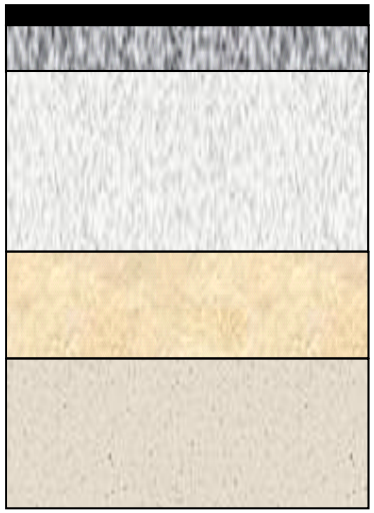
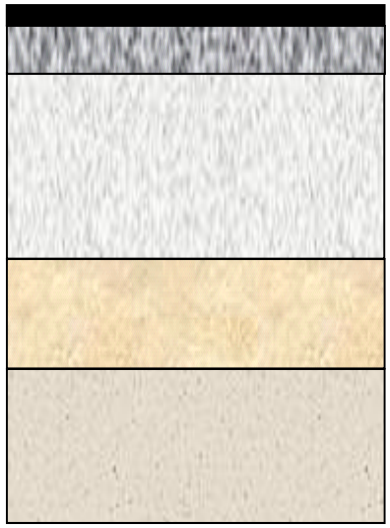
Project: Amsterdam Schiphol Airport

- **Pavement Specifications**
  - After an extensive research program in 1990 Schiphol Airport decided to use Sealoflex® SFB5-50 for all the asphalt pavement structures to be built
  - Sealoflex® SFB5-50 was even mentioned by name in the specifications

Original



Sealoflex® Alternative



70 mm Layer thickness reduction!

Project: Amsterdam Schiphol Airport

- **Decisive factors in choosing Sealoflex®**
  - The best resistance with respect to crack resistance (#1 factor)
  - Substantial reduction in layer thickness (70 mm!)
  - High resistance to permanent deformation
  - The good workability of the product
  - Low environmental contamination potential

- **Performance and evaluation**
  - The Sealoflex® asphalt is still in good condition (after 10-15 years)
  - No major renovation works are conducted

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Other references

Country	Project	Year	Tons PMA
Netherlands	Euromax Terminal	2010	320.000
India	New Delhi International Airport	2009	420.000
Jordan	Queen Alia International Airport	2008	100.000
Malta	Malta International Airport	2008	20.000
Bulgaria	Sophia International Airport	2006	164.000
Jordan	Queen Alia International Airport	2005	130.000
Kazakhstan	Atyrau Airport	2005	100.000
Egypt	Cairo International Airport	1998	260.000

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Thank your for your attention