IKA® Technology for bitumen industry
The IKA® fields of activity

LABORATORY TECHNOLOGY

PROCESS TECHNOLOGY

ANALYTICAL TECHNOLOGY
The IKA® subsidiaries worldwide

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  Wilmington, USA

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- IKA® Korea
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- IKA® Japan K.K.
  Osaka, Japan

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  Bangalore, India

Malaysia
- IKA® Works (Asia) Sdn Bhd
  Selangor, Malaysia

China
- IKA® Works Guangzhou
  Guangzhou, China
1. Continuous production of Polymer modified Bitumen PmB
What is polymer-modified bitumen?

Polymer modified bituma (PMB) are mixtures produced from:

- bitumen
  and
- polymers

in which the polymers change the visco-elastic behaviour of the bitumen and thus make this binder more suitable for different stresses.
What are polymers?

For modified bitumen mainly the following polymers are used:

- SBS - styrene-butadiene-styrene-copolymer
- EVA - ethylene-vinyl acetate-copolymer
How is PMB continuously produced?

inlet bitumen

DR 2000/50-PB

cross-links

SBS 1

SBS 2

PMB storage
The Bitumen DISPAX® DR-PB was developed as a combination of the in-line powder incorporation machine MHD and the three stage DR high shear disperser.
The machine

Following sizes are available:

- DR2000/10 - PB
- DR2000/20 - PB
- DR2000/30 - PB
- DR2000/50 - PB

(PB = polymer bitumen)
The machine

Performance "Bitumen-Dispax"
DR 2000/50-PB, 160 kW

Material properties:
1. Bitumen 50/70
   t = +165°C
2. SBS
   diameter: ~4 mm
   length: ~6 mm
   density: 0.3 kg/dm³
The machine

Technical data

<table>
<thead>
<tr>
<th></th>
<th>DR 2000/10-PB</th>
<th>DR 2000/20-PB</th>
<th>DR 2000/30-PB</th>
<th>DR 2000/50-PB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power:</td>
<td>18,5 kW</td>
<td>45 kW</td>
<td>75 kW</td>
<td>160 kW</td>
</tr>
<tr>
<td>Throughput:</td>
<td>2,5 t/h</td>
<td>6 t/h</td>
<td>15 t/h</td>
<td>35 t/h</td>
</tr>
<tr>
<td>Max. throughput bitumen:</td>
<td>2.500 l/h</td>
<td>6.000 l/h</td>
<td>15.000 l/h</td>
<td>35.000 l/h</td>
</tr>
<tr>
<td>Max. throughput polymer: (at a bulk density of approx. 0,3 kg/dm³)</td>
<td>400 l/h</td>
<td>900 l/h</td>
<td>3.700 l/h</td>
<td>8.000 l/h</td>
</tr>
<tr>
<td>Viscosity of final product:</td>
<td>approx. 200 - 1.000 mPas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delivery height:</td>
<td>max. 10 m (ca. 1 bar)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content of polymer:</td>
<td>0,1 - 15%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The machine

DR 2000/50-PB
The trial plant

A complete trial plant for bitumen production type DR 2000/10-PB is available for trials at site.
We offer stand-alone machines and complete PMB production plants with capacities of up to 35 t/h of PMB.
Complete IKA® PMB production plants consist of the following components:

- Bitumen heating tank, with stirrer
- Pumps
- Filters
- Flow meter
- Solids dosing
- Bitumen DISPAX-REACTOR®-PB
- Heated pipelines
- PMB storage tank, heated with stirrer
- Electric control
Bitumen pumps

**Gear pumps**
- to fill the bitumen heating tank
- to feed the hot bitumen in the continuous disperser
- for pumping of the PMB to the storage tanks

<table>
<thead>
<tr>
<th>Throughput:</th>
<th>approx. 10,000 to 30,000 l/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power:</td>
<td>11 – 15 kW</td>
</tr>
<tr>
<td>Material:</td>
<td>cast steel</td>
</tr>
<tr>
<td>Specification:</td>
<td>incl. a heating jacket and directly mounted safety valve</td>
</tr>
</tbody>
</table>
**Tank**

Bitumen heating tank with stirrer to heat up the bitumen prior to the incorporation of polymer.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Useful volume</td>
<td>60 m³</td>
</tr>
<tr>
<td>Stirrer power</td>
<td>11 kW</td>
</tr>
<tr>
<td>Material</td>
<td>carbon steel St 37</td>
</tr>
<tr>
<td>Execution</td>
<td>incl. heating coils and insulation</td>
</tr>
</tbody>
</table>
Flow meter

High temperature flow meter
for measurement of the bitumen flow from
the second pump to the disperser.

<table>
<thead>
<tr>
<th>Measuring principle:</th>
<th>Coriolis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throughput:</td>
<td>up to 30,000 kg/h</td>
</tr>
<tr>
<td>Specification:</td>
<td>carbon steel St 37</td>
</tr>
</tbody>
</table>
Solids dosing

Solids dosing unit
for gravimetric continuous dosing of the SBS granules into the disperser DR 2000/50-PB

<table>
<thead>
<tr>
<th>Feed rate:</th>
<th>200 up to 2.200 kg/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material:</td>
<td>stainless steel AISI 316 or better</td>
</tr>
<tr>
<td>Specification:</td>
<td>with 1.500 ltr dosing vessel, disaggregator and analogue weighing system</td>
</tr>
</tbody>
</table>
High shear dispersing machine type DISPAX-REACTOR®-PB
for continuous wetting, mixing and dissolving of the SBS into the hot bitumen.

<table>
<thead>
<tr>
<th>Total capacity:</th>
<th>up to 30,000 ltr/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor power:</td>
<td>160 kW</td>
</tr>
<tr>
<td>Material:</td>
<td>stainless steel AISI 316Ti</td>
</tr>
<tr>
<td>Specification:</td>
<td>incl. double jacket and locking pressure system</td>
</tr>
</tbody>
</table>
**Tank**

- **Bitumen storage tank with stirrer**
  - for storage of the finished polymer modified bitumen (PMB) prior to loading.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Useful volume</td>
<td>~ 100 m³ each</td>
</tr>
<tr>
<td>Stirrer power</td>
<td>15 kW</td>
</tr>
<tr>
<td>Material</td>
<td>carbon steel St 37</td>
</tr>
<tr>
<td>Execution</td>
<td>incl. heating coils and insulation</td>
</tr>
</tbody>
</table>
Heating unit

Heating unit for thermal oil
for heating of the complete plant, i.e.: tanks, pumps, double jacketed bitumen pipelines, dispersing machine.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating capacity:</td>
<td>700 kW</td>
</tr>
<tr>
<td>Max. operating temperature:</td>
<td>280°C</td>
</tr>
<tr>
<td>Pump delivery:</td>
<td>50 m³/h</td>
</tr>
</tbody>
</table>
Control

Electric control
The control system includes:

- programmable logic control (PLC)
- control of all process streams
- safety interlocks
- weighing system
- motor control centre incl. the frequency converters
Control

Functions
The plant is operated via a Human Machine Interface (graphical operator terminal with touch screen).

Following functions are available:

- Automatic/manual control
- Limit value adjustment and control
- Alarm handling
- Safety interlocks
PMB production plant: Flow sheet
PMB production plant DR 2000/50-PB
PMB production plant DR 2000/20-PB
Technical conditions

Bitumen characteristics:

- Temperature: min. +160°C to max. +190°C
- Viscosity at working temperature: max. 400 mPa·s
- No impurities

Polymer (SBS-Polymer) characteristics:

- Bulk density: min. 300 to max. 450 kg/m³
- Particle size: length max. 6 mm, diameter max. 4 mm
- No impurities, especially no metal

Cross-links characteristics:

- Bulk density: min. 800 to max. 1.100 kg/m³
- Particle size: length min. 1 mm, max. 5 mm
- No impurities, especially no metal
Benefits

• Direct mixing and dispersing in one machine
• Constant quality of the final product
• Less process steps
• Less time consuming
• The ability to produce different quantities with varying SBS concentrations
• Reduction of (expensive) SBS while maintaining constant quality of the PMB
• Higher flexibility regarding production quantities
• Less space requirement for machines and storage
2. Production of bitumen emulsions
Bitumen emulsion plant
Bitumen emulsion plant

High speed IKA Colloid Mill with adjustable gear gap
Bitumen emulsion plant
Bitumen emulsion plant

EPB 2500
Bitumen emulsion plant

EPB 2500
Bitumen emulsion plant
Bitumen emulsion plant
Bitumen emulsion plant

EPB 15000
Bitumen emulsion plant

EPB 15000
customized plant
R&D bitumen emulsion plant

R&D plant
capacity 200 ltr/h
R&D bitumen emulsion plant
R&D bitumen emulsion plant
R&D bitumen emulsion plant
R&D bitumen emulsion plant
Benefits

- Improved emulsion stability is attained by a narrow particle distribution
- Specialty emulsions with up to 75 % binding material mass can be produced
- Particle sizes of 2.0 micron to 2.2 micron $d(50)$ are typically achieved
- Mixing at temperatures over 100 °C is possible