Binder with a proven track record worldwide.

Foamed bitumen
Fit for the future with foamed bitumen.

HIGH-QUALITY, COST-EFFICIENT, ENVIRONMENTALLY FRIENDLY, AND FUTURE-PROOF: COLD RECYCLING WITH FOAMED BITUMEN, THE INNOVATIVE BINDING AGENT. INEXTREMEABLY TIED TO THE NAME OF WIRTGEN, THE PIONEER IN FOAMED BITUMEN. OUR VISION TO FULLY REALIZE THE POTENTIAL INHERENT IN THE FOAMED BITUMEN TECHNOLOGY HAS MATURATED INTO MANY YEARS OF PROVEN EXPERTISE AND EXPERIENCE. ALWAYS IN LINE WITH CUSTOMER REQUIREMENTS. CLOSE TO OUR CUSTOMERS. THE ROAD CONSTRUCTION MATERIAL OF TOMORROW HAS SCORED TOP MARKS WITH COUNTLESS USERS AROUND THE GLOBE EVEN TODAY.
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A BINDING AGENT OFFERING LOTS OF POTENTIAL

Cold recycling with foamed bitumen has become an established technology worldwide and is now increasingly moving into the focus of road authorities and construction companies for use in the rehabilitation and new construction of road pavements.

Cold recycling with foamed bitumen produces flexible and highly durable base layers. Being a part of the pavement structure, these are the perfect foundation for the final asphalt overlay to be built at reduced layer thickness. Foamed bitumen is produced from approx. 175 °C hot road-grade bitumen using state-of-the-art technology. Microprocessor-controlled injection systems installed in the WIRTGEN recyclers produce the foamed bitumen and inject it into the mineral aggregate in precisely metered quantities.

The perfectly engineered process impresses with:
> exceptionally high durability of layers
> economic viability
> saving of natural resources
> reduction of CO₂ emissions
> reduction of construction times.

The foamed bitumen is injected into the mixing chamber in precisely metered quantities via special injection systems. Microprocessors...
PRODUCING FOAMED BITUMEN

Foamed bitumen is produced by foaming standard road-grade bitumen. In the process, small amounts of water and air are injected into the hot bitumen at high pressure, which results in the bitumen foaming and expanding to around 20 times its original volume. The bitumen foam is then injected into a mixer via injection nozzles. It is eminently suitable for mixing with cold and moist construction materials. The new material – frequently produced using reclaimed asphalt pavement (RAP) – is called BSM (bitumen-stabilized material).
History of the foamed bitumen technology

WIRTGEN – A PIONEER IN FOAMED BITUMEN

In 1956, Professor Ladis Csanyi from Iowa State University (USA) was the first to recognize the suitability of foamed bitumen for use as a binding agent. This technology was later refined by Mobil Oil. Mobil Oil developed the first expansion chamber in which bitumen was mixed with water to produce bitumen foam. WIRTGEN has taken the lead in the industry since the 1990s in working with this innovative binding agent. Integrating the system into the WIRTGEN recyclers in 1995 finally sparked the interest of industry peers.

The WR 2500 was the first recycler to be fitted with this system. In 1997, WIRTGEN additionally developed the WLB 10 foamed bitumen laboratory unit to enable the production of foamed bitumen in the laboratory. Well over 300 laboratory units have since been sold around the globe, used by contractors, construction materials testing laboratories, institutes, universities and consulting engineers. Today, WIRTGEN offers its customers a fleet of state-of-the-art cold recyclers equipped with foamed bitumen technology for in-situ or in-plant cold recycling applications.
Foamed bitumen has gained acceptance worldwide

AN INTERNATIONALLY ESTABLISHED TECHNOLOGY

The success and approval gained in over 90 countries and across almost all climates reflect the high level of acceptance for the use of foamed bitumen as a binding agent. The technology is preferably used wherever road pavements are exposed to high traffic volumes or particularly economical and sustainable construction is required.

The foamed bitumen technology offers a truly forward-thinking solution and is used in both structural rehabilitation and new construction projects.

Mixes containing foamed bitumen are construction materials capable of meeting the highest requirements. Using the innovative binding agent in all climatic conditions and in pavements subject to the highest traffic volumes has stood the test: in excess of 2,500 machines from the broad range of WIRTGEN recyclers are currently in operation around the globe.
IN EXCESS OF 100 MILLION SQUARE METRES HAVE MEANWHILE BEEN RECYCLED IN NUMEROUS COUNTRIES AROUND THE WORLD USING FOAMED BITUMEN AS A BINDING AGENT.
DETERMINING THE FOAMED BITUMEN QUALITY IN ADVANCE

Preliminary testing with the mobile WLB 10 S foamed bitumen laboratory unit enables the foamed bitumen quality to be precisely determined in the laboratory even prior to the start of construction. Extremely simple handling enables parameters such as the water quantity, air pressure and temperature to be varied quickly and easily.

The quality of foamed bitumen is primarily described in terms of its expansion ratio and half-life.

Production of foamed bitumen in the laboratory

Small amounts of water cause an abrupt increase in volume of the hot bitumen (foamed bitumen).
The WLB 10 S foamed bitumen laboratory unit is used for:

- general testing of the types of bitumen used to determine their suitability for the foaming process.
- optimizing the foaming process by adjusting the temperature and the quantity of water to be added.
- mix production in the laboratory using different rates of bitumen application.

For mix production in the road laboratory, the WLB 10 S is connected directly to the WLM 30 twin-shaft pugmill mixer. The foamed bitumen produced by the WLB 10 S is then injected into the mixing process taking place in the WLM 30. The materials are mixed precisely and without any losses. Mixes for the manufacture of test specimens are thus produced in next to no time.
Properties of BSM (bitumen-stabilized material)

USING BSMS IN THE FIELD

Easy workability is one of the distinctive features of BSM mixes. When sufficiently moist, there are no time limitations for the subsequent compaction process. Yet another very important hallmark of BSM layers is that they can be opened to traffic temporarily immediately after completion.

In many cases, the cold recycled layer is simply surfaced with a thin asphalt layer serving as a wearing course. Road maintenance interventions also focus on the asphalt surface course, leaving the cold recycled layer undisturbed. This approach pays off in low road maintenance costs.

MATERIAL STRUCTURE

Cold mixes produced with foamed bitumen behave like a construction material with constant inter-particle friction but significantly increased cohesion (adhesion force) and strength. This type of material is also called BSM (bitumen-stabilized material).

BSM mixes do not involve coating of the aggregate but homogeneous mixing of the bitumen binder and aggregate. Typical bitumen quantities range between 1.5% by mass and 2.5% by mass of the mixed material. After final compaction, the material is characterized by good flexible properties and high bearing capacity. It has a proven track record around the globe.
Addition of:
2.2 % bitumen
1.0 % cement
(identical density and moisture content)

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<th>AGGREGATE CRUSHED AS PER GRADING CURVE</th>
<th>BITUMEN-STABILIZED MATERIAL</th>
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<td>Cohesion: 30 to 55 kPa</td>
<td>Cohesion: 200 to 300 kPa</td>
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<tr>
<td>Angle of friction: 43 to 51°</td>
<td>Angle of friction: 40 to 49°</td>
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Material treated with foamed bitumen is distinctive for its optimal strength and bearing capacity.
Use on the construction site – in-situ or in-plant

COLD RECYCLING IN-SITU

Cold recycling with foamed bitumen can be performed either in-situ (on site) or in-plant (in a mixing plant).

When cold recycling in-situ, a cold recycler granulates the damaged road pavement while at the same time mixing in foamed bitumen, water and cement in the required quantities. This method produces a new, homogeneous construction material (BSM) in a single operation. The in-situ cold recyclers are equipped with a powerful milling and mixing rotor and an injection system.

Some models are additionally fitted with a screed for paving and pre-compaction of the new material mix.
COLD RECYCLING IN-PLANT

When cold recycling in-plant, the pavement material is removed and transported to a mobile cold mixing plant located in the vicinity of the construction site. The milled material is then processed with foamed bitumen, water and cement in the required quantities to produce a new, homogeneous cold mix (BSM) which is suitable for immediate placing true to line and level or can be placed in stockpile for later use.

STATE-OF-THE-ART INJECTION SYSTEM

Highest quality guaranteed: a thermostat-controlled heating system maintains the specified operating temperature of the entire injection system at all times both prior to and during the foamed bitumen production. This feature dispenses with having to flush the system after breaks in operation or at the end of the working day.

The foaming process and application rates are governed by microprocessor control.

The powerful twin-shaft continuous mixer installed in the KMA 220 mixes the milled material and foamed bitumen injected into the process.
Cold mixes containing foamed bitumen

CONSTRUCTION MATERIALS IN-SITU

Generally, all granular construction materials - and RAP materials - are suitable for recycling with foamed bitumen. WIRTGEN recyclers granulate both the asphalt layer and the underlying layer, mixing the material with foamed bitumen in-situ in a single operation. After compaction, a high-quality bituminous base layer has thus been produced that is capable of withstanding extremely high traffic loads.

RAP MATERIAL IN-PLANT

The RAP material recovered by a WIRTGEN cold milling machine can usually be processed right after milling or placed in stockpile for an extended period of time.

The mobile WIRTGEN KMA 220 cold mixing plant uses this source material to produce cold mix in-plant for subsequent reuse by a Vögele asphalt paver.
RECOVERED AND NEW MATERIALS

Materials recovered from existing pavements, recycling materials and new materials are processed using appropriate crushing and screening technology and are subsequently mixed with foamed bitumen in the KMA 220 cold mixing plant. All road construction materials with suitable grading characteristics are qualified for recycling with foamed bitumen.

LABORATORY TESTING

The performance of specimens manufactured in the laboratory from a previously produced mix is verified by means of mix design testing.

Optimum mix formulations usually include 1.5% by mass to 2.5% by mass of foamed bitumen and approx. 1.0% by mass of cement. The low application rates of foamed bitumen and cement required guarantee highest efficiency
LOW OVERALL COST

The pavement structures depicted in the chart are examples of three different construction classes. These construction methods are especially economical in terms of construction costs due to low binder requirements, the use of RAP material and fast completion times.

Reducing the thickness of the asphalt overlay results in additional, significant cost reductions.

In addition, maintenance costs are extremely low. Unlike ageing conventional asphalt layers, BSM layers are not prone to cracking, which requires only the upper, thin asphalt surfacing to be replaced at regular intervals. Cost-intensive replacement of the asphalt pavement at full depth is not required.

Owing to the advantages offered by the construction method and their exceptional material properties, bitumen-stabilized materials are increasingly used also in Public Private Partnership (PPP) projects.
Homogeneous asphalt mix processed by the WR 240 cold recycler.

AC = asphalt surface course
BSM = bitumen-stabilized material
CBR = California Bearing Ratio
ESAL = equivalent standard axle load (= 8.16 t)
Wide range of applications from a single source

As foamed bitumen offers numerous advantages, it enjoys a prominent position among the range of binding agents. Adding foamed bitumen to granulated asphalt enables the material to be recycled 100% even in cold condition.

Processing without having to heat the source materials results in a huge reduction of CO₂ emissions.

Low application rates of only 1.5% to 2.5% of the total mass incur correspondingly low costs. Road-grade bitumen can be obtained worldwide and is suitable for immediate use without requiring additional processing. Construction materials mixed with foamed bitumen can be placed, compacted and reopened to traffic immediately, thus minimizing construction times and disruptions to traffic.
Simultaneous injection of foamed bitumen and cement slurry by the WR 4200 cold recycler.

Bitumen can be obtained worldwide and is added to the mixing process after foaming at a temperature of approx. 175 °C.
Material for the highest environmental standards

ROAD REHABILITATION
THE ECOLOGICAL WAY

Protecting the environment and ensuring profitability are not mutually exclusive goals. This basic principle is confirmed by combining the resource-efficient foamed bitumen technology with environmentally friendly WIRTGEN machine engineering.

The process draws on recycled material, with binders being the only substances added. In addition, fewer truck transports polluting the environment are required compared to new construction.

- Recovered, bound and unbound road construction materials are recycled 100%.
- The number of truck transports to and from site is reduced by up to 90%, relieving strain on the road network.
- Cold recyclers complete several work steps in a single machine pass.
- The fast-paced construction method minimizes space requirements and environmentally harmful disruptions to traffic.
- Around 10 to 12 litres of fuel per tonne of paving material are saved in comparison with conventional rehabilitation methods (hot mix).
- Fuel consumption and emission levels are reduced further by state-of-the-art engine technology featuring intelligent control systems.
- The KMA 220 mobile cold recycling mixing plant enables processing in-plant in the vicinity of the construction site.
We see ourselves as an innovative specialist for the highly efficient cold recycling technology. In addition to the machinery required for the process, we offer customers a comprehensive range of services. In close cooperation with users in the field, we are driving the development of new products. We then share our experiences with industry peers to enable our customers to benefit from new markets opening up. Consulting services offered at specific project and target group levels are yet another strong point guaranteeing a made-to-measure, cost-effective recipe for success.

The global WIRTGEN service network with its sales and service companies offers professional customer support. Our employees keep up to date on foamed bitumen by attending regular trainings providing theoretical and practical knowledge.
1. Our trade show presentations, real-life demonstrations, articles in trade journals and expert lectures create awareness for foamed bitumen in all parts of the world.

2. Multi-lingual documents compiled by experts provide in-depth information on the application of the cold recycling technology.

3. Operating personnel around the globe is trained and supported in field operation by experienced trainers.

4. WIRTGEN experts provide customized and application-based support right on the job site.