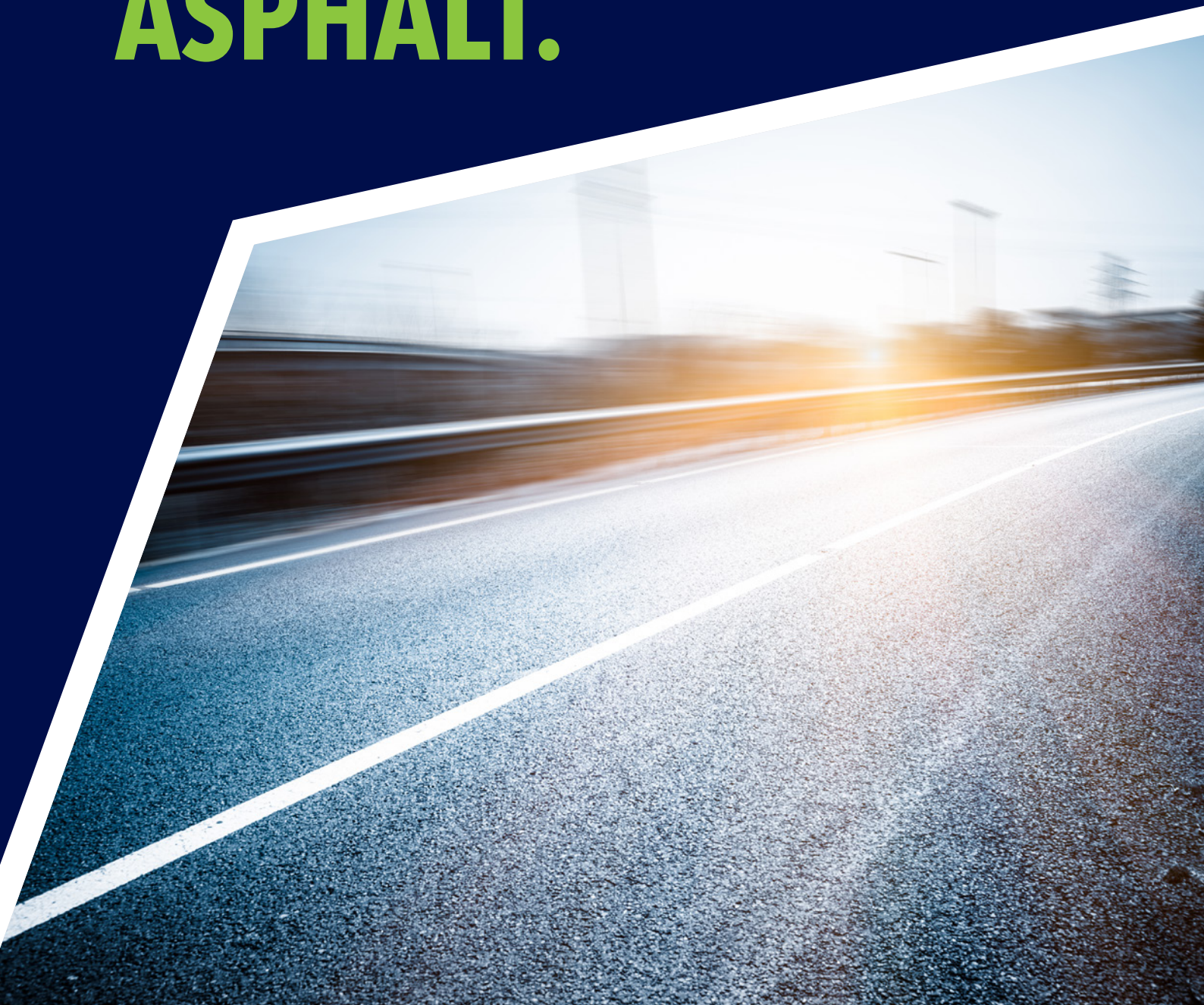


aspha-min[®]

**JUST
WARM MIX
ASPHALT.**



CONTENTS

Introduction	4
Development	5
Application.....	6
Instructions.....	9
Lab Testing	13

INTRODUCTION



aspha-min® is a finely granulated, synthetic zeolite-based additive designed for the production of warm mix asphalt (WMA) and low-viscosity hot mix asphalt (HMA). The additive functions through a physical mechanism: the release of chemically bound (crystallised) water generates micro-pores within the binder, producing a controlled foaming effect (indirect foaming). This temporarily increases the effective binder volume, reduces binder viscosity, and thereby improves the workability and compactability of the asphalt mixture.

The use of **aspha-min®** enables a reduction in asphalt mixing and paving temperatures of approximately 30 K. Intentional temperature reduction at the asphalt plant lowers energy demand and helps protect workers, the environment, and equipment. Reduced temperatures also allow time-critical construction projects to be completed and opened to traffic more rapidly.

When used in conventional hot mix asphalt, **aspha-min®** significantly enhances workability and compactability, particularly when working with stiff or modified binders, under adverse weather or haulage conditions, and during manual paving operations.

DEVELOPMENT

The application of **aspha-min®** is among the earliest and most well-established WMA technologies. It originated in the mid-1990s from research and development activities conducted by Mitteldeutsche Hartstein-Industrie AG (MHI) in Hanau, Germany – a family owned company with decades of experience in aggregate production, asphalt manufacturing, and asphalt road construction.

These developments have received numerous international awards, including the Prix de l'Innovation Vinci (2001), Certificat Innovation Autoroutière (2005), Prix Innovation de la FNTF (2005), and Grand Prix de l'Innovation du SMCL (2005) in France, as well as the Hazard Protection Prize (2002) in Germany.

Since 1997, an extensive track record of reference projects across Europe and overseas has demonstrated and confirmed the long-term performance and sustainability of warm mix asphalt produced with **aspha-min®**.



APPLICATION

Warm Mix Asphalt (WMA)

aspha-min® allows asphalt to be mixed and paved at significantly reduced temperatures, resulting in a substantial decrease in energy consumption and markedly reduced thermal stress on both the binder and equipment.

Lower consumption of fossil fuels leads to a significant reduction in emissions of carbon dioxide (CO₂), nitrogen oxides (NO₂), and volatile organic compounds (VOCs) during asphalt production.

At the paving site, reduced asphalt temperatures notably improve working conditions by decreasing odour, vapour, and aerosol exposure.



In Germany, emission reduction measures for asphalt works in tunnels have been mandatory since 2007. In this context, the use of **aspha-min®** has proven to be particularly effective.



Measurements obtained during field trials have shown that the use of **aspha-min®**, combined with reduced paving temperatures, results in a substantial decrease in bitumen vapours and aerosols. For example, reducing the mixing temperature by 26 °C achieved a 74 % reduction in ultrafine particle emissions, accompanied by a noticeable reduction in odour.

Since November 2019, Germany has applied a much more stringent occupational exposure limit for vapours and aerosols from hot bitumen of 1.5 mg/m³. Although the obligation was temporarily suspended for five years, it must be fully considered in risk assessments from 2027 onwards.

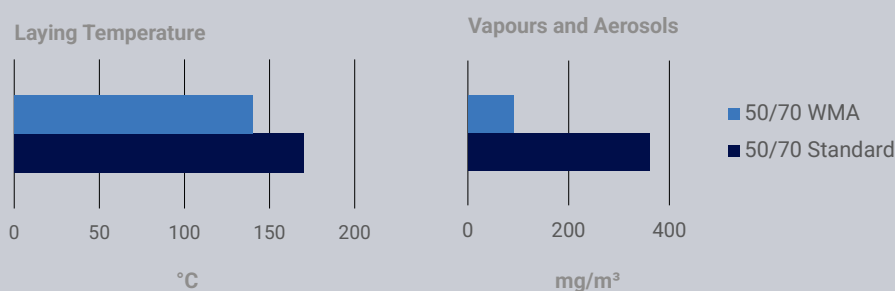
Comprehensive compliance with this limit value can generally only be achieved through a combination of warm mix asphalt and paving equipment with effective vapour extraction systems.

Additional operational benefits of WMA with **aspha-min®** include significantly improved logistics for projects under extreme time constraints, such as airport paving, urban traffic corridors, and heavily trafficked highways that are increasingly constructed at night or under very short closure windows. Warm mix asphalt enables earlier opening to traffic.

In tramway track construction, particularly where timber sleeper tracks are used, reduced paving temperatures minimise tensile stresses in the steel rails.

Furthermore, all asphalt components experience lower thermal exposure, including polymers, fibres, and the bitumen itself—positively influencing the service life and durability of the asphalt pavement.

Case Study: Emission Reduction with a 50/70 PG Bitumen



Practical example of a 26K temperature reduction leading to a 74% reduction in emissions.

Low Viscosity Hot Mix Asphalt

In addition to its established use in warm mix asphalt, **aspha-min®** is highly effective as a workability and compaction aid in conventional hot mix asphalt.

With continuously rising quality standards in asphalt road construction, innovations such as thin layers, high modulus mixtures, and stiff or heavily modified binders have made paving operations increasingly demanding. Construction windows are becoming shorter, night paving more frequent, and the risk of penalties due to insufficient compaction has increased. At the same time, achieving target compaction is critical to pavement performance and longevity.

When used in hot mix asphalt, **aspha-min®** significantly improves the workability and compactability of the mix. This reduces compaction risks in thin layers, high modulus asphalt, and under unfavourable weather conditions. **aspha-min®** effectively extends the compaction window, which can be decisive under such circumstances.

Adequate workability can be maintained at temperatures as low as 100 °C. In contrast to some other technologies, **aspha-min®** does not alter the ring and ball softening point or any other binder properties, nor does it cause premature stiffening of the mix. Consequently, no additional or higher requirements are imposed on paving or compaction operations.

aspha-min® has proven particularly suitable for hand placed asphalt, for example in confined urban environments such as between tram rails, where improved workability and ease of compaction are essential.

Reliable compaction under challenging conditions reduces maintenance needs and improves pavement durability—saving energy, raw materials, and public funds while enhancing overall sustainability in road construction.

Examples of Use as a Compaction Aid:



Cold and wind



Thin layers



Manual laying



Long distance hauling

As a compaction aid, **aspha-min®** has been helping construction companies overcome difficult paving situations for many years.

INSTRUCTIONS

Principle of Action

aspha-min® contains approximately 20% chemically bound (crystallised) water. When introduced directly into the mixing process, this water is gradually released and vaporised, creating micro-pores within the asphalt binder. This controlled foaming effect temporarily increases the effective binder volume and reduces binder viscosity, keeping the asphalt mixture supple, workable, and compactable, even at reduced temperatures.

Because the crystallised water is released progressively, the effect can persist for up to eight hours and gradually diminishes as the mix temperature approaches approximately 100 °C. Upon cooling, the binder fully regains its original properties.

When using **aspha-min®**, water vapour is the only additional emission. No changes occur to the ring-and-ball softening point or any other binder characteristics (e.g. PG grading), nor to the asphalt mixture itself.

The use of **aspha-min®** does not alter the performance of the bitumen or the finished asphalt course.



The use of **aspha-min®** does not change the performance of bitumen and the finished course.

Delivery and Storage

aspha-min® is supplied in big bags on pallets, soluble (melting) bags, or in bulk, ensuring straightforward handling and storage. The product is resistant to temperature fluctuations between -15°C and $+70^{\circ}\text{C}$ without any material degradation.

As a result, no additional investment in heated bitumen storage tanks is required; dry storage conditions are fully sufficient. Furthermore, **aspha-min®** is classified as a non-hazardous substance.

Dosage

The addition of **aspha-min®** to the mixer is recommended at 0.2% to 0.3% by weight of the asphalt mixture, typically at approximately the same time as binder injection – or briefly thereafter.

In principle, any dosing or metering system capable of handling low feed rates, such as fibre feeders commonly used for stone mastic asphalt (SMA), is suitable for **aspha-min®**.

To maintain product quality during transportation and storage, exposure to moisture and excessive heat ($> 70^{\circ}\text{C}$) needs to be avoided.



Production of Warm Mix Asphalt

Depending on binder content, 0.2% to 0.3% by weight of **aspha-min®** is added to the asphalt mix. Dosing is recommended directly into the mixer at approximately the same time as bitumen injection or briefly thereafter. Dry mixing prior to binder addition must be avoided.

While the binder production temperature remains unchanged, the mixing temperature can be reduced by approximately 30 K by adjusting the heating of mineral aggregates and/or reclaimed asphalt pavement (RAP).

The exhaust gas temperature of the asphalt plant must not fall below the dew point, in order to prevent condensation, corrosion or the potential clogging of filter bags.

All other mixing parameters remain largely unchanged. The addition of **aspha-min®** via a separate weighing system does not require an extension of batch mixing time, thereby ensuring that plant productivity and output remain unaffected.

All standard road-construction binders—such as standard bitumen, polymer-modified bitumen, or blends thereof—can be used without restriction.

Production and Paving of Low-Viscosity Hot Mix Asphalt

Handling of **aspha-min®** for a hot mix is identical to its use in warm mix asphalt. However, production temperatures remain within the conventional hot mix range.

The addition of **aspha-min®** releases fine water vapour, forming micro-pores within the binder and increasing its effective volume. This improves the suppleness, workability, and compactability of the asphalt mix and significantly extends the effective compaction window.

Production and delivery occur at standard hot-mix temperatures. During paving, the asphalt mix initially exhibits markedly improved workability and compactability at higher temperatures, which is particularly beneficial for manual paving operations and high-modulus asphalt mixtures.

As the gradual release of crystallised water also supports good compactability at lower temperature ranges, reliable compaction is still achievable when the mixture cools prematurely during transport or paving.

Paving Operations

The paving of asphalt mixtures modified with **aspha-min®** differs only marginally from conventional asphalt paving. However, until sufficient practical experience has been obtained under varying site conditions, the use of non-destructive compaction measurement methods is recommended.

The intentional reduction of asphalt temperature leads to a shift in the paving and compaction window. The continued release of crystallised water reduces binder viscosity, enabling reliable compaction even at lower temperatures.

As with all warm mix asphalts, rapid unloading, paving, and compaction are essential. Where possible, the paver should be preheated. Temperature losses due to the use of feeders or vapour extraction systems must be taken into account. Ultimately, the temperature at the screed is decisive for paving quality.

When used as a compaction aid in hot mix asphalt, the mix is significantly more compactable in the upper temperature range than conventional asphalt. In this case, compaction monitoring devices may help prevent over-compaction.

Improved workability at lower temperatures provides a wider window for transport, paving, and compaction, enhancing operational reliability.

Quality Control

When using 3 kg of **aspha-min®** per tonne of asphalt mix, the filler content must be reduced by an equivalent amount. No chemical or physical changes occur to the binder. During application, only water vapour is released, while the remaining solid material remains in the mix and functions as a synthetic filler.

The ring and ball softening point and all other binder characteristics remain unchanged. The same applies to the performance of the finished asphalt course, which is particularly relevant for quality assurance, warranty considerations, and future reuse of the material as RAP.

Warm mix asphalt produced with **aspha-min®** is considered technically equivalent to conventional asphalt mixtures, as confirmed by long term performance studies conducted in Germany.

aspha-min® can be used with any aggregate or binder type, including reclaimed asphalt, and is suitable for all asphalt pavement layers.

LAB TESTING

Mix Design

For laboratory mix design with **aspha-min®**, it is recommended to follow the procedures described below. Existing mix designs for conventional asphalt mixtures can be easily adapted at any time.

The dosage of **aspha-min®** is based on the binder content. Therefore, an addition rate of 0.2 % (base courses) to 0.3 % (binder and surface courses) by mass of the asphalt mix is recommended. The filler content must be reduced accordingly, resulting in only a minor change to the overall mix composition.

As **aspha-min®** only temporarily reduces binder viscosity during paving, the performance of the finished asphalt course remains unchanged.



Sample Preparation

For manual preparation of Marshall specimens, the heated aggregate and filler are placed in a bowl (one specimen per batch). The hot bitumen is added into a central well, and the cold **aspha-min**® is applied directly onto the binder. The mixture must then be stirred immediately and thoroughly.

Mix temperatures should comply with TP Asphalt StB 07 or applicable local testing regulations.

For larger laboratory batches, such as slab production, the heated aggregate and filler are charged into the mixer. The cold **aspha-min**® is added shortly before or simultaneously with the hot bitumen, and mixing is started immediately. The exact procedure depends on batch size and mixer geometry.

Pre heating **aspha-min**® is neither necessary nor advisable, as the effect is negligible for the small quantities used in laboratory testing. By comparison, **aspha-min**® is also added cold at full scale asphalt plants.

Laboratory investigations have shown that an additional two hour conditioning period of the finished mix in an oven (135 °C for standard bitumen; 145 °C for PMB) prior to specimen production can improve compactability and result in lower air void contents (typically by 0.1 %–0.2 %) compared to immediate specimen preparation.

Detection in Asphalt Mixes

The detection of **aspha-min**® in finished asphalt mixtures (e.g. retained samples or drilled cores) cannot currently be achieved using conventional laboratory test methods.

Furthermore, **aspha-min**® no longer exhibits any functional effect in retained or recovered asphalt samples. Consequently, control mixtures must always be produced and tested at conventional hot mix temperatures.

With regard to workability (e.g. mixing resistance) and compactability (e.g. specimen air voids), laboratory testing can only approximate field performance, and results should always be interpreted accordingly.

Distributed by:

aspha-min GmbH
Main-Kinzig-Str. 30
63607 Wächtersbach, Germany

Phone: +49 (0) 6053 6189-0
Fax: +49 (0) 6053 6189-14

info@aspha-min.com
www.aspha-min.com



aspha-min®

Ready for Improved Sustainability in Asphalt Road Construction?

aspha-min® is a granulated, synthetic zeolite for the production of warm mix asphalt or low viscosity hot mix asphalt.

The use of **aspha-min®** helps to reduce the laying temperature of asphalt mix by around 30 K. A deliberate temperature reduction at the mixing plant reduces energy cost and protects staff, the environment and equipment. It also enables time-critical construction projects to be completed more rapidly.

When used in conventional hot mix asphalt, **aspha-min®** guarantees better workability and compactability for stiff binders, under adverse weather and hauling conditions and for manual laying.