# We know fibres.

## Benefit from 35 years' experience

Aramid fibers AS FIBER®

# ASPHALT FIBERS 4.0

These fibers are used to great effect for both binder and surface courses made from asphalt concrete, SMA and porous asphalt (low-noise surfaces).

Danish Fibres

The strong solution

# Established quality to suit the highest standards

# AS FIBER® ARAMID FIBERS

AS FIBER® significantly reduces thermal cracking, cracks caused by material fatigue and the formation of ruts and is thus capable of extending the service life of an asphalt surface by as much as 50%.

Asphalt, the most important of the materials used to build our roads, is not particularly good at absorbing the tensile forces exerted on it unscathed, and this has always constituted one of the biggest potential causes of damage to asphalt road surfaces. Irrespective of whether they are the result of heavy traffic or of contraction due to changes in temperature, even mild tensile forces can cause cracks on both the upper and lower sides of asphalt structures. This event triggers an all-too familiar situation that usually involves damage culminating in costly road repairs.

Now, with AS FIBER® aramid fibers, it is possible to reinforce asphalt surfaces in such a way that the system can absorb the tensile forces, no matter where they occur, without suffering any damage. The threedimensional reinforcement is distributed across the entire thickness of the course and is therefore always right where it's needed.

It is also responsible for the fact that the mixture is significantly more resistant to permanent deformation and the rut depth is drastically smaller. Rut formation and compressive strength tests on AC 11 D S / AC 16 DS have provided convincing proof of this. Meanwhile, thermal stress restrained specimen testing has determined the cracking temperatures and the associated failure stresses. With cracking temperatures as low as -26.3 °C and a measured failure stress of 4,470 N/mm$^2$, the figures are very respectable.

Tests on specimens made from PA 11 mixtures with and without fiber reinforcement showed that surface wear was ten times higher on the sections without fibers. AS FIBER® asphalt fibers are thus paving the way to longer-lasting asphalt surfaces

- ☑ **Service life increased by around 50%**
- ☑ **Rut formation reduced by > 50%**
- ☑ **Thermal stability increased**
- ☑ **Fewer cracks, and those that do occur are bridged**
- ☑ **No need for any change in installation methods**
- ☑ **100% recyclable**

# IT'S THE FIBERS THAT MAKE THE DIFFERENCE

## Conventional asphalt and AS FIBER® compared

### Mixture test results from the IBQ Institute:

| Mixture type | AC 11 UHSF-FA | AC 11 DS |
|---|---|---|
| **Binder type** | 25/55-55 A | 25/55-55 A RC |
| **Additives** | AS FIBER® | / |
| **Density by volume [g/cm3]** | 2.372 | 2.384 |
| **Bulk density [g/cm3]** | 2.440 | 2.441 |
| **Air void content (calculated) [% by volume]** | 2.8 | 2.3 |
| **Rut depth [mm]** | 2.5 | 4.9 |
| **Strain rate [‰*10-4/n] (0.35 MPa)** | 0.8 / 0.0 / 1.0 | 12.3 / 13.1 / 7.7 (at inflection point) |

Although the test results for density by volume and bulk density were almost identical, there were distinct differences in the other results of the analyses conducted as part of the performance tests.

Significantly better results were consistently achieved with the modified mixture. At 2.5 mm, the absolute rut depth identified in the rut test for the modified mixture was, on average, around half that determined for the specimens made without the AS FIBER® asphalt fibers. The compressive strength tests revealed a similar picture. The strain rates identified on the specimens with the special AC 11 DS UHSF-FA mixture were much lower than those of the conventional AC 11 DS mixture.

The AC 11 DS UHSF-FA mixture with the AS FIBER® asphalt fibers produced a marked increase in strength even without the additional modification of the binder with wax, including at high temperatures. This means that the special mixture analyzed in these tests (without wax-modified binders) will yield considerably longer service lives than an AC 11 DS mixture manufactured conventionally in accordance with the TL Asphalt-StB technical standards.

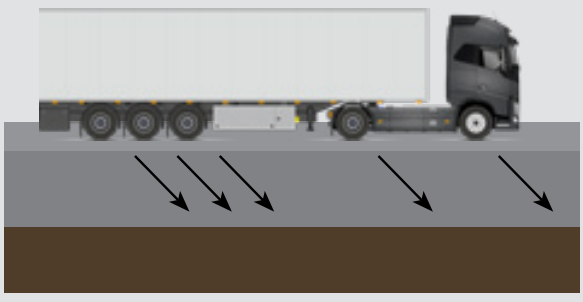
The key characteristics of the mixture test fell within the limits required by the ZTV Asphalt-StB and TL Asphalt-StB standards.

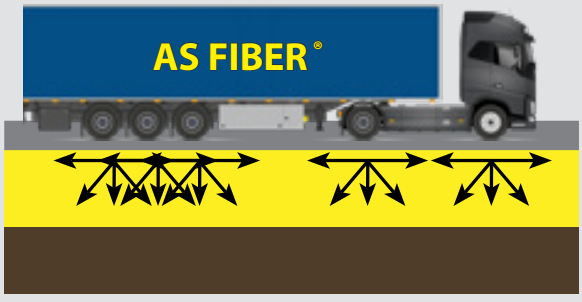
## Conventional asphalt

When pressure is exerted over a long period of time, it causes ruts. Tensile forces can be absorbed only to a limited extent, leading to cracks.

## Asphalt with AS FIBER®

The three-dimensional system increases the restoring force of the asphalt surface and absorbs compressive and tensile forces. This results in a considerable reduction in rut formation and improved thermal stability and ensures that tensile forces from cryogenic and shear stress are dissipated without causing any damage.





# PRODUCT INFORMATION

## AS FIBER® Fibers

### An additive with a host of benefits

**AS FIBER® is a synthetic fiber mixture of aramid and polyolefin fibers approximately 18 mm long, intended to be used as three-dimensional reinforcement in binder and/or surface**

AS FIBER® bridges cracks and significantly reduces thermal cracking, as well as cracks caused by material fatigue. It also cuts rut formation dramatically due to the mixture's higher resistance to permanent deformation.

These properties alone give asphalt modified with AS FIBER® a service life roughly 50% longer than that of conventional mixtures.

Aramid fibers do not melt when the mixture is hot and are renowned for their high tensile strength and durability at both high and low temperatures.

## Key material characteristics

| Material | Polyolefin | Aramid |
|---|---|---|
| **Type** | Fibrillated fibers | Monofilament fibers |
| **Specific weight (g/cm3)** | 0.91 | 1.45 |
| **Tensile strength (MPa)** | 483 | 3000 |
| **Length (mm)** | 18 | 18 |
| **Color** | Yellow | Yellow |
| **Melting point (°C)** | 115/157 | > 450 |

*Source: Journal of Testing and Evaluation, Volume 38, Issue 4*

## Metering / wet mixing time

AS FIBER® fibers are metered at between 0.5 kg and 0.8 kg per metric ton of mixture. The wet mixing time (with liquid asphalt) should be at least 45 seconds.

| Packaging unit | |
|---|---|
| **Bag** | 0.5 kg |
| **Box** | 35 bags (17.5 kg) |
| **Pallet** | 24 boxes (420 kg) |

For more informationen
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