

SASOL

SASOBIT

**The versatile additive
for asphalt mixes**

Sasol Chemicals



About us

We at Sasol Chemicals innovate for a better world and deliver long-term value to our customers, communities and society.

Our broad portfolio of high-value products plays an integral role in the creation of numerous solutions that benefit the lives of millions of people.

Thousands of companies around the world leverage our technology, world-class facilities, expertise and collaborative approach to tackle their challenges.



SASOBIT – reliable quality
for highest standards

Traffic volumes in Europe will continue to increase in the years to come and asphalt mixes will have to meet higher demands. With **SASOBIT** you are well prepared to master future challenges.

SASOBIT is a synthetic hard wax which has been used successfully worldwide in asphalt road construction since 1997.

SASOBIT ensures complete process reliability for all asphalt mix applications at all times – including under adverse conditions.

Even the most demanding asphalt applications, e.g. heavy-duty asphalt mixes for airports or container terminals, will work with an additive as versatile as **SASOBIT**.

On top of that, all asphalt mixes can be produced and placed at reduced temperatures when using **SASOBIT**, protecting resources and saving costs.

SASOBIT is the versatile additive, which is perfectly suited for all asphalt applications and ensures highly durable asphalt pavements.

SASOBIT One product – many benefits

- ✓ enhanced workability
- ✓ improved process reliability
- ✓ temperature reduction (Warm Mix)
- ✓ early traffic release
- ✓ increased stability
- ✓ extended service life



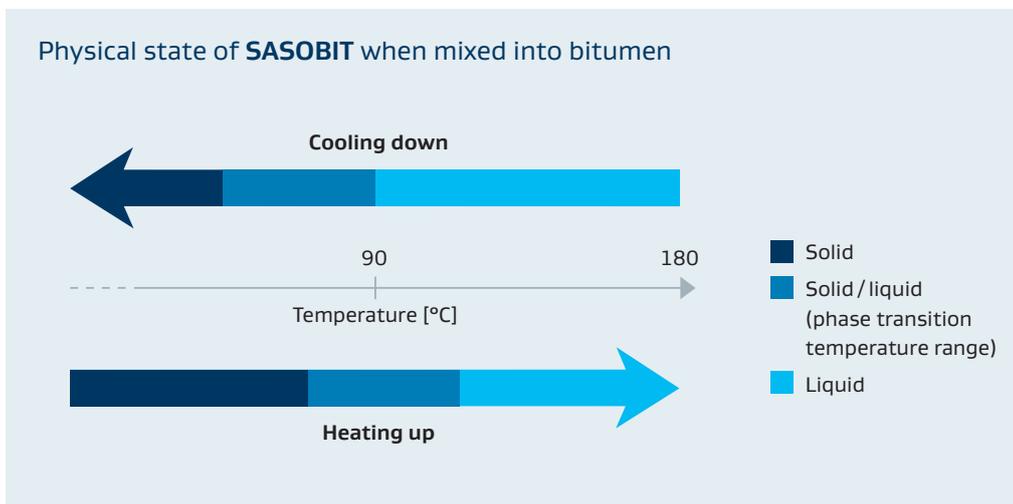
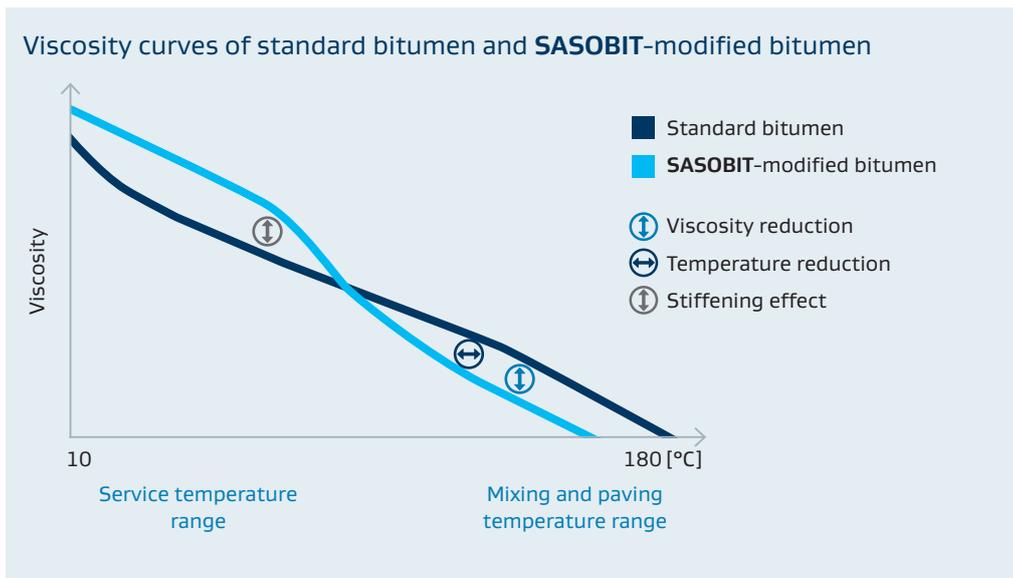
Working principle: the effect of SASOBIT on bitumen viscosity

Mixing and paving temperatures can be reduced by as much as 30 K when using **SASOBIT**, because at temperatures above 115 °C **SASOBIT** is completely soluble in bitumen and reduces viscosity significantly.

Reduced viscosity at standard temperatures enhances the workability of the asphalt mix. **SASOBIT** increases process reliability and significantly reduces the risk of improper paving operations.

During the cooling phase **SASOBIT** starts to crystallize at 90 °C and forms a lattice structure in the bitumen which has a stiffening effect (the frequently cited congealing point of 100 to 105 °C refers to pure **SASOBIT**).

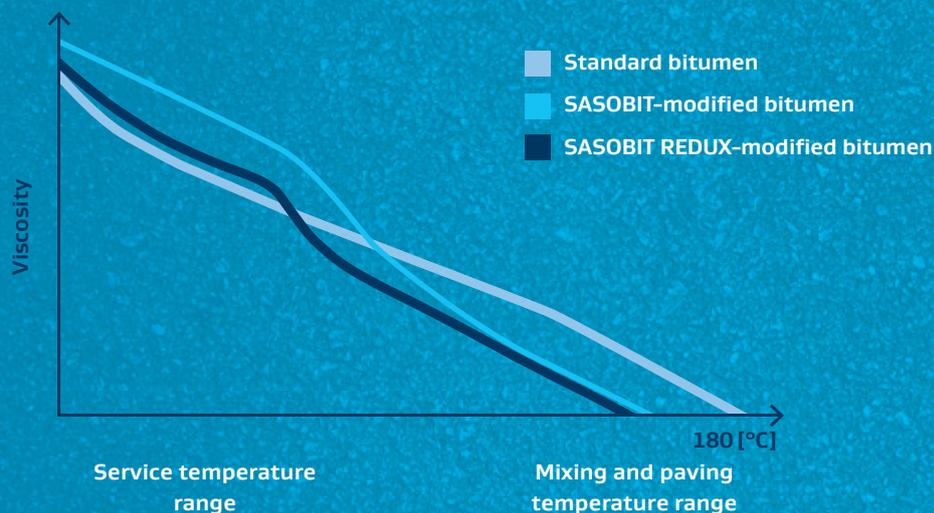
Deformation resistance increases significantly when adding the appropriate quantity of **SASOBIT**, without impairing low-temperature performance.



SASOBIT REDUX

Learn more
about our
new product
SASOBIT
REDUX.

Working principle of SASOBIT REDUX in comparison to SASOBIT



The additive designed to

- reduce viscosity
- reduce ageing
- reduce temperatures
- reduce compaction resistance

Better workability – increased process reliability

Process reliability increases when adding only 1.5 % **SASOBIT** by weight of bitumen – from the production to the extended period of use and eventual reuse. So it is no surprise that **SASOBIT** has been successfully used for years, even under difficult conditions.

SASOBIT improves workability, and this has the following benefits:

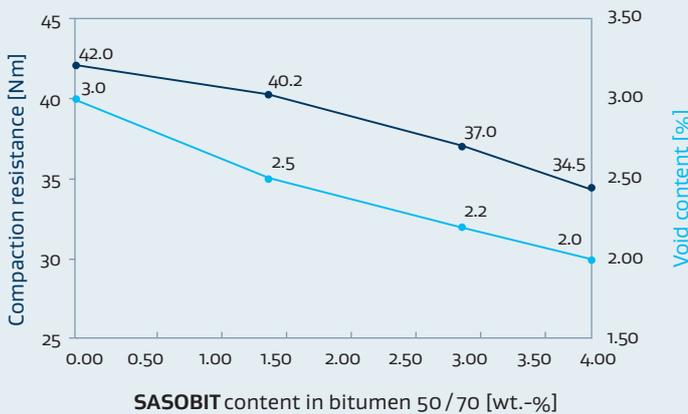
- Reduces the risk of compaction failures especially when using very hard and highly viscous bitumen
- Good workability even during poor weather conditions without any additional compaction / without increasing mixing temperatures
- More effective compaction down to the critical paving temperature range
- Extended construction season because weather conditions matter less
- Easier manual application

Regulations for paving temperatures



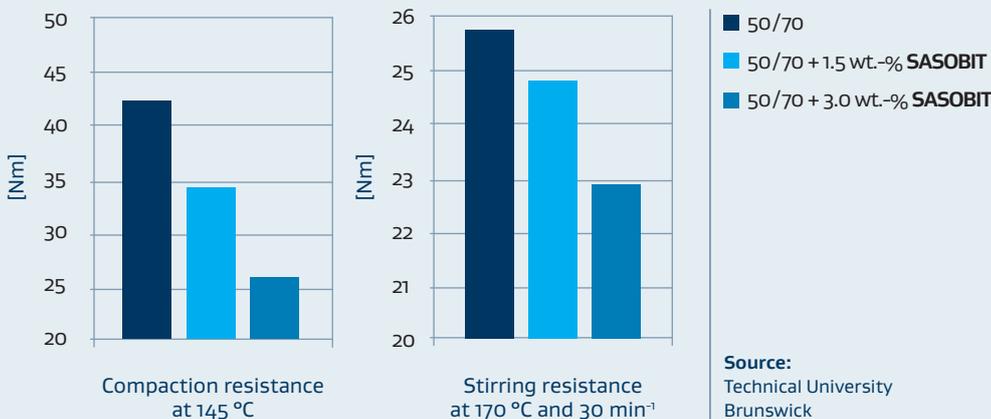
According to technical rules there are minimum ambient temperatures for paving asphalt mixes. These requirements often cannot be met due to poor weather conditions. Our advice: use **SASOBIT** and benefit from the improved workability.

Marshall compaction of SMA 11 S at 135 °C



Source:
Asphalt Labor A. J. Hinrichsen

Compaction and stirring resistance of AC 11 D S



Source:
Technical University Brunswick

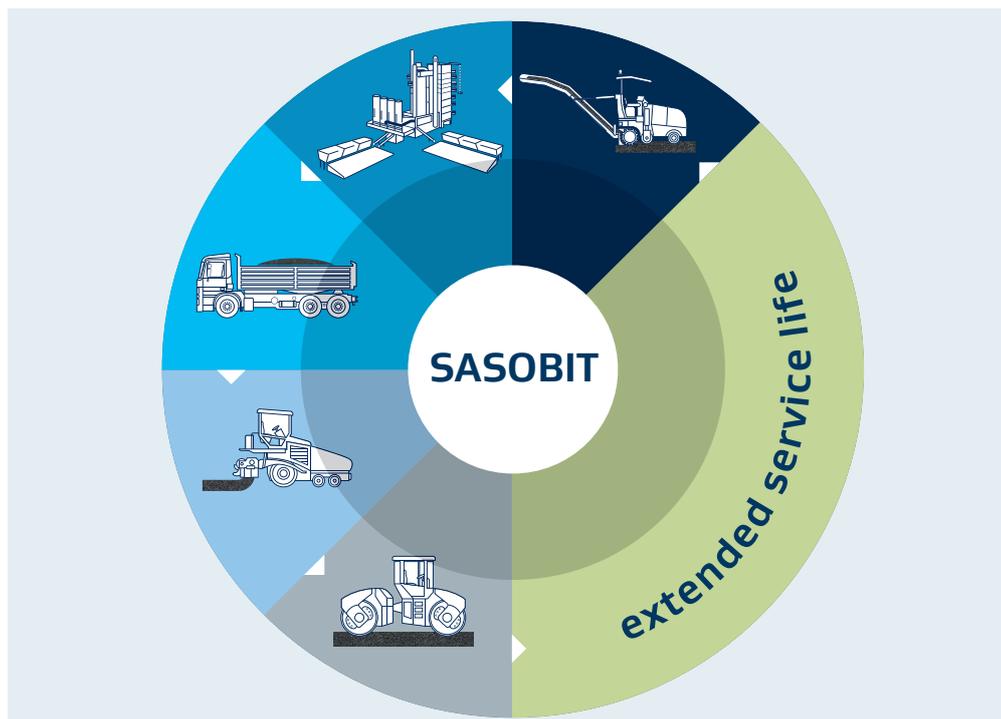
Finding the right bitumen grade

More than 20 years of practical experience offers two options to achieve improved workability and higher process reliability. **SASOBIT** can be employed either with the originally selected bitumen or with a softer bitumen grade.

Example

Load class	> 1.0 and ≤ 1.8 Mio. equivalent 10-ton axle passages (load class 1.8 according to German technical standards)
Asphalt mix	AC 11 D N
Standard bitumen	50/70

	Option 1	Option 2
SASOBIT -modified bitumen employed	70/100 + SASOBIT	50/70 + SASOBIT
SASOBIT -modified bitumen vs. 50/70. Result:	<ul style="list-style-type: none"> • Markedly improved workability • Comparable deformation behaviour • Extended service life 	<ul style="list-style-type: none"> • Improved workability • Improved deformation behaviour • Extended service life



Warm-Mix Asphalt with **SASOBIT** – green and sustainable

Warm-Mix Asphalt (WMA) technologies have proven to offer the following advantages for all asphalt mixes:

- Less CO₂ emissions
- Less energy consumption
- Less fumes and aerosols
- Less bitumen ageing
- Less wear on machines and resources

European legislators are now focussing on WMA technologies, and rightly so.

A 3-percent-addition of **SASOBIT** yields the best results when aiming at a maximum temperature reduction of 30 K. To ensure that **SASOBIT** can also improve process reliability, the temperature reduction potential should not be fully exploited.

Unique to SASOBIT



Using **SASOBIT** as Warm-Mix additive also provides the whole range of benefits that **SASOBIT** offers in the service temperature range.

Savings per tonne of asphalt mix

Temperature reduction = 30 K
→ Fuel and CO₂ savings of 18 – 22 %

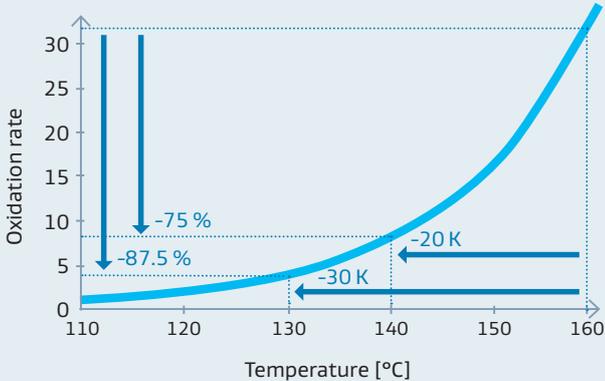
Sources:

- BG-Bau (German construction workers mutual insurance association) "Paving at reduced temperatures"
- EAPA "The use of Warm Mix Asphalt EAPA - Position Paper – 2015"

SASOBIT encourages sustainable and cost-efficient asphalt mix production.

50 % of bitumen ageing occurs while the asphalt mix is produced and placed. WMA-technologies can reduce short-term ageing significantly while considerably extending the service life of asphalt pavement (Straße und Autobahn, 8.2014).

Temperature reduction / oxidation rate



Van't Hoff equation

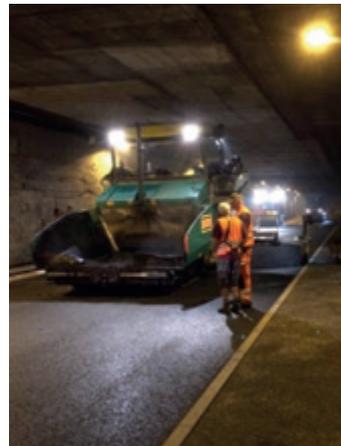
The oxidation rate halves for every 10 K in temperature reduction.

Temperature reduction in the field

Since 2008, mastic asphalt mixes in Germany may only be produced, supplied and placed at temperatures ≤ 230 °C. **SASOBIT** has been used with great success to meet this requirement. And even for rolled asphalt mixes the WMA technologies are being used to a greater extent. The WMA technology is used especially for tunnel works in order to meet Occupational Health and Safety (OHS) requirements with the most cost-efficient solution.

Practical example: Wallringtunnel Hamburg, August 2015

	Surface course	Binder course
Asphalt mix	SMA 8 Hmb	AC 16 B Hmb
Bitumen	25 / 55-55 + SASOBIT	10 / 40-65 + SASOBIT



The employers' liability insurance association in the construction industry (BG Bau) found that vapour and aerosol concentrations were significantly lower. What is more, nearly 1,500 l of fuel oil and 4.5 t CO₂ were saved compared to standard technologies. Requirements for layer properties, especially regarding compaction and void content, were easily met.

	Screed operator	Paver operator	Roller driver
Vapour and aerosol concentration / bitumen (mg / m ³)	6.6	3.2	3.0
Standard asphalt mix (mg / m ³)	18.6	18.5	7.2
Reduction by (%)	65	83	58

The BG Bau homepage lists other construction projects where the WMA technology worked very well in combination with **SASOBIT**. In all construction projects, the measured values proved that temperature reduction has a significant positive effect on OHS.

Sources:

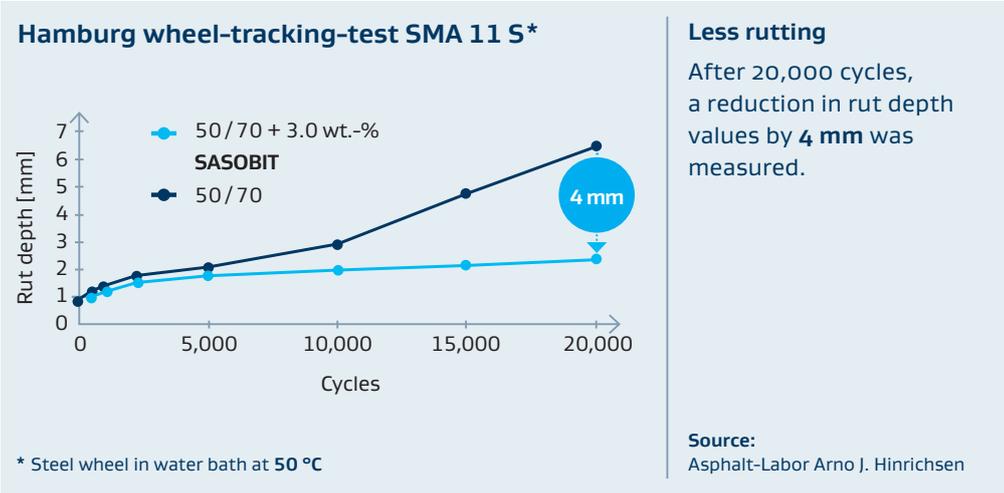
Schäfer, V./Rosauer, V. in Straße und Autobahn 67.9, S. 703 - 714 (2016), Hinrichs, B. in Asphalt, 47, 2, S. 10-15 (2016)

Asphalt mix performance – with a 3 % addition

Asphalt mix performance is usually defined as deformation resistance as well as cold-crack and fatigue-crack resistance. Optimal compaction enhances performance.

A 3 % modification with **SASOBIT** increases process reliability and ensures optimal compaction. In combination with the stiffening effect in the service temperature range **SASOBIT** therefore greatly improves pavement performance – road durability increases in line with pavement performance.

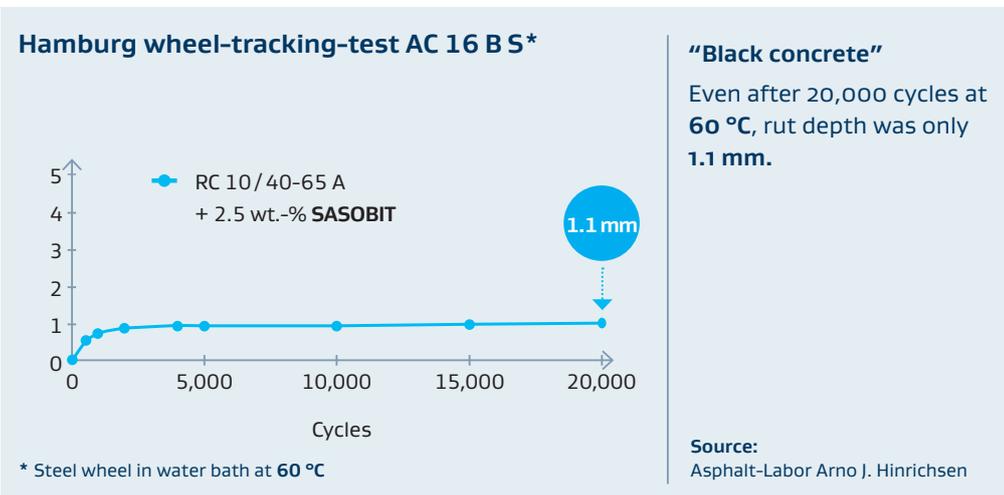
Countless construction projects which have been carried out since 1997 demonstrate that **SASOBIT** provides longer pavement service life. This means significantly lower maintenance costs and ensures sustainable and resource-saving road construction projects.



Less government spending

SASOBIT is being used for a growing number of public road construction projects. The extended service life and lower maintenance costs ease strain on budgets.

SASOBIT has also yielded outstanding results – mostly as co-modification of PmB – when using it for heavy-duty asphalt pavements. Such asphalt mixes are used for areas under high dynamic and static loads.



Low-temperature performance

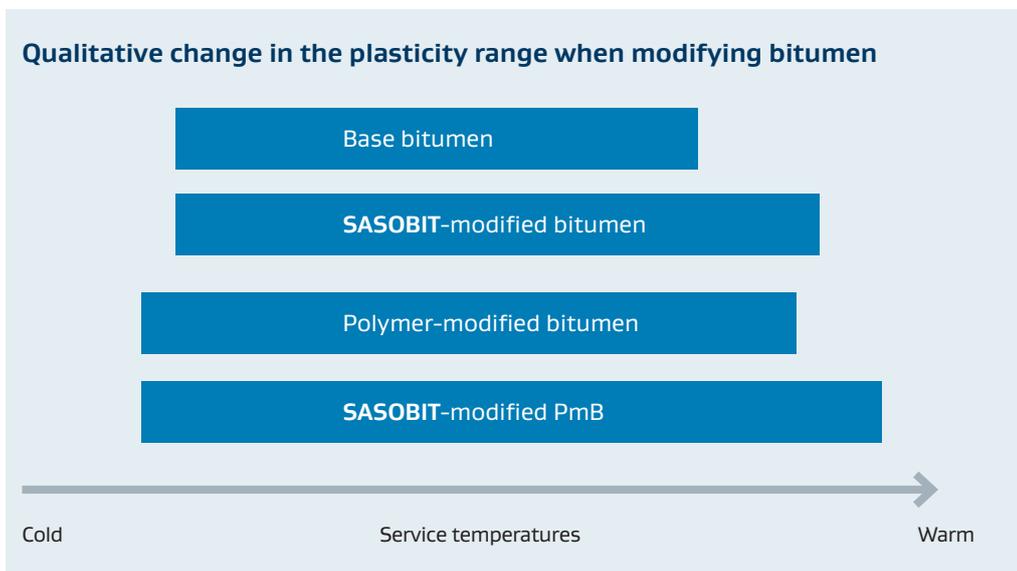
Compared to unmodified bitumen, **SASOBIT**-modified bitumen significantly improves deformation behaviour of asphalt mixes at high temperatures. **SASOBIT** does not have any great impact on low-temperature performance, as the basic bitumen determines low-temperature performance to a decisive extent.

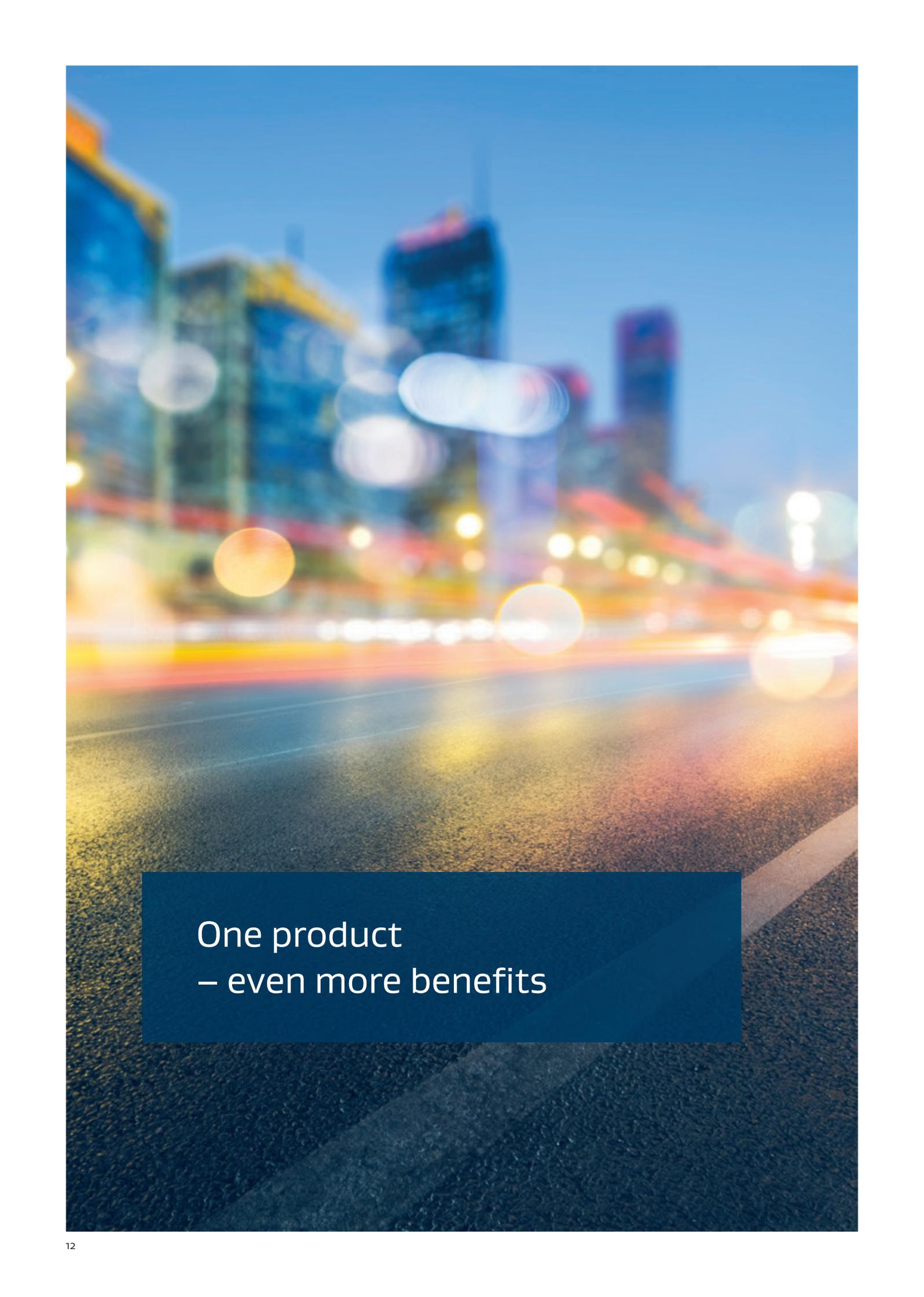
Thermal Stress Restrained Specimen Tests (TSRST) according to arand / renken

	Binder	Fracture temperature [°C]
SMA 11 S	50 / 70	-25.0
	50 / 70 + 3.0 wt.-% SASOBIT	-24.5
MA 11 S	25 / 55-55	-26.5
	25 / 55-55 + 3.0 wt.-% SASOBIT	-25.5
AC 11 D S	50/70	-21.4
	50 / 70 + 1.5 wt.-% SASOBIT	-22.5

The addition of **SASOBIT** has no noticeable effect on low-temperature performance and improves deformation resistance at high service temperatures. This combination extends the plasticity range and leads to a wider usable temperature interval.

It makes sense from an engineering and cost-efficiency point of view to use softer base bitumen, especially in harder systems.





One product
– even more benefits

Many aspects have to be considered to successfully complete a project: is the asphalt mix production cost-efficient and environmentally friendly? Does it have good workability? Is it durable and resistant against a variety of impacts? Thanks to its properties **SASOBIT** is the ideal, versatile additive for a multitude of projects and offers many benefits for practical use.

Bitumen adhesion

Adhesion between bitumen and aggregates is crucial for durable asphalt pavements. **SASOBIT**-modified binders provide for good adhesion performance without any additional chemical additives – even for aggregates with poor adhesive strength. This increases resistance to stripping as well as the resistance against de-icing agents.

The Rolling-Bottle-Test (EN 12697-11) has demonstrated repeatedly times that **SASOBIT**-modified bitumen improve adhesion performance.

Earlier traffic release

Every year, traffic hold-ups due to construction sites impact the economy and cost billions of euros (ADAC Staubilanz 2014 – traffic jam statistics from Germany's motoring association). The goal is to minimize road closures while ensuring high-quality roads.

This is precisely what **SASOBIT** does, because asphalt mixes can be placed at lower temperatures. Even better, the stiffening effect ensures an improvement in initial stability even at comparatively high temperatures.

Enhanced fuel resistance



Pure **SASOBIT** is nearly insoluble in fuels. **SASOBIT**-modified asphalt mixes are therefore much more fuel-resistant. Fuel resistance is enhanced even more because **SASOBIT** allows for an optimal compaction.

Ease of use

In principle we recommend ready-to-use **SASOBIT** modified bitumen. But it is also possible to add **SASOBIT** directly at the mixing unit:

- Melting system
- Ejector system
- Modification in the bitumen tank
- Modified fibre pellets
- Direct addition to the mix together with the bitumen or afterwards

SASOBIT can be stored in a solid state and should be used within 10 years. No additional safety precautions are needed for storage or handling.

- **SASOBIT** is not classified as hazardous in terms of the European Legislation
- **SASOBIT** is in compliance with the following regulations:
 - Directive 2001 / 95 / EC on General Product Safety
 - REACH-Regulation (EC) No 1907 / 2006
 - CLP-Regulation (EC) No 1272 / 2008

Enhanced rubber modification at standard temperatures

Performance characteristics improve when modifying asphalt mixes with rubber. However, such highly viscous mixes need high production temperatures.

SASOBIT allows for the production of rubber modified asphalt mixes at standard temperatures. This means temperature increases can be avoided. Thus emissions and binder ageing are prevented – a major contribution to environmental protection and occupational health and safety. On top of that **SASOBIT** enhances the workability and compacting properties of rubber-modified asphalt mixes.



More recycling options

The added quantity of RAP to the asphalt mixing process has increased because reusing RAP saves resources and costs. For the production process this means: the more RAP is added to the mix, the higher the temperature settings for fresh mineral aggregates. This leads not only to higher energy consumption but also releases more emissions – and damages the bitumen especially.

When using **SASOBIT**, more RAP can be added without any temperature increases, no matter whether RAP is added in a cold or warm state.

Highly dense and resistant asphalt mixes

Due to its properties asphalt mix is ideal for impermeable paved areas. These areas include storage facilities for liquid and solid manure, as well as silage effluents; facilities which store, bottle, or process substances hazardous to water and facilities which produce, treat or use substances hazardous to water. (Asphalt journal 3.2008)

Modifying rolled and mastic asphalt mixes with **SASOBIT** improves:

- Workability
- Density
- Resistance to fuels, effluents and many other chemicals
- Deformation resistance
- Durability



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