Granulate Rubber Modified
High Performance Solutions
GRM by CTS

Urgently sought: “Anti-ageing for asphalt”.

What can be done?

Road ageing: costly and bad for our environment.

It cannot be overlooked. Our asphalt pavements do not hold for as long as they used to. The construction material bitumen seems to have changed. Whether this is due to different methods in the refineries or the crude oils used, we do not know. Those who must surely know are unfortunately not telling us.

At any rate, the fact remains that not just the increase in traffic but also the significantly risen environmental influences and, indeed, perhaps even a subtle change in climatic conditions have noticeably accelerated the material loss in the asphalt pavements.

What does “asphalt ages” actually mean?

Normally, a distinction is made between short-term and long-term ageing. Short-term ageing arises through the mechanical and thermal load (oxidative process) in asphalt production, transportation and installation. After this, long-term ageing (e.g.: photographic oxidation due to UV radiation) sets in. A bit every year. And sometimes a bit too much.

The bitumen used does not show sufficient resistance towards the daily stress factors. Subtly but continuously, volatile compounds are being lost. The consequences are a likewise continuous hardening and/or embrittlement of the binding agent and crack formation occurs in the unusually early end stage of the asphalt lifespan (e.g.: alligator cracking). And not only that: the crack formation in the top layer of the asphalt, in turn, promotes and accelerates the ageing of the underlying layers, as these are now also more exposed to aerial oxygen and other harmful substances. A vicious circle.

Subsequently, moisture can also penetrate the asphalt structure. The interaction of frost and thawing, mixed with the corresponding de-icing salts, then leads to further considerable and barely tameable irreversible structural damage to the asphalt pavement. The consequence: potholes in the asphalt and significant costs for an urgently required thorough renovation.

What can be done?

In the design and tender of asphalt pavements, all possible follow-up costs must be taken into account in the calculation.

Incidentally, permanent asphalt pavements can still be designed with usual road construction bitumen. But with today's constantly changing crude oil varieties? A dangerous game. Although standard-compliant bitumen production is guaranteed and also complied with verifiably, unfortunately no standard says anything about its permanent use behaviour. There is simply no standard for effective resistance towards aerial oxygen, towards other environmental influences and load due the UV radiation.

However, there is extensive experience.

Usual road construction bitumen is long since no longer used on high-traffic federal motorways, federal roads and (increasingly also on) regional and city roads. It simply can no longer cope with the permanently increased traffic loads. Top layers are now consistently designed only with modified binding agents. Against high traffic volumes? Yes, that as well! Additionally, in each case, the modification also causes a significant improvement in the susceptibility to ageing.

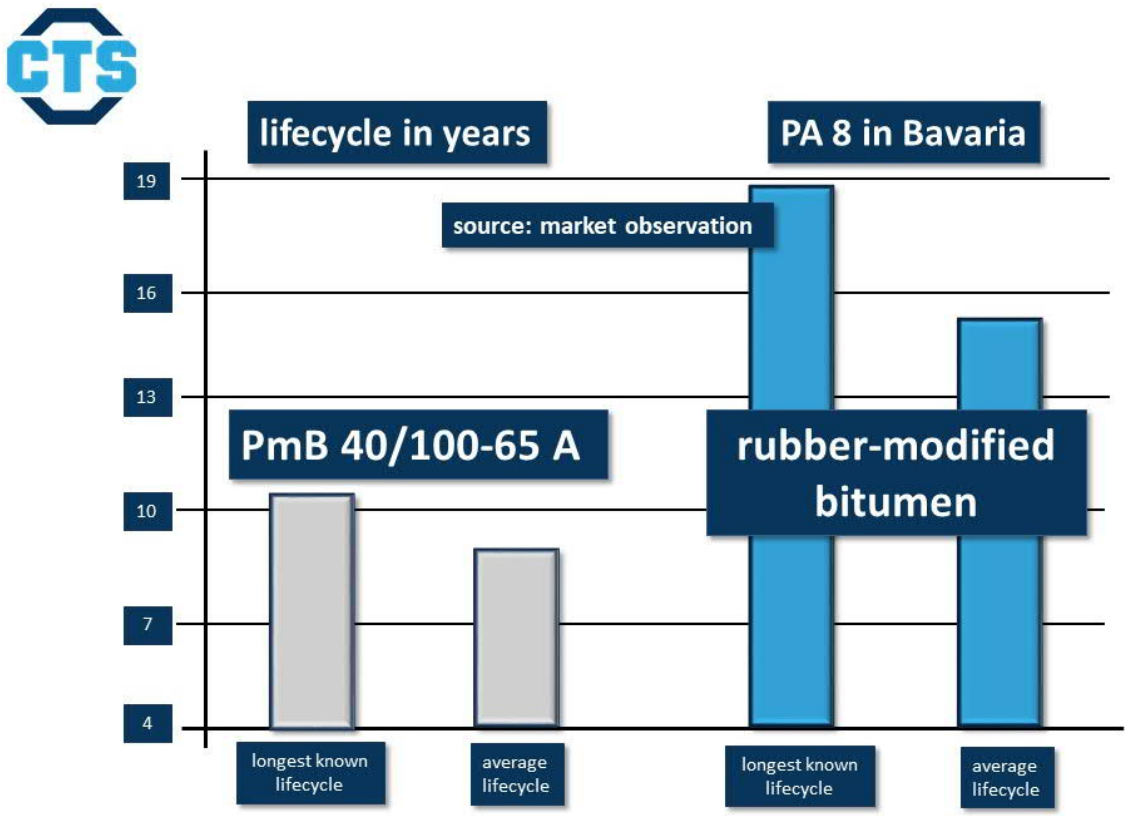
Polymers in bitumen against anti-ageing?

There is only one simple answer to this question: Yes!

However, the next question then automatically arises: which type of modification is particularly effective?

Open-pored asphalt top layers age virtually in fast motion. Due to the high hollow space content (accessible hollows), the binding agents used here must be particularly resistant towards oxidative ageing. And there is a wealth of experience and comparisons here.

Rubber-modified binding agents convince with particularly long lay times (lay time on the A9 federal motorway near Nuremberg 15 years, on the A99 federal motor-



way near Munich 17 years, A99 federal motorway Eschenried, 17 years, B 36 near Karlsruhe, 18 years, etc.). PmB does not manage that.

The lay times of open-pored asphalt top layers in Bavaria are named as examples. The following statements can be derived from market observations:

- PmB 40/100-65 A, average use duration of approximately 9 years, maximum of approximately 11 years
- Rubber-modified bitumen, average use duration of approximately 15 years, maximum of approximately 19 years

In an opinion of 08/03/2018 on the “Permanence of rubber-modified asphalt pavements”, the head of the Institut Dr Gauer (IFB) in Regenstauf, Dr Schmalz, comes to the following statement:

“Numerous analysis reports show that rubber-modified bitumen

- ages approximately 70% more slowly than non-modified bitumen,
- ages approximately 40-50% more slowly than polymer-modified bitumen,
- possesses improved behaviour at low temperatures.

Due to these properties of the rubber-modified bitumen, the embrittlement of the top layer of the asphalt is reduced. This leads to the pavement coping with the high loads due to traffic, frost, de-icing salt and temperature changes even at

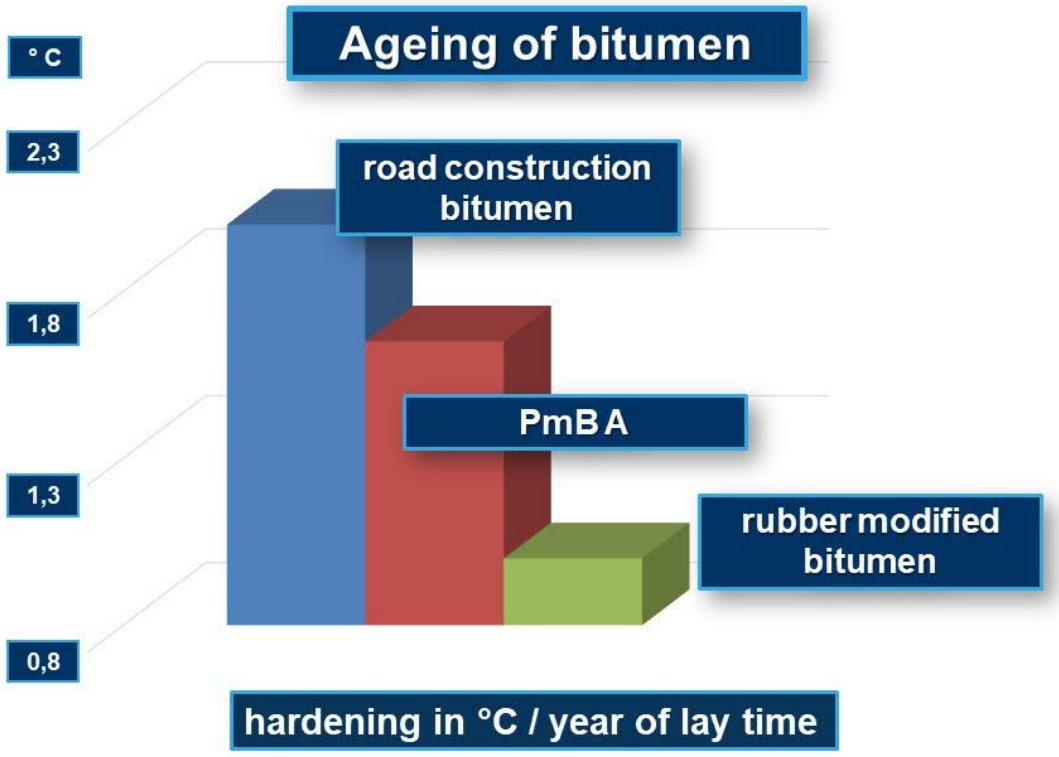
wintry temperatures. The characteristic damage mechanisms of superficial grain loss and crack formation do not occur, or occur much later."

At this point, it is appropriate to point out that the background experience at the IFB testing institute is based on the extensive activities (research work, initial testing, construction monitoring) and observations right outside its premises.

Consequently, the motorway directorates in Bavaria, for example, have refrained from using PmB A in tenders for open-pored asphalt top layers since the implementation of TL RmB-StB, By (2010). For reasons of better economic efficiency, design is permitted only with rubber-modified products.

Now, an increasing number of road construction offices and municipal road construction administrations are also making use of the many advantages offered by a rubber modification pursuant to TL RmB-StB.

Road construction bitumen, PmB and CTS special bitumen were compared regarding their ageing behaviour on the A5 motorway within a test section. At IFTA GmbH, Dr Potschka, the average rise of the ring and ball softening point was determined after a 10-year lay time. Here, the statements of the IFB, Dr Gauer are confirmed.



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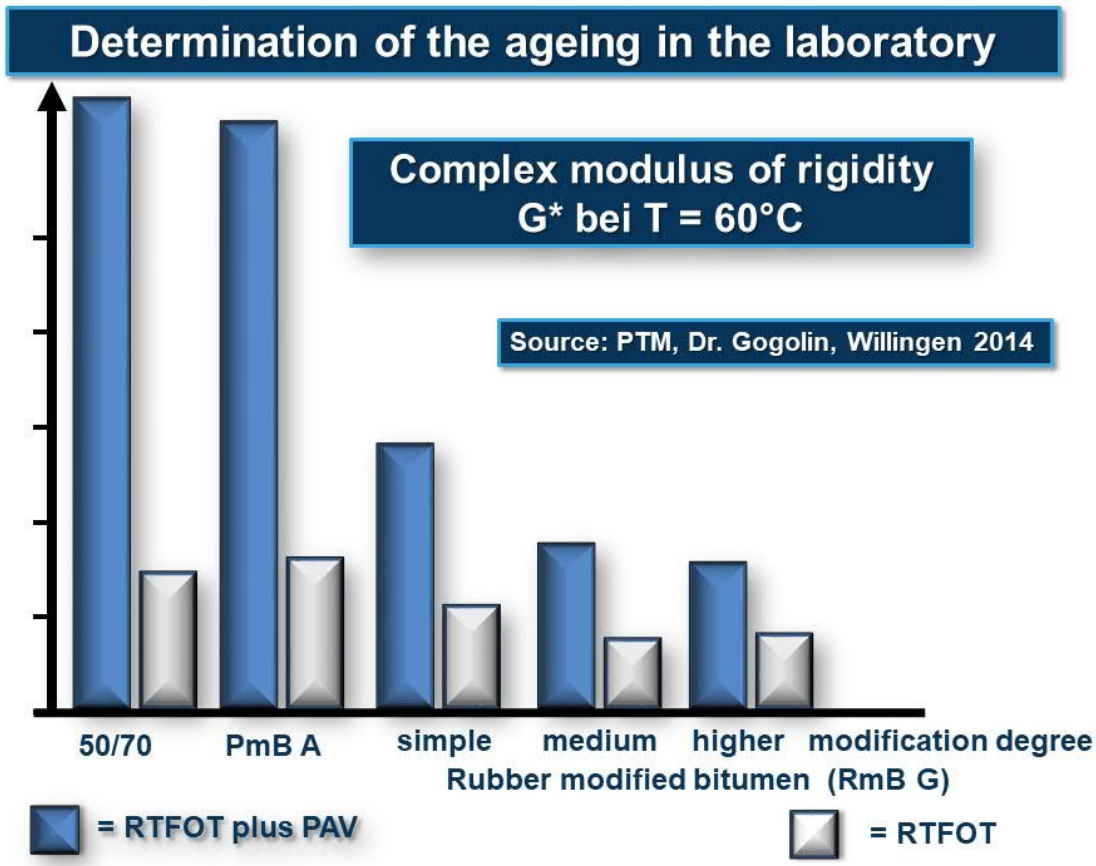
Findings from practice that can also be confirmed in laboratory tests. The fact that rubber-modified binding agents show a particularly improved ageing behaviour was presented by Dr Gogolin (PTM) in his presentation on the occasion of the DAV Asphalt Seminar in Willingen in 2014. He reported of extensive laboratory tests in which various binding agent systems were exposed to long- (RTFOT plus PAV) and short-term ageing (RTFOT) and thereafter the modulus of rigidity G* was determined at a constant 60 °C.

The advantages of rubber modification are not to be overlooked.



And something that was actually to be expected: “A lot helps a lot”, i.e.: in the event of a higher modification degree, a higher concentration of buffing dust or rubber-modified bitumen granulate, a further considerable improvement in the ageing behaviour can be anticipated.

Further factors that speak for the use of rubber modification are our environment/the use of RC material and economic efficiency. In the case of rubber-modified binding agents, used tyres form the raw material basis and not synthetically manufactured polymers.
The very low ageing susceptibility means a significant advantage for the reuse of rubber-modified asphalts, as no restrictions to the addition quantities due to the softening point of the RC material being too high are to be expected. However, heavily hardened asphalt pavements cannot be reused without limit.

“The use of rubber-modified bitumen entails an economic advantage due to the considerable extension of the use duration – despite the marginally higher manufacturing costs.” Quote from the IFB opinion of 08/03/2018. Corresponding calculations are available.

Ageing also has a significant influence on the permanence of little driven-on roads or asphalt pavements (e.g.: airfields, side roads). Here, the asphalt ages significantly more quickly without a lack of load.

R. Reiter
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