Granulate Rubber Modified
High Performance Solutions
GRM by CTS

The cost brake for your asphalt

Significant reduction in the average annual costs for maintenance and service due to CTS GRM

Since the mid-1980s, the rubber modification of bitumen and/or asphalt has been a recognised and successful construction method in Europe. Initially, it was used as a special construction method for “very special applications” - mainly for open-pored asphalt top layers. Today, in contrast, it is a really versatile and universal application for nearly all asphalt concepts.

However, the success of the rubber modification is based solely on an effective embedding of the polymers of the rubber into the bitumen matrix. All other attempts to apply rubber in the asphalt have so far always failed, i.e.: these products did not prove themselves in long-term behaviour, as these asphalts showed corresponding damage (fretting, grain loss) after only an unusually short lay time. By now, a large number of providers have had to remove these products from the market again and/or are no longer present themselves.

Hot-liquid rubber-modified binding agents constitute the most original form of rubber modification of bitumen. These products have been used successfully and on a large scale in several measures. Admittedly associated with high outlay, but successful nonetheless. They consist of a mixture of bitumen and recycled buffing dusts and/or rubber granulates and possibly other additives. They were delivered ready for use to the asphalt mixing plants as hot liquid in the TTF. However, that is now history:

1. Because rubber-modified bitumen is not storage-stable. Since the insoluble product components of the buffing dust unavoidably sediment, prompt consumption is an essential requirement for successful use. Even mixing tanks at the mixing plant did not manage to ensure homogeneity permanently. For system reasons, the demixing begins shortly after the loading process of the manufacturing plant.
2. Hence, a dangerous game in logistics, especially in unclear weather situations. Additionally, the production capacity at the manufacturing plant is frequently limited. An absolute co-criterion when carrying out larger measures on the motorway.
3. Since high temperatures of bitumen are not just not contemporary but even banned for occupational safety and environmental protection reasons, an optimal production of these binding agents can currently be ruled out. At production temperatures of considerably less than 200° C, it is not possible to move the polymers from the buffing dust to an optimal reaction. And at the 180 °C production temperature barely tolerated today?
4. Today, the performance of these products would receive the school mark “insufficient and topic missing” and lags miles behind the usual efficiency. For this reason, nearly all manufacturers in Germany have decided to discontinue the production of hot-liquid rubber bitumen. Because it makes no qualitative sense.

However, there is now a clever new development - alternative would not be the right word for it, as the performance of these “new” products already surpasses that of the hot-liquid rubber-modified binding agents. Sounds simple but the development was a long, demanding and very rocky path. Despite this, CTS Bitumen managed - in a production facility designed specially for this purpose - to supply the market with the rubber-modified bitumen granulates (CTS GRM) as early as 2005. Since this time, they have proved their worth. Without exception. Without product-related failures, without demixing problems, without problems in logistics, without problems in storage at the mixing plant. A strong claim and combined with strong efficiency in asphalt.

The rubber-modified bitumen granulates from CTS Bitumen immediately asserted themselves on the market. The tendering entities were immediately convinced by the high quality level and ultimately – what an accolade – even implemented CTS GRM in the first German regulations dealing exclusively with the rubber modification of bitumen and asphalt, TL RmB-StB, By. The fathers (representatives of science, industry and authorities) of TL RmB were impressed by the production method and recognised that sustainable quality is produced here.

In order to fulfil all the requirements of the regulations, the manufacture of the rubber-modified bitumen granulates must take place in the so-called wet process, along the lines of the former hot-liquid rubber-modified binding agents. Key here is that the defined composition of the GRM is complied with. In a further work and process step, the concentrate is granulated on a final basis after the optimal polymer digestion.

This production process has a series of advantages:

1. Reproducible and controllable process conditions (temperature and time) that ensure that the polymers are embedded optimally into the bitumen matrix.
2. Since the production takes place in closed production plants – under a protective gas atmosphere – no separate temperature restrictions apply here. Thus, all occupational safety and environmental protection requirements can be safely fulfilled.
3. The composition of the products used defined according to the regulations ensures that only optimally reacted products not only can fulfil all the specifications, but also that the desired high viscosity can be achieved at all *only* through the optimal polymer digestion. Because *it* specifically is what guarantees high efficiency and is the key to permanent effectiveness of the rubber-modified bitumen granulates in the asphalt.
4. It is thus ensured that only process-reliable products can be used. Pseudo-modifications have no chance of consistently fulfilling all the specification criteria of the standard.
5. Incidentally, the addition of buffing dusts of any type to the asphalt – with or without additive – was not included in the TL RmB regulations due to qualitative considerations only. The basic idea was: to describe quality and not to allow any pseudo-modification.

The rubber-modified bitumen granulates from CTS Bitumen exhibit a series of advantages compared to commercially available polymer-modified binding agents:

1. Viscosity level
2. Ageing behaviour
    a. Induced by the extremely strong viscosity increase of the rubber modification
    b. *The* key property for particularly thick binding agent films

   c. Higher resistance of the polymers made of natural rubber towards oxidative influence and higher thermal and mechanical stability
   d. Associated with this, significantly higher permanence, i.e.:
      i. demonstrably considerably longer lay times
      ii. reduced maintenance effort
      iii. extended renovation intervals
      iv. as result: higher economic efficiency
3. Significantly better behaviour at low temperatures
   a. Flexibility at low temperature
   b. Flexibility at -20 °C
4. Significantly higher cohesion
5. Higher flexibility of the asphalt mixing plant. Nearly all asphalt varieties can be manufactured on the basis of CTS GRM and road construction bitumen of different gradation. With minimum logistical workload.

Conclusion:

The rubber modification (CTS GRM) offers a series of advantages compared to common road construction bitumen, usual PmB A as well as other types of rubber modification:

- Significantly more favourable resistance towards premature ageing
- Very high viscosity, enabling particularly thick binding agent films, which, in turn, is to be assessed as positively pro permanence
- Therefore, an addition of fibres in the case of SMA, SMA LA, PA and asphalt binder according to the SMA principle is usually not necessary, as a running out of the binding agent cannot be observed
- The storage at the asphalt mixing plant is non-critical
- Small and minute quantities can also be ordered and processed at the mixing plant.
- An order of large quantities such as with PmB A (special binding agents are frequently delivered only in large quantities) for a smaller measures is not necessary
- Rubber-modified binding agents from CTS Bitumen have demonstrably significant economic advantages over traditional bitumen.
- The high cohesion allows the successful implementation of special asphalt conceptions
- Reuse of rubber-modified asphalts is possible without problems and has already proved effective on multiple occasions over many years.

Milestones of CTS GRM:

○ Ageing:	approx. 50 % slower than PmB A
○ Flexibility at low temperature at –15 ° C:	approx. 5 x higher than PmB A
○ Flexibility at – 20 °C:	approx. 10 x higher than PmB A
○ Compressive stress:	approx. 10 x higher than PmB A

Consequently:

Significantly longer use durations.

In the PA: approx. 50 % longer than PmB A

In the case of dense asphalts: approx. 25 % longer than PmB A

Significant reduction in the average maintenance costs per year of lay time

As early as the late 1970s, university professor Alfred Schmuck of Munich University occupied himself intensively with the topic of economic efficiency in road construction. He was one of the first to take into account also the economic load due to traffic jam costs, costs for premature repairs and general maintenance costs. As a result, he postulated: “Only the roads that last longer are the most economically efficient.”

If Prof Schmuck had known then about CTS GRM, he would surely have immediately come up with the idea of the cost brake thanks to CTS Bitumen in the asphalt.

CTS Bitumen
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