
Recovery of Sealoflex® bitumen from asphalt concrete – State of the art.

There are several procedures available for the quantitative determination or recovery of bitumen in paving mixtures, such as extraction methods, ignition methods and nuclear methods. For Sealoflex bitumen, extraction gives the most reliable results at this moment. For this, a soxhlet extraction or an automatic extraction apparatus can be used.

An extraction is normally used to determine the bitumen content and the gradation of the aggregate. However, it is also possible to reclaim the residual bitumen and determine its mechanical properties.

The amount of bitumen found in the mixture, can be different than expected, due to several reasons. Such as absorption of bitumen in porous aggregate particles, wash out of filler and used modifiers in the bitumen, which could be insoluble in the used extraction solvent. Due to the same reasons, the properties of the reclaimed bitumen can be different than the properties of the fresh bitumen.

Furthermore, it has been found in the past, that due to the interaction of the plain bitumen with the filler, the amount of bitumen found can also be much lower than expected. Introducing a 2nd extraction step with a recommended mix of methylene chloride (78%) and methanol (22%), may solve this recovery problem. This kind of interaction will mainly occur with cured asphalt concrete. (Source: Benelux Bitume).

To minimise the influence of the recovery procedure itself, the extraction has to be done in accordance with the following procedures, depending on the goal:

Determination of mix composition only:

- ▶ Use an automatic extraction apparatus and methylene chloride as solvent. If not available, use a soxhlet extraction with methylene or toluene for a maximum of 24 hours.
- ▶ Weigh the maximum amount of asphalt concrete into a suitable bowl (normally 1,5 kg).
- ▶ If necessary, combine samples of the same source.
- ▶ Submerge the sample(s) in the solvent for about 30 minutes.
- ▶ Extract the submersed sample(s) as usual, only increase the extraction time up to 2 times as with a conventional bitumen, if necessary (the extraction solvent has to be clean).

The amount of bitumen found in the asphalt concrete mix can be lower than expected, because not all the bitumen will always be extracted, depending on bitumen type and solvent used. In case of special modified bitumen a correction factor has to be applied. In the next table the correction factors for the different types of Sealoflex bitumen can be found.

Table 1: Correction factors for the amount of Sealoflex bitumen found.

<i>Bitumen</i>	<i>Methylene extraction</i>	<i>Toluene extraction</i>
SFB 3	1.000	1.000
SFB 5	1.000	1.000
SFB 5 (JR)	1.025	1.000
SFB 5 (PA)	1.025	1.000

Determination of mix composition and mechanical properties of Sealoflex bitumen:

- ▶ For SFB 3 and SFB 5 extract as described in determination of mix composition only.
- ▶ For SFB 5 (JR) bitumen a soxhlet extraction with toluene is needed for a maximum of 24 hours. If methylene chloride is used, not all the bitumen will recover and due to this the mechanical properties will be of no value.

To prevent deterioration of the bitumen properties, the recovery of the Sealoflex bitumen from the extraction solvent has to be done very carefully in accordance with the following procedure.

- ▶ Reclaim the Sealoflex bitumen with a rotary vacuum evaporator with a maximum temperature of 185°C.
- ▶ Pour the binder in a preheated tin and place the tin at a heating plate.
- ▶ Mix and heat the binder to 185°C.
- ▶ Continue mixing for at least 15 minutes after the temperature of the binder has reached 185°C.
- ▶ Take samples for testing.

After performing the recovery procedure, it is likely found that the properties are different than of fresh material. The cause of this difference is the influence of the extraction solvent and the asphalt concrete mixing process in the mixing plant. Due to this, there shall always be a difference in bitumen properties.

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