

## Introduction

The need for more circularity increases, also for the Asphalt industry. But recycling of surface layers is not yet common and a lot of this material containing high-quality materials (both aggregates and binder) is 'downcycled' into base layers or even worse.

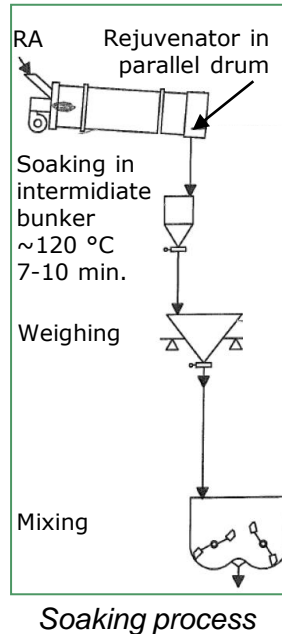
AsfaltNu and Heijmans developed a method to make this horizontal recycling possible, thereby facing problems like grading, aged bitumen and the recycling of PmB.

## Binder

The binder in surface layers is generally more aged than in base layers (Pen ~10 for the investigated case); and needs to be reactivated. This is not possible with existing recycling methods.

To rejuvenate such an aged binder, a 'soaking process' (see figure), was developed by Heijmans more than 10 years ago. This process involves a rejuvenator, time and temperature.

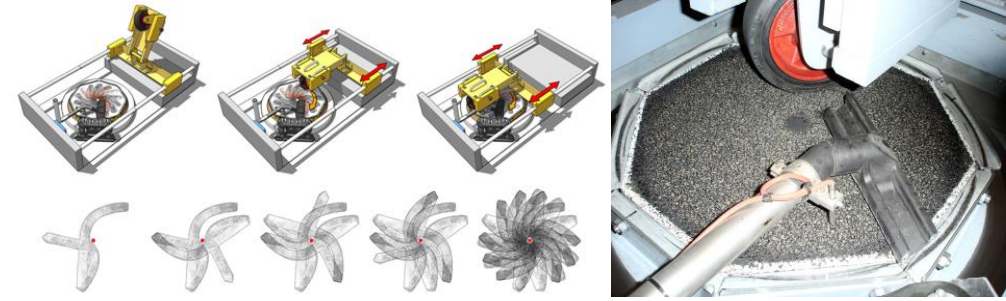
This process is also found to be suitable for the rejuvenation of RA, containing PmB.



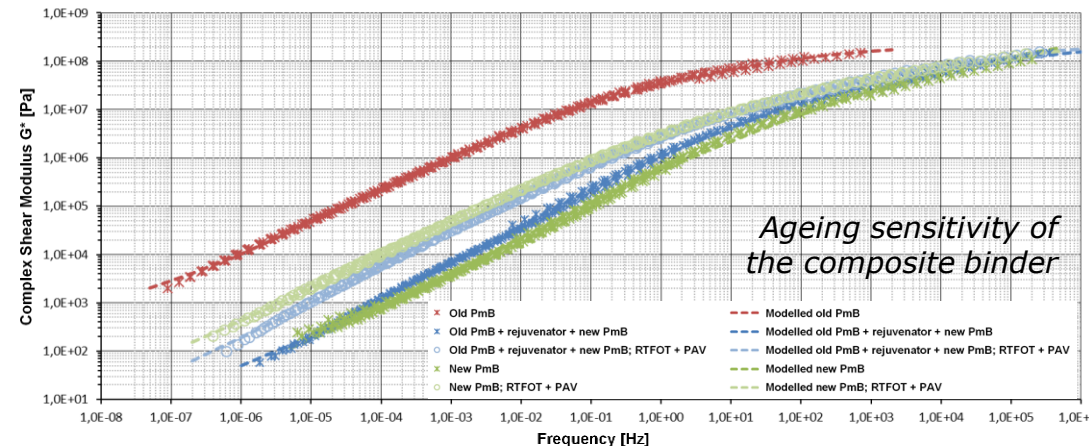
## Test program

Besides regular typetesting, some extensive tests were performed on both a new mixture with 40% RA containing highly aged PmB and a reference mixture (VAL and REF). Among those tests were:

- RSAT, a raveling test, investigated by CEDR, DRaT project).
  - The mixture with RA shows a better resistance against raveling
- ITT after 3 months frost thaw conditioning
  - Deterioration of VAL and REF is comparable
- GPC analysis (molecular size)
  - Homogeneous over thickness of bitumen shell
- FT-IR (finger print)
  - Soaking process reactivates the binder
- Ageing sensitivity: The composed binder has an equivalent ageing behaviour as a fresh binder



Rotating Surface Abrasion Test (RSAT)



Ageing sensitivity of the composite binder

## Conclusions

The new mixture with 40% RA, containing highly aged PmB showed an equivalent behaviour to the reference. This means:

- Recycling highly aged binder (Pen ~10) is possible
- Recycling PmB is possible

