

KONFERENCJA - Nowoczesne nawierzchnie drogowe
Recykling w konstrukcjach nawierzchni drogowych

CONFERENCE - Modern Road Pavements
Recycling in road pavement structures

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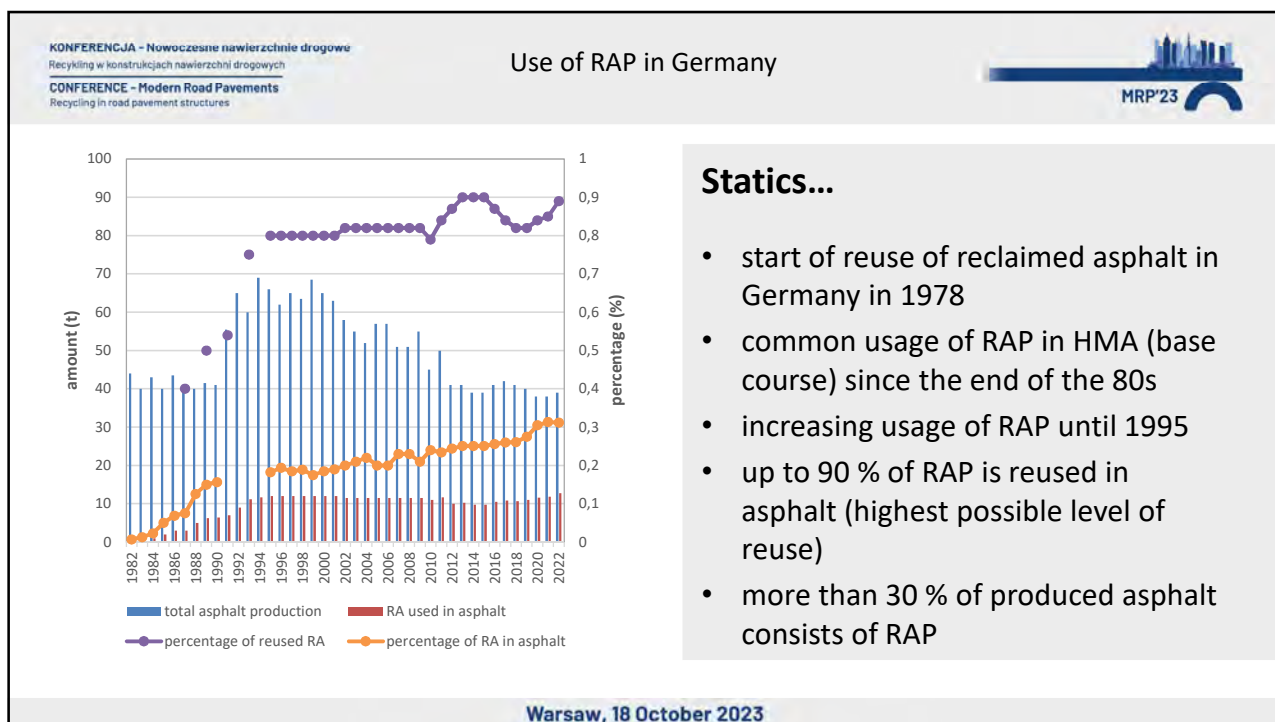
Warsaw, 18 October 2023

Use of RAP in Germany

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Section Asphalt Pavements
Dr. Verena Rosauer



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Relevant technical documents



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Possible adding of RAP to asphalt

- according to TL and ZTV Asphalt-StB 07/13
 - asphalt concrete (base, binder, surface course)
 - mastic asphalt
 - NOT: porous asphalt, stone mastic asphalt
- environmental compatibility
 - PAK according to EPA in solid material: < 25 mg/kg
 - phenol index in the eluate: ≤ 0,1 mg/l

possible adding in:	mastic asphalt	hot rolled asphalt surface course	asphalt binder course	asphalt base course
RAP from:				
mastic asphalt	++	0	0	+
hot rolled asphalt surface course	–	++	++	+
asphalt surface ¹⁾ and binder course	–	0 ²⁾	++	+
asphalt binder course	–	0 ²⁾	++	+
asphalt base course	–	–	–	++

0 conditionally possible, after special analysis
 1) usually not mastic asphalt
 2) after separate preparation

(Table: Instruction sheet for the reuse of Asphalt (M WA), Table 1)

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Extraction and handling of RAP

- layered milling (instead of breaking blocks)
- detailed analysis in advance (composition and characteristics/ageing of asphalt)
- storage of RAP at the plant (separation, piling, covering)



(picture: Federal Highway Research Institute, Kalantari)

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Technique to reuse RAP

- percentage of RAP added to asphalt depends on
 - asphalt produced
 - homogeneity and characteristics of RAP
 - technique of the plant
 - cold feed system (directly into the mixer or to the heated aggregate) → max. 30 % RAP
 - heating together with the aggregate → max. 40 % RAP
 - hot feed system – “proven” parallel drum → max. 60/70 % RAP
 - hot feed system – parallel drum using counter flow principle with hot gas generator → max. 100 % RAP
 - number of hoppers for RAP



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Homogeneity of RAP pile

- tested each 500 t, at least 5 times per pile
 - binder
 - content
 - softening point ring and ball
 - gradation after extraction
 - grain class 0/0,063
 - grain class 0,063/2
 - grain class 2/D
 - foreign materials

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Quality of asphalt

- quality of new asphalt courses must be ensured
 - same requirements are valid for asphalt mixture and course, even if RAP is used
 - softening the resulting binder by using
 - softer binder (max. one class softer)
 - rejuvenator

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Outlook

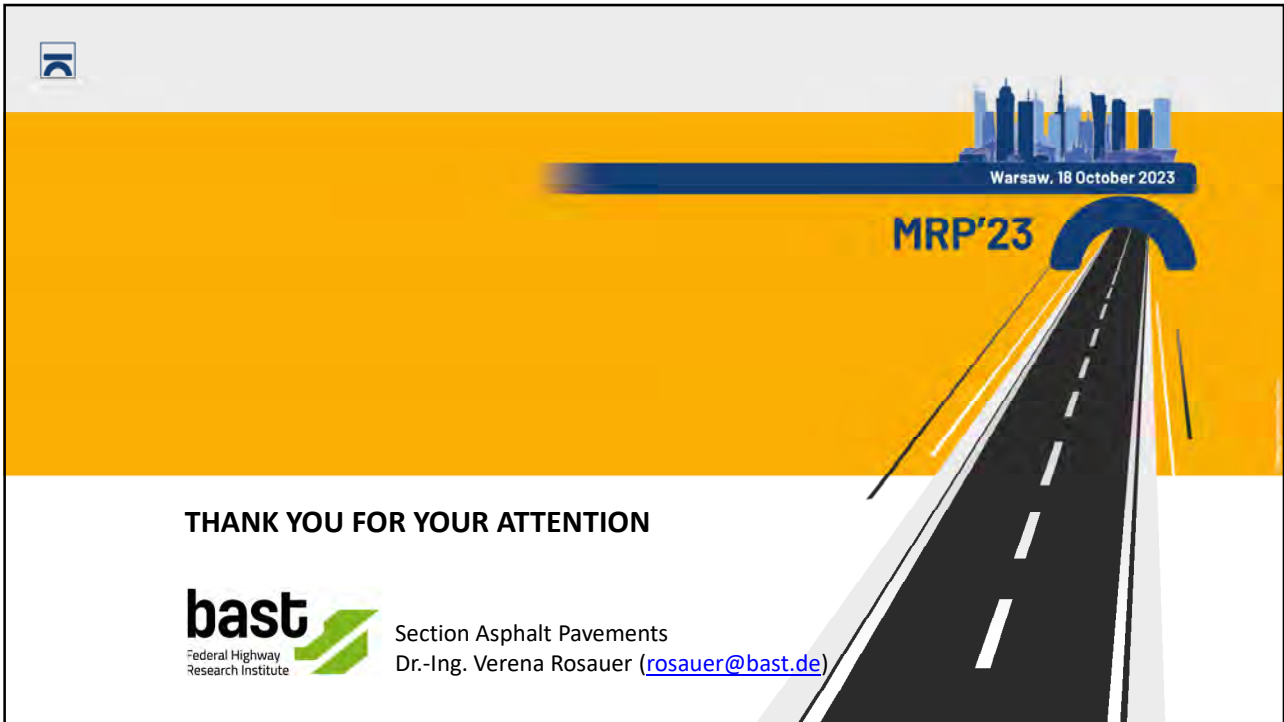
- regulation of some federal states to raise the content of RAP in the mixture
 - green asphalt, maximum recycling → up to 80..90 (100) % RAP
 - use of RAP also in stone mastic asphalt
- research
 - valuation of binder characteristics with rheological parameters
 - evaluation of test tracks with maximum recycling
 - usage of FTIR to identify modification of binder
 - double coating of aggregates
- list for rejuvenators that showed good performance
- present revision of the guidelines


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Summary

- 80 to 90 % reuse of RAP in HMA
- still scepticism of some contracting authorities
- efforts are made to enhance quality of RAP and thus raise possible RAP content in asphalt (extraction, handling and storage, plant technique)
- further research is to be done (e.g. recycling 2.0/3.0..., modification of asphalt, ...)
- quality of new asphalt courses must be ensured (no reduction in service life)
- ecological and economical benefits of using RAP (sustainability)

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THANK YOU FOR YOUR ATTENTION

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