Comparative Site Monitoring
Field Performance of Asphalt Surface Courses with RA

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Overview

- Background and objectives
- Sites monitored
- Results from monitoring
- Discussion
- Conclusions & recommendations for implementation

Background

- New bituminous layers, especially in the base layers have included high percentages of RA as standard practice across Europe.
- The higher demands of surface course layers has restricted the use of RA to relatively low levels (if at all).
- Increasing the RA content of surface course layers has benefits in terms of reduced demand for premium aggregates and binder.

Objectives

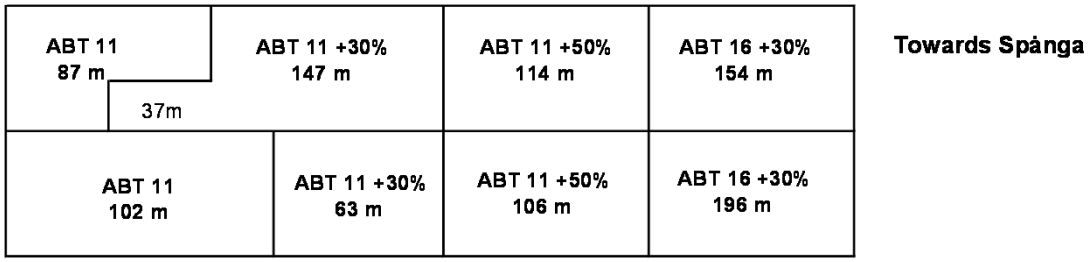
- The objective of WP 2 is to analyse the potential use of reclaimed asphalt (RA) in new asphalt surface layer mixes and particularly the use of modified binders.
- Sub-task 2.3 of WP 2 covers field validation and to determine whether the inclusion of RA in surface courses would affect its medium term performance.

Sites monitored (1)

Danish sites – all in situ recycled:

- Process used extensively since 1980.
- Sites monitored were constructed between 2006 and 2008.

Swedish sites – in situ plus two case studies with high RA content added at the plant.



ABT 11= 69 kg/m^2
ABT 16= 92 kg/m^2

The binder type is B180 for all coatings.

Sites monitored (2)

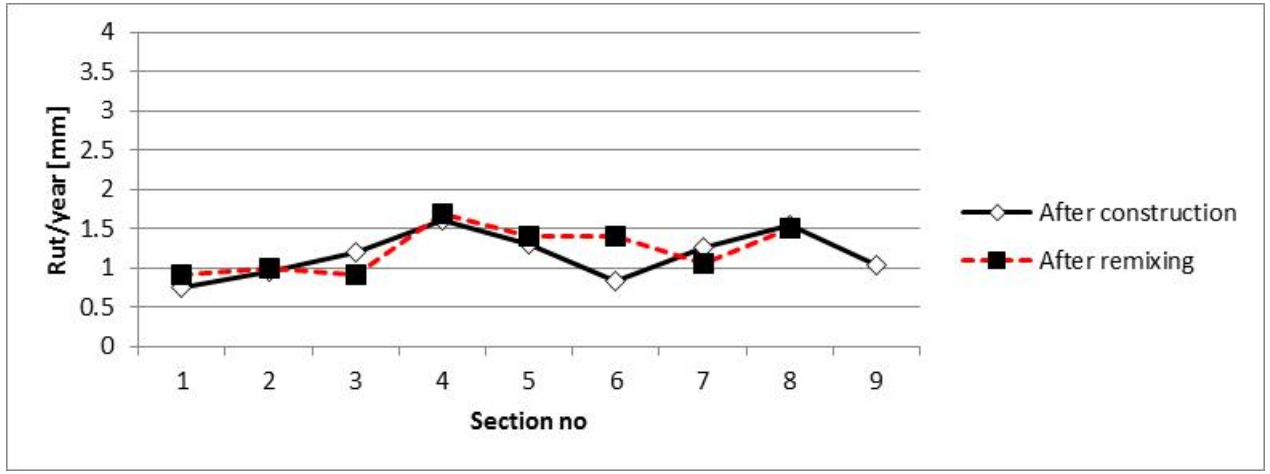
UK sites – all plant mixed ranging from pilot scale trials to full schemes.

Site	Constructed	Quantity of RA
Renishaw	2002	control, 15 % and 30 %
A405#	2004	control, 10 % and 30 %
M4 Cardiff#	2006	control, and 25 %
M25 Reigate 1	2007	control, and 23 %
M25 Reigate 2	2009	control, and 40 %

In Situ Results (1)

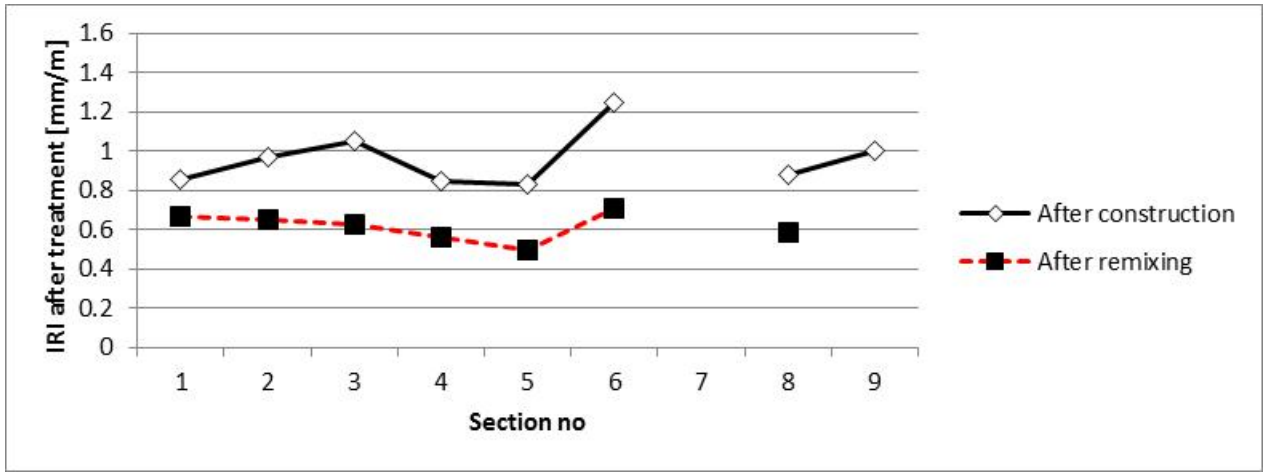
Possible to produce a remixed binder course that could remain exposed to traffic for 5 years.

Good performance for evenness and deformation resistance .



In Situ Results (2)

Remixing was a good way of restoring the road profile.

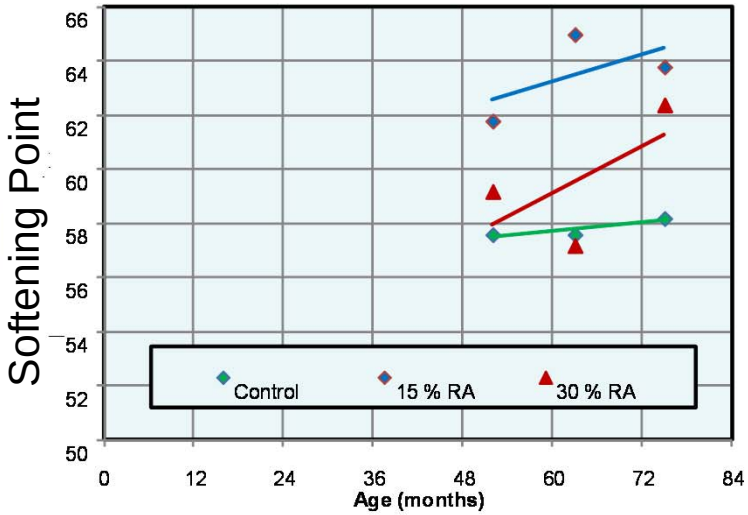


Repeated remixing shows that there was not an ‘end of life’ issue with AC.

Variations observed in services lives - 75% comparable with control sections.

Plant mixed results (1)

Renishaw pilot scale trial – after 10 years service.



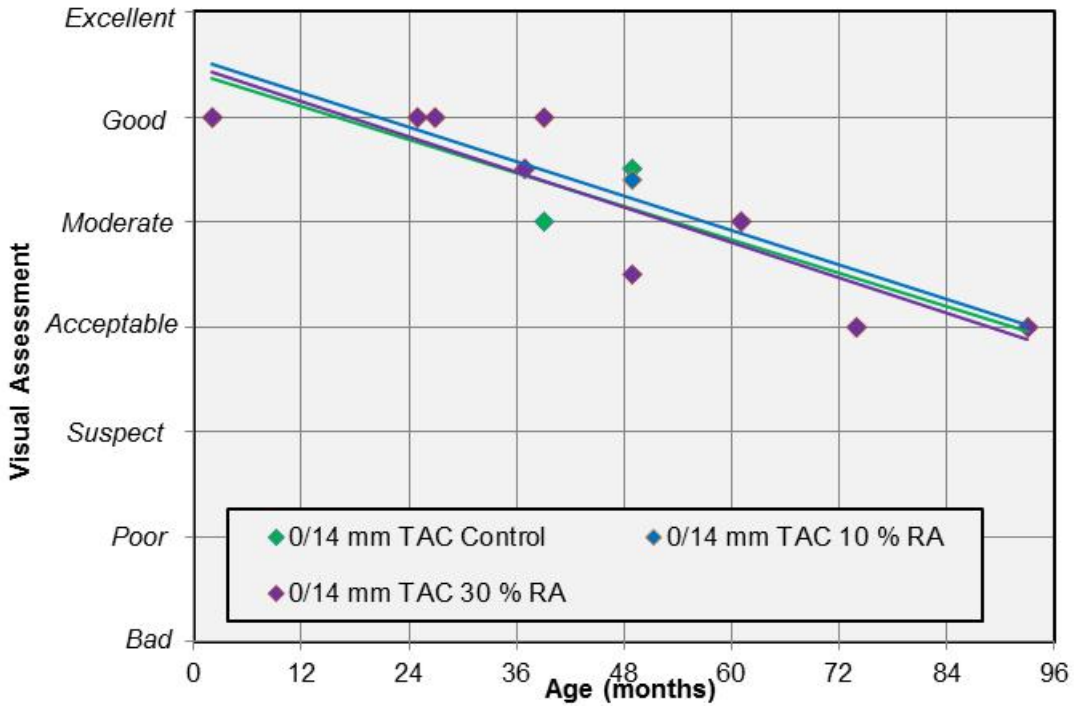
Some variations in recovered binder properties.

Deformation resistance comparable.

Visual assessment showed no differences between sections.

Plant mixed results (2)

A405 Trials Control, 10% and 30% RA with PmB.



Visual assessment showed no differences between sections.

Plant mixed results (3)

Resurfacing schemes

M4 Cardiff – client demanded 25% RA as part of contract.

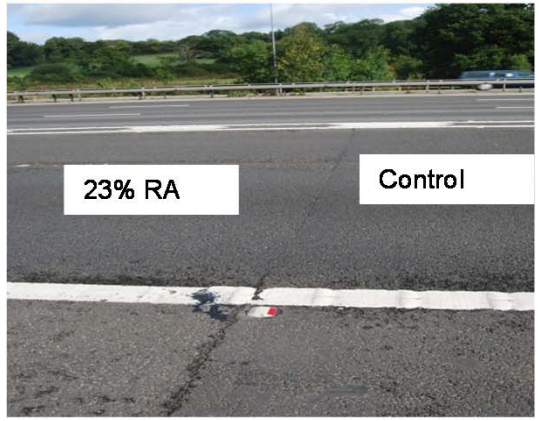
Test	Age (months)	14 mm TAC Control	14 mm TAC 25 % RA
Recovered penetration (0.1mm)	11		20
	23		21
	35	**20.5**	**20**
	52	**26**	**24**
Recovered Softening Point (°C)	11		70
	23		71.6
	35	**67.1**	**69.4**
	52	**68.2**	**70**
Visual assessment	11	E	E
	23	G	G
	35	G	G
	66	**M-j_o**	**G/M-j_o**
Wheel-tracking rate @ 60C	52	0.5	0.3

Visual assessment showed good agreement between sections.

Plant mixed results (4)

Resurfacing schemes

M25 J6-7 Reigate – client demanded high RA content as part of contract.



First scheme with only 23% RA.

40% RA added on second scheme following addition of separate RA dryer at the asphalt plant.

Energy savings with both options.

Plant mixed results (5)

Resurfacing schemes

Sweden Case Study SE-2 Spanga road, Bromma.

Section	Voids ratio, % by volume	Indirect tensile strength, kPa (Dry samples)	Indirect tensile strength, kPa (Wet samples)	Indirect tensile strength ratio,%
ABT11+50% RAP	3.0	1321	888	67
ABT11	2.4	1428	936	66

In 2010, the surface course for both sections was replaced was replaced after 11 years service.

No measurements could be performed prior to these works but the visual inspection showed no differences between RA and control sections.

Visual assessment showed good agreement between sections.

Discussion

- Limiting factors (asphalt plant / grading compatibility).
- Higher levels achieved with separate RA dryers.
- RA is an increasingly valuable resource.
- The scheme in the UK with high RA contents were all client driven.
- Adding large quantities to surface course can demand extra processing and testing. Using a consistent source can reduce this requirement.
- As a general rule, adding in small quantities could become the norm with higher percentages on major resurfacing contracts.
- No issues with PmB blends.

Conclusions (1)

- Plant mix
  - Performance of surfacing materials with RA have demonstrated comparable performance over the medium to long term.
  - The use of PmBs in trials and schemes has not presented any problems.
  - Some variation in recovered binder and material properties but not a cause for concern.
  - Visual observations key in demonstrating performance.
  - The schemes in the UK with high RA content were all client driven.

Conclusions (2)

- In Situ
  - Improvements in the operational process for in situ recycling since the late 1990's and this has led to a more consistent end product.
  - 75% of RA sections gave comparable performance to control treatments.
  - Effective in reducing the IRI and hence increasing the ride quality of the pavement.
  - Can be applied multiple times without adversely affecting asphalt performance.

Implementation

Quantities of up to 10% could be added on a routine basis provided RA stockpiles separate surfacing materials from other layers.

Higher quantities can be added on a scheme specific basis where the existing surfacing is of a consistent nature and the recycling can be undertaken with minimum amount of processing and testing.

In situ recycling can extend the life of the existing surface course and the treatment can be repeated.

Comparable performance can be achieved, but good quality control is needed for in situ recycling to ensure the right amount of additives and mixing occurs (and that the road has sufficient bearing capacity).