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Focus on Transportation Engineering:

- - PRASA's new National Strategic Plan
- MiCiTi: it is not just about the bus
- Geometric design: past, present and future
- Why do we drive on the left?





Getting the road between the Vaal River and the Kroon Plaza up to standard

A first for South Africa: high percentage reclaimed asphalt and warm mix technology

REPORT NRA N001-180-2011/1 NATIONAL ROUTE N1 Section: 18

SANRAL (South African National Roads Agency) initiated this project as part of its routine maintenance programme. This particular section of road (km 68.2 to 78.2) last received a light rehabilitation around the early 2000s. The rehabilitation then comprised isolated base corrections and an ultra-thin friction course (UTFC) – the National Asphalt licensed U-LM was applied for the first time in South Africa.

V & V Consulting Engineers were appointed to design the rehabilitation of the section with the aim of extending the life of the road by another 15 years. The structural capacity analysis of the pavement prior to the rehabilitation indicated that the remaining life of the pavement was inadequate to handle the required traffic load. Visual inspection of the north-bound carriageway showed surfacing defects, such as bleeding and deformation over the entire length, and patches of structural defects over the last three kilometres. Surfacing defects on the south-bound car-

riageway comprised mainly dryness and brittleness of the surface, with aggregate loss and surface cracks. Some sections were badly cracked and pumping was also visible in certain areas.

The project duration was to be ten months. With site hand-over having taken place at the end of last year the project was due for completion by the end of August 2013.

One of the specifications and design parameters that SANRAL insisted on was to reclaim and re-use the asphalt millings from the project. The replacement asphalt mix therefore had to contain a minimum of 40% of reclaimed asphalt (RA). The concept is based on the earlier very successful warm mix asphalt (WMA) trials, where 40% RA was used in a number of the trial mixes. The main reason for using reclaimed asphalt is to ensure the sustainability of natural resources, in this instance to save on the use of aggregates. The fact that the reclaimed asphalt materials still

contained aggregates of a very good quality meant that, with correct handling and processing, it could be re-used.

In terms of the design, and to ensure the extended life performance of the road, the old asphalt layers had to be milled to a depth of between 85 mm and 100 mm, and replaced with new asphalt containing 40% RA. The binder that was selected was an A-P1 that was achieved by using EVA blended with 70/100 penetration grade bitumen supplied by the SAPREF refinery.

Not only is this project the first in South Africa where 40% RA was specified on a full-scale project, but it was also the first where such a base was overlaid with an ultra-thin friction course (UTFC). In this instance the UTFC proposed by the contractor was the National Asphalt licensed U-LM, which is also certified by Agrément SA.

Due to National Asphalt's extensive involvement in the WMA and RA trials, which have been on-going since 2008, it

Asphalt hot storage plant



Vögele Paving applying 40% reclaimed asphalt black base mix



was fortuitous that they had placed an order with COMAR Plant Design to build a mobile plant capable of handling at least 40% RA, well in advance of the project even being advertised. When contractors then started asking for asphalt for the project it was much to the delight of National Asphalt that they had a use for the plant much sooner than they had anticipated. They could therefore give prices to the market with confidence. When the project was awarded to Roadmac Surfacing and it became apparent that the plant would be positioned at Vanderbijlpark, certain changes had to be made so that some of the infrastructure on the site could be incorporated into the new plant, including, for example, hot storage silos and cold feed bins.

The plant is a 100 ton per hour twin drum with the drying drum incorporating a counter-flow double-barrel section for heating of the RA only to a temperature of 100°C whilst virgin aggregates are still heated to normal requirements. The RA and virgin aggregate are then brought together at the end of the drum and together transferred into the second "mixing" drum where the bitumen and fillers are added and thoroughly mixed. Initially problems were experienced due

to changes that had to be made to incorporate the material into the existing hardware of the old plant. Ultimately these were overcome and the plant is currently working very well and efficiently.

The final asphalt mix design was done at National Asphalt's Bon Accord facility under guidance of Wynand Nortje, Technical Manager, who has immense experience with RA and WMA mixes. All the design parameters, as per the project specifications, were met, and, due to the specified high RA content, both the TRH 21 and the SABITA Manual 32 were used to optimise the binder quantity. As mentioned earlier, the base binder selected was 70/100, modified to conform to the TG1 A-P1 specifications. The high RA content not only required that base bitumen one grade softer had to be used, but also that a rejuvenator was needed to achieve the correct binder properties after mixing, and for this Sasol Wax's SW 1665 rejuvenator was selected. Modern "new age" rejuvenators not only rejuvenate the old binder in the recycled asphalt, but also has the additional benefit of transforming

the asphalt into a warm mix asphalt, of which some advantages are listed below:

- Longer haul distances can be achieved
- Lower application temperatures are possible i.e. winter paving, night paving, etc
- Lower mixing temperatures
- Fewer emissions, thereby improving worker comfort and safety
- Lower energy consumption, resulting in cost savings
- Various benefits to the environment.

This venture has been a success for all the parties involved in the contract. The project commenced during the summer months, and the same mixing and paving temperatures and rolling techniques were used well into the winter months, with no undesired effects experienced. By the time of going to press almost all of the total of 43 000 tons of base asphalt and 47% of the 13 000 tons of UTFC had been placed.

► INFO

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KEY PLAYERS

Client SANRAL

Project design and managers

V & V Consulting Engineers

Main contractor Road Mac Surfacing

Asphalt supplier, COMAR

National Asphalt

Base bitumen supplier

Asphalt Plant Manufacturer, SAPREF

Rejuvenator supplier SASOL

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