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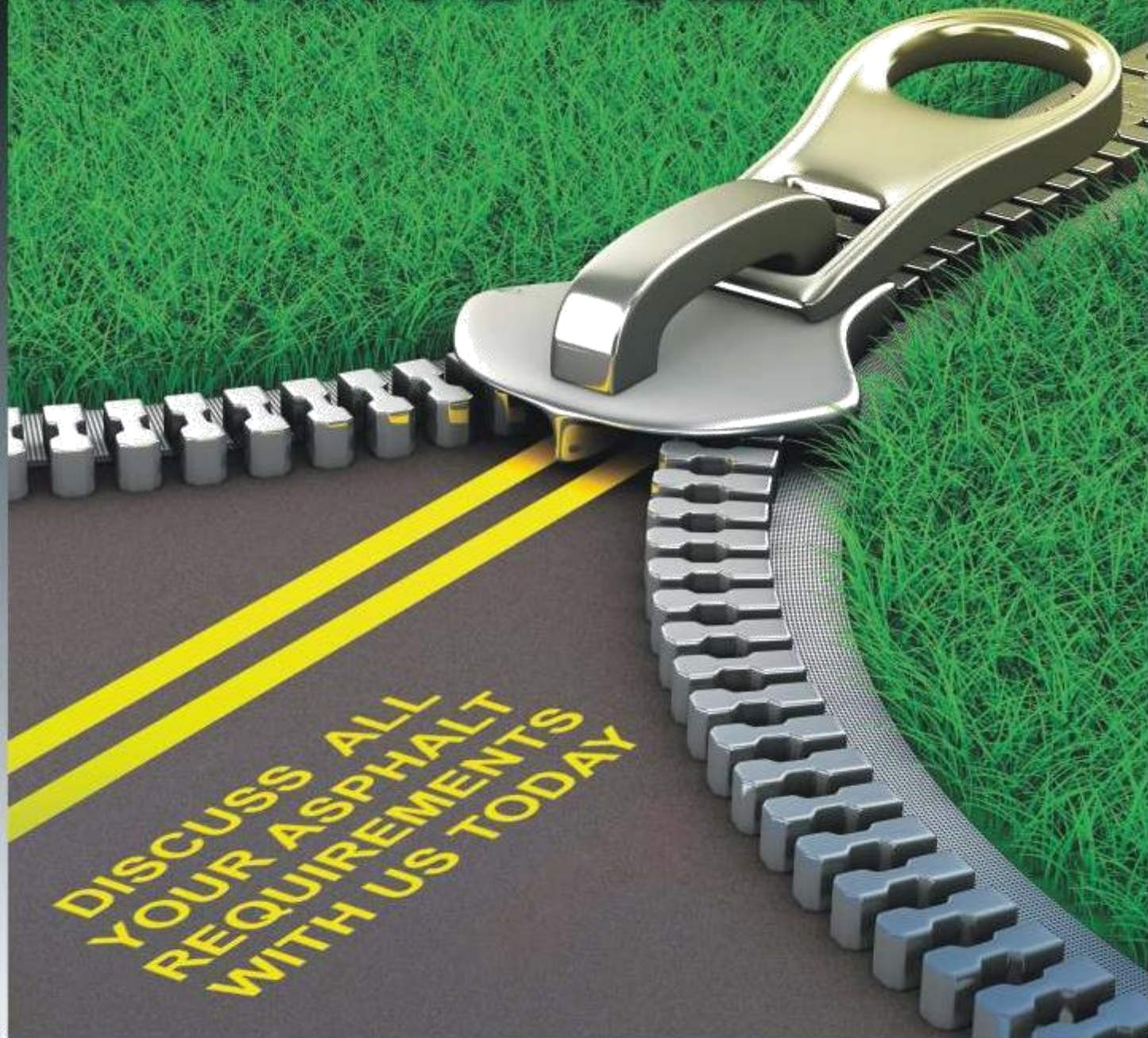


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Rehabilitation project achieves unique first in use of RA and WMA

A recent SANRAL project to rehabilitate an 18-km section of National Route N1 between Vaalrivier and the Kronvaal Plaza incorporated a unique combination of high percentages of reclaimed asphalt (RA) and warm mix asphalt (WMA technology).

Part of SANRAL's routine maintenance programme, the 10-month project was started towards the end of 2012, and is due for completion at the end of August 2013. This particular section of road last received a light rehabilitation around the early 2000's, made up of isolated base corrections and an ultra-thin surfacing course (UTFC).

The structural capacity analysis of the pavement prior to the rehabilitation indicated that the pavement was inadequate to handle the required traffic load during its anticipated remaining life. Visual inspection of the north bound carriageway showed surfacing defects such as bleeding and deformation over the entire length and structural patches over the last 3 km. Surfacing defects on the south bound carriageway were made up mainly of dryness and brittleness of the surface, with some aggregate loss and surface cracks. Some sections were badly cracked and pumping was also visible in certain areas.

V & V Consulting Engineers were appointed to design the rehabilitation of the section with the objective of extending the lifecycle of the road by another 15 years, and one of the specifications and design parameters insisted on by SANRAL was that asphalt millings from the project be reclaimed and re-used. The new replacement asphalt mix therefore had to contain a minimum of 40% of RA, the guiding precedent being the very successful WMA trials conducted recently by the eThekweni Municipality, in which 40% RA was used in a number of the trial mixes.

Sustainability

The principal objective behind this decision was to promote sustainability by reducing the consumption of new (raw) natural resources – in this case by re-using the high quality aggregates reclaimed from the existing pavement.

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 85mm and 100mm, and replaced with a new asphalt containing 40% RA. The binder selected was an A-P1, 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 in which 40% RA was specified on a full-scale project, but it was also the first in which such a base has been overlaid with UTFC. In this instance the UTFC proposed by the contractor was the National Asphalt licensed U-LM, which is also certified by Agrèment SA.

Due to National Asphalt's extensive involvement in the on-going WMA and RA trials since 2008, the company had



commissioned a mobile plant capable of handling at least 40% RA, well in advance of the project even being advertised. The 100-ton/hour twin-drum plant incorporates a drying drum with counter-flow double-barrel section for heating of the RA only to a temperature of 100°C, while the virgin aggregates are still heated to normal requirements. The RA and virgin aggregate are then brought together at the end of the drum and are simultaneously transferred into the second mixing drum, where the bitumen and fillers are added and thoroughly mixed.

Figure 1. Milled asphalt stockpiled ready for crushing and screening

On site a Wirtgen W200 milling machine was used to mill out the old asphalt materials according to the specified depths, at a milling speed of about 8 m/minute, resulting in a yield of around 300 m per day. Normal warm mix paving methodology was implemented and both the paving and milling operations took place in single closures of not more than 3 kilometres. Back at the asphalt plant all the milled material was crushed and then screened into three fractions at a rate of approximately 80 ton/hour. It is worthy to note that in the beginning the milling speed was around 12 m/minute, which resulted in material that was too coarse, the required percentage of finer material was not achieved, and too much “oversize” material was left on the floor.



Figure 2. Mobile asphalt mixing plant capable of handling at least 40% RA



Figure 3. Thermal image on the N1

After experimentation a milling speed of 8 m/minute was selected, giving the optimum fractions for the final asphalt mix.

The final asphalt mix design was done at National’s Bon Accord facility under technical manager Wynand Nortje, who has had immense exposure and experience of RA and WMA mixes. All the design parameters in the project specification were met, and due to the high RA content specified both TRH 21 and Sabita Manual 32: *Best practice guideline for warm mix asphalt*, were used to optimise the binder quantity. As earlier mentioned the base binder selected is a 70/100, modified to conform to the TG1 A-P1 specifications. The high RA content not only required that one grade softer base bitumen be used, but also that a rejuvenator was needed to achieve the correct binder

properties after mixing. Sasol Wax’s SW 1665 rejuvenator was selected.

WMA advantages

Modern “new age” rejuvenators not only rejuvenate the old binder in the recycled asphalt, but also result in an additional benefit of transforming the asphalt into a WMA, of which some advantages include:

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

Conclusion

There is no doubt that to date the project has been a success for all the parties participating in this project, which commenced during the summer months. It is noteworthy that the same mixing and paving temperatures and rolling techniques have been used throughout the project to date, well into the winter months, with no undesired effects being experienced. By the time of going to press most of the total of 43 000 tons of base asphalt and 47% of the 13 000 tons of UTFC had been placed.

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