

## Innovative warm mix asphalt trials completed near Durban

wma1

South Africa's first warm mix asphalt (WMA) trials, initiated by an interest group under the leadership of Krishna Naidoo of eThekweni Municipality and consultant Tony Lewis, were successfully completed near Durban in November 2008.

The main aim of these trials, carried out over a period of three days, was to confirm that asphalt mixes could be produced and paved at significantly lower temperatures than conventional asphalt, resulting in energy savings through lower fuel consumption, and a decrease in the emission of greenhouse gases.

A detailed visual inspection carried out along 30km of Brackenhill Road in eThekweni showed that severe pavement distress was concentrated on the first 400m of the road. Over the balance of the road, the distress was found to be more isolated. The severely distressed areas were patched to a depth of 200 mm.

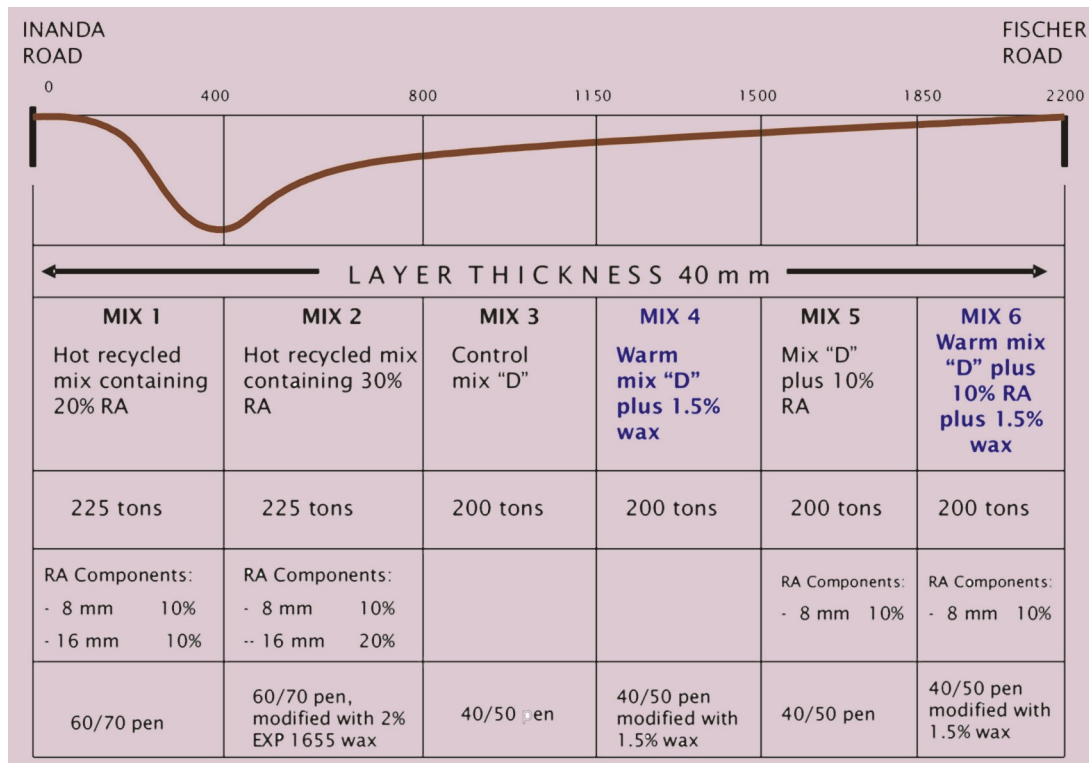
Another initiative of eThekweni's Road Rehabilitation Branch was to utilise the reclaimed asphalt (RA) from their roads by stockpiling it at convenient sites for later use in foam bitumen treated cold mixes. The mixes were produced in a specialised cold mixing plant by blending 85% RA and 15% crusher dust together with 2% foamed bitumen and 1% cement. The cold bituminously treated mix was paved and compacted in the same way as hot-mixed asphalt.

To strengthen the existing pavement and to provide a more uniform support for the surfacing trial mixes, a 125 mm layer of the cold in-plant recycled RA was paved over the full length and width of Brackenhill Road.

### **TRIAL WMA DETAILS**

The same grading, eThekweni Municipality's "Mix D", which is close to COLTO "medium" continuous graded asphalt surfacing mix, was used for all the six mixes used in the trials. The opportunity was taken to explore warm asphalt mixes with and without the addition of reclaimed asphalt (RA), and to also include two mixes with high RA contents.

As can be seen in the diagram below, modification of the two "warm" asphalt mixes was achieved by adding 1.5% SASOBIT to the bitumen used in each of these mixes, while in the case of the 30% RA recycled mix, SASOL provided a wax additive "EXP 1655", 2.0% of which was added to the 60/70 pen bitumen used in this mix.



The RA was fractionated into three sizes, with minus 16 mm plus 8 mm fractions being used in the high RA recycled mixes (Mixes 1 and 2), and only the minus 8 mm fraction being used in the two mixes containing 10% RA (Mixes 5 and 6).

Monitoring of a wide variety of parameters such as ambient, bitumen and mix temperatures, as well as burner fuel consumption, was carried out, and samples were taken for the full spectrum of tests, including MMLS testing.

Emission samples were taken at the plant, while fume measurements were taken at the paving site. The density of the paved asphalt was tested as compaction proceeded using a nuclear gauge and the final density checked using both nuclear gauge and core sampling methods.

## MAIN FINDINGS

In what were probably the first properly monitored warm mix asphalt trials in South Africa, the 125 mm overlay was useful in showing how reclaimed asphalt can be effectively utilised, not only in hot mixes, but also in cold bituminously treated mixes.

It was also found that:

- WMA mixes can be successfully produced at temperatures at least 20°C below those of conventional asphalt;
- Moisture content in the mixes was less than 0.5%;
- The mixes could be compacted to the same degree as conventional asphalt;
- Burner fuel consumption was reduced by between 15% and 20%;
- At least 10% RA could be incorporated in WMA.

Pertinent findings regarding the two “High RA” mixes that were manufactured at conventional asphalt mixing temperatures are that:

- At least 20% RA could be incorporated in a mix, by using a higher penetration grade bitumen i.e. 60/70 instead of 40/50.
- Full coating was achieved when 30% RA was used in the mix, which was manufactured with 60/70 pen bitumen and a wax additive

The execution of this project provided a good example of how partnerships between clients, contractors, consultants and suppliers can be utilised to successfully introduce new technology, and earned project leaders Naidoo and Lewis the prestigious annual Sabita Award for Outstanding Achievement in Bituminous Product Technology.

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