Bituminous Surfacings New Directions

Keynote Address

Delivering Spray Sealing Benefits

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2010 Biggest Issues reported

1. Sustaining the existing network
   1. Monitoring networks (Pavement Management Systems)
   2. Insufficient preventive maintenance (resealing)
   3. Impact of increased loadings
   4. Performance based maintenance/reseal contracts

2. Skills shortage
   1. Preparation of base course prior to sealing
   2. Appropriate seal type aggregate and binder selection
   3. Design and specifications
   4. Construction and QA

3. Better understanding required
   1. Mechanisms to seal failure
   2. Binder/aggregate properties and interaction
   3. Moving from “art” to science

Emphasis

- Do we understand the benefits of preventive maintenance: Resealing?
- Do we expect too much of seals?
- How can we improve the quality and performance of sprayed seals?

Benefit of Reseal in time

- Quantify through PMSs
- Reseal in time $x
- Rehabilitation $6x-$18x

Western Cape Provincial Government

- Annual monitoring of road network condition
- Drastic improvement due to
  - Significant increase in annual reseal program

PMS without action

- Require proper asset management system
- NB – to act according to recommendations
New RSA initiatives

- Updating
  - Road Asset Management manual (TMH22)
  - Updating all assessment manuals (TMH9)
  - Other relevant guideline documents
- SANRAL to manage
  - Grant to Road Authorities
    - Reinstate Asset Management Systems
    - Subsidise preventive maintenance

What do we expect from seals

- Safe, durable all-weather riding surface with acceptable noise level
  - Protect the base from vertical moisture ingress
  - Provide Skid resistance
  - No damage to vehicles from aggregate loss
  - Noise levels appropriate to local environment
- In all situations?
  - NB – Important to understand the limitations of seals

Skill shortage: Base finish before sealing

- Crushed stone bases
  - Ideal
  - Coarse but OK
  - Poor

Cape Seal on proper crushed stone base

- IDEAL: to prevent embedment
  - Seal stone must be in contact and adhere to larger aggregate in base

Soft layer/lens on base

- Final grader cut
  - Low density untreated top layer
  - Biscuit layer

Cement stabilised base

- Soft layer due to carbonation
Impact of upper base softness

- Embedment/ texture loss/ pick-up

What if “no prime”?

Solutions to base problems

- Training (RA, Consultant, Contractor)
- Improved specifications
- Improved test methods
- Method specifications
  - Base construction
  - Seal construction
- Selection of more appropriate surfacing types

RSA initiatives

- Updating of the “Standard Specifications for Road and Bridge Works”
- Foam/ Emulsion treated bases – current investigation

Skill shortage: Effect of old surfacing

Varying existing texture - Impact?

- Dry/brittle porous surfacing
  - No pre-treatment e.g. rejuvenation
Skill shortage: Effect of old surfacing

- Poor transverse distribution on old seal
  - Pre-treatment required e.g.
    - Diluted emulsion and texture treatment

Skill shortage: Effect of old surfacing

- Dirty surfacing before reseal

Reseal: Solutions

- Training
- Proper investigation
- Interpretation of measurements
- Pre-treatment e.g.
  - Fogspray
  - Texture treatment
  - Drymatting

Construction

- Attention to detail
  - Joints
  - Transverse distribution
  - Aggregate spread (construct according to design)
  - Rolling
  - Opening to traffic

Effect of Spray bar height

Aggregate spread control
## Aggregate spread

- Same seal and binder application
- Different aggregate spread rates

## Building on previous SSA workshops

- Only pneumatic rolling
- Seal and pneumatic rolling

## Aspects recently addressed (RSA)

- Seal and binder selection – SABITA Manual 10
- Slurry & Microsurfacing – SABITA Manual 28
- SAPEM
  - Pre-treatment
  - Seal construction and QA

## New initiatives (RSA)

- Moving science closer to the “art”
- SANRAL initiatives
  - Performance of thin surfacings
  - Towards a mechanistic design for sprayed seals
  - Maximise sealwork: Winter sealing
  - Sprayed seals – effect on road noise

## Binder hardening

- Building on J Oliver’s work
- Testing 70 samples
  - Different seal types
  - Age groups
  - Climatic zones
  - Binder type and initial quality (properties)
- Promising results
  - Different climatic influencing factors

## Seal performance

- Oxidative hardening
- Crack initiation
- Crack reflection
  - Different seal and binders
- Texture loss

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G van Zyl – University Stellenbosch
Impact of upper base softness

- Surfacing fatigue (new seal)
  - Low temperature (-5 Deg C)
  - Stiff binder (4% PMB)
  - Soft layer below seal
  - Heavy loads at night

Quantifying stiffness & fatigue characteristics with ageing

- 70 Seal samples

Defining seal geometry

- Different seal types

Development of mechanistic models

- 3D models
- Test Extrusion Process
- Chemical Extrusion Process
- X-ray Models

Development of adhesive failure

Embedment potential

- Ball penetration - Site tests
  - Effect of measurement/interpretation
    - Embedment/Displacement/crushing
    - Measured ball penetration on hard surfaces
    - Effect of very soft surfaces
**Modelling embedment**
- Effect of load, tyre pressure/ Aggregate spread (G van Zyl)
- Mechanistic modelling (J Gerber)

**Sprayed seals – Noise reduction trials**

**Existing 19/9 + Fine slurry**

**Existing 19 + closely packed 9.5 mm**

**N2/6 Results – Noise Improvement Trials**

<table>
<thead>
<tr>
<th>Noise Improvement Trials (Normalised Dual N2/6)</th>
<th>4.7 dBA</th>
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<tbody>
<tr>
<td>19/9 + Fine slurry</td>
<td></td>
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<tr>
<td>19% + 9% (6mm)</td>
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<tr>
<td>19/9 + 9% (6mm)</td>
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<tr>
<td>19/9 + closely packed 9.5 mm</td>
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<tr>
<td>19% with 9% closely packed</td>
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<tr>
<td>Existing 19/9 double seal</td>
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**Winter seal trials**
- 6 Seal types
- 5 Binders
- High – Low application rates
- 0% - 4% Low flashpoint solvents
- Aggregate spread (Open – closed)
- With and without fogsprays
- Low – High traffic
- 3 Climatic areas
Winter seals

- Trials (Emulsions) – Temp -5 Deg C
  - First spray PMB Emulsion
  - Second spray PMB + LFS
  - Cover spray Cationic Emulsion

Performance based contracts

- Macro texture (Skid/ Noise)
  - Appropriate (Climate, traffic volume, geometry)
  - Mean Profile depth or Mean Texture Depth

Point

 Performance based contracts

- Uncertainties e.g.
  - Traffic volume, loading, tyre pressure
- Risk sharing
  - How?

SUMMARY

- Skills !!
- Learn from eachother
- Training the whole work force
- Monitor performance and quantify
  - Benefits
  - Risks
- Research
  - Practical
  - Art to science
- Adjust management strategy if necessary

END

THANK YOU!