

Bituminous Surfacings New Directions



Keynote Address

Delivering Spray Sealing Benefits

Gerrie van Zyl
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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

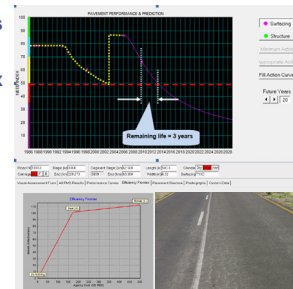


- Do we understand the benefits of preventive maintenance: Resealing ?
- Do we expect too much of seals ?
- How can we improve the quality and performance of sprayed seals ?

Benefit of Reseal in time



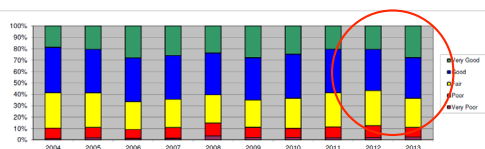
- Quantify through PMSs
- Reseal in time \$x
- Rehabilitation \$6x-\$18x



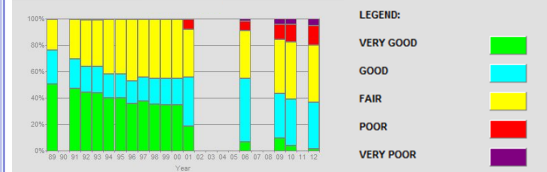
Western Cape Provincial Government



- 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

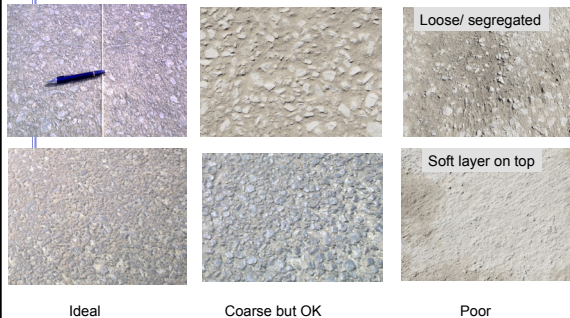
- **Updating**
 - ☐ Road Asset Management manual (TMH22)
 - ☐ Updating all assessment manuals (TMH9)
 - ☐ Other relevant guideline documents
- **SANRAL to manage**
 - ☐ Grant to Road Authorities
 - Reinstate Asset Management Systems
 - Subsidise preventive maintenance

What do we expect from seals

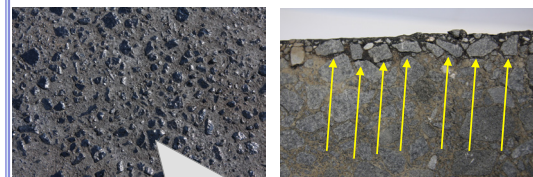
- **Safe, durable all-weather riding surface with acceptable noise level**
 - ☐ Protect the base from vertical moisture ingress
 - ☐ Provide Skid resistance
 - ☐ No damage to vehicles from aggregate loss
 - ☐ Noise levels appropriate to local environment
- **In all situations ?**
 - NB – Important to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

Skill shortage: Base finish before sealing

• Crushed stone bases



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



- Publishing of SA Pavement Engineering Manual
- 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?



Skill shortage: Effect of old surfacing



- 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



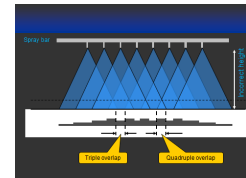
- **Training**
- **Proper investigation**
- **Interpretation of measurements**
- **Pre-treatment e.g.**
 - Fogspray
 - Texture treatment
 - Drymatting



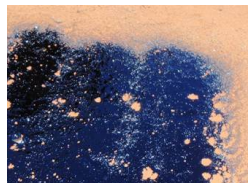
Construction



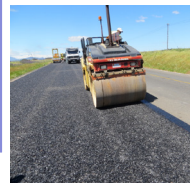
- **Attention to detail**
 - Joints
 - Transverse distribution
 - Aggregate spread (construct according to design)
 - Rolling
 - Opening to traffic



Effect of Spray bar height




Aggregate spread control

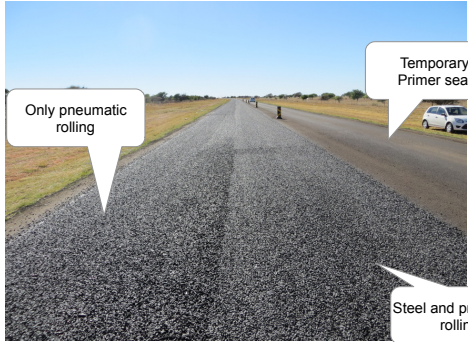


Aggregate spread

- Same seal and binder application
- Different aggregate spread rates



Building on previous SSA workshops



Only pneumatic rolling

Temporary Primer seal

Steel and pneumatic rolling

Aspects recently addressed (RSA)

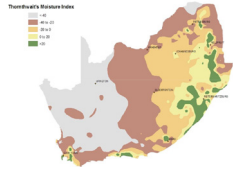
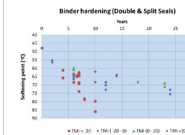
- Seal and binder selection – SABITA Manual 10
- Slurry & Microsurfacing – SABITA Manual 28
- SAPEM
 - Pre-treatment
 - Seal construction and QA

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

G van Zyl – University Stellenbosch


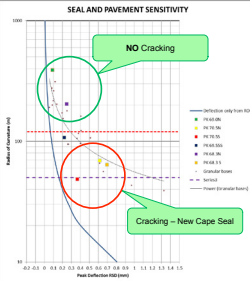
Seal performance

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



Impact of upper base softness



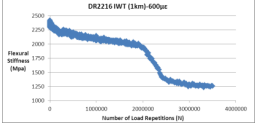
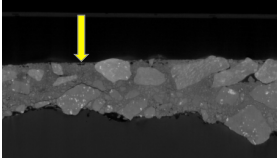
- **Surfacing fatigue (new seal)**
 - ❑ Low temperature (-5 Deg C)
 - ❑ Stiff binder (4% PMB)
 - ❑ Soft layer below seal
 - ❑ Heavy loads at night

J Gerber – University Stellenbosch

Quantifying Stiffness & Fatigue characteristics with ageing

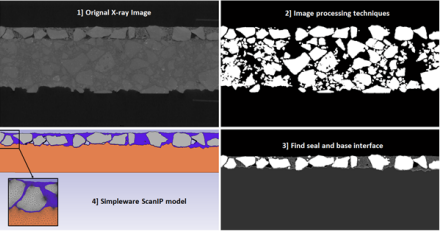
- **70 Seal samples**

R Cloete – University Stellenbosch

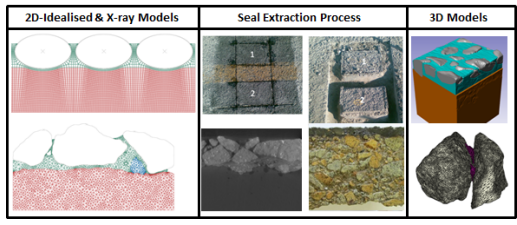
Defining seal geometry

- **Different seal types**



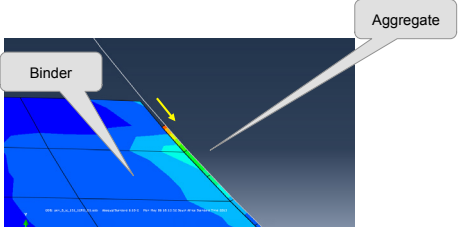
J Gerber – University Stellenbosch

Development of mechanistic models



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Development of adhesive failure



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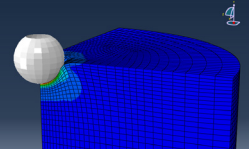
Embedment potential

- **Ball penetration - Site tests**
 - ❑ Effect of measurement/ interpretation
 - Embedment/ Displacement/crushing
 - Measured ball penetration on hard surfaces
 - Effect of very soft surfaces




J Gerber – University Stellenbosch


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

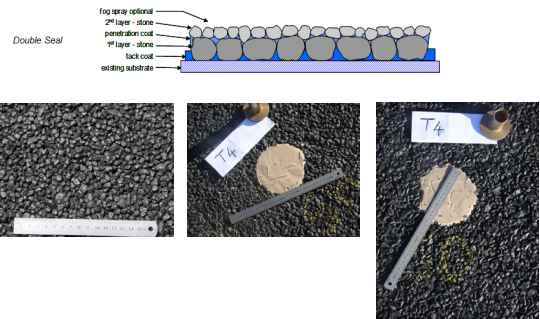
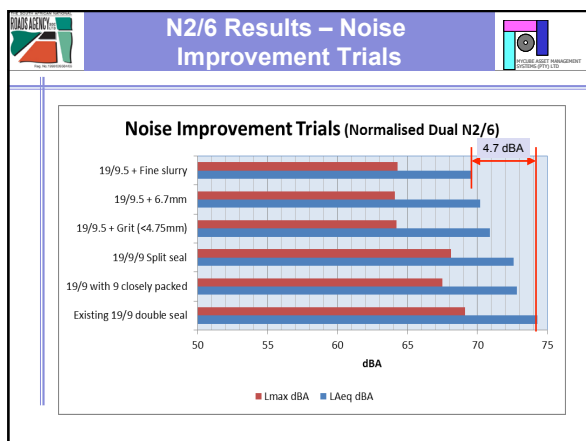


Diagram labels: fog spray optional, 2nd layer - stone, penetration coat, 1st layer - stone, tack coat, existing substrate.







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

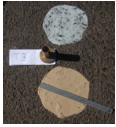

- **Trials (Emulsions) – Temp -5 Deg C**
 - First spray PMB Emulsion
 - Second spray PMB + LFS
 - Cover spray Cationic Emulsion

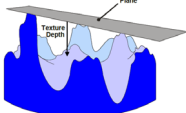
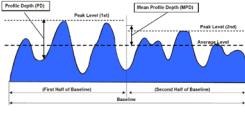
13.2+6.7
19+6.7
19+6.7+6.7
19+9.5

Performance based contracts

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

ETD = 0,2 mm + 0,8 MPD
(ISO 13473) ????

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 !