

Technology in Practice

High-Performance Emulsions

37th Roads Pavements Forum

Port Elizabeth

Why the focus on emulsions?

- Great potential for alleviating impact of winter seal embargo on bitumen usage - Van Zyl and Bredenhann CAPSA 2015 paper.
- Scope for improving safety for road construction workers and lowering carbon footprint.
- Versatile method for producing fine-tuned binders. Hot (melt) binders have limited opportunity for rheology adjustment.
- From own experience in water-based emulsions for decorative and automotive paints and adhesives it was obvious there was more.
- Potential to lower cost of spray equipment and therefore give access to emerging contractors with limited capital.

H-PEG – why, who and how

- SABITA Technical Committee accredited working group
- Why? Investigate if our emulsion products are up with state-of-the-art in ROW. Particular emphasis on chip spray seals with greatest potential.
- Who? Materials scientists and other interested parties – 9 members
- How? Pre-reading of relevant technical papers for each meeting with outline of pertinent learnings prepared for each. Clear objectives for each meeting but with fluid agenda.
- Application of learning to address local challenges, shown in CAPSA 2015 conference paper: “Recommended Practice For Winter Sealing in South Africa” by Gerrie van Zyl and Steph Bredenhann.
- Report of meetings to RPF and SABITA Technical committee (in draft still).

1st Meeting – Where are we now?

Current state of the art of emulsions for chip seals

- 70/100 PEN used now, previously 150/200 PEN
- Flow off slopes, slow to allow traffic, short shelf-life
- Emulsion “secrets” – difficult for RM suppliers to offer new concepts.
- Quality measurements do not adequately reflect break and cohesion
- Improved emulsion properties are limited by emulsion plants (insufficient shear, heat removal and fine mill adjustment.
- “Chicken and Egg” – market is mostly uninformed of possibilities, so expectations are low and emulsion producers are waiting for market to ask.

2nd Meeting – Where do we want to get to?

Define the performance parameters that would match our industry requirements and unique climatic conditions

- Widespread use of emulsion based seals for maintenance in all seasons, in all South African weather conditions (except falling rain).
- Getting traffic on the road quicker after chip seal application, by fine-tuned emulsion design – so called “*Next Generation*” emulsions.
- Offerings in industry of a wider choice of emulsions rheologies enabling new seal designs, not possible with current hot and emulsion binders.
- Cold binder application to enable less sophisticated, less expensive spray equipment or even application by hand sprayers.
- Benefits with emulsions of worker safety, lower energy requirements and

2nd Meeting – Where do we want to get to?

- More young, skilled emulsion chemists, with access to essential analytical equipment (e.g. particle size analysers), suited to developing optimum formulations via scientific fundamentals.
- Offer by binder manufacturers of new, high performance PMBE's for use on heavily trafficked roads, especially for microsurfacing operations.
- Industry emulsion specifications that ensure quality, but do not inhibit innovation.

3rd Meeting – How will we get there?

- A definite commitment from the industry to exploit all opportunities for replacing hot binders with emulsion based binders.
- Investment in higher specification emulsion plant equipment to produce more refined, more stable emulsions
- Strategic intent by emulsion producers to develop “next generation”, cationic emulsions for winter sealing operations.
- Sharing of optimum sprayer configuration for application in all conditions (storage criteria , pumping capacity, nozzle designs, etc)
- Commitment by whole industry to attract chemists who are trained and understand the formulation of emulsions and interaction with aggregates
- Open forums, like H-PEG, for discussing best international practice in emulsion formulation, manufacture & application in road construction.

4th Meeting – Conclusion and Close-off

- Opportunities for early wins – CAPSA Workshop, Gaylon (IBEF Chairman) visit, “Next Generation” emulsion chip seal trial in this embargo period.
- Emulsions to match SE1/SE2 and refine rheological properties of SCE1 and SCE2 type emulsions.
- Promote the use of emulsion based chip seals for pavement preservation especially by smaller contractors.
- Encourage fundamental local research on bitumen emulsions, with emphasis on new concepts for more effective unpaved road stabilisation
- Review and combine TRH7 and Manual 26.
- Next discussions: emulsions for tack coats, bond coats, cold asphalt surfacing, etc.

