Feedback on 4th Eurobitume & Euroasphalt Congress & 1st Spray Seal Conference

Trevor Distin

RPF 11 November 2008

4th Eurobitume & Euroasphalt Congress

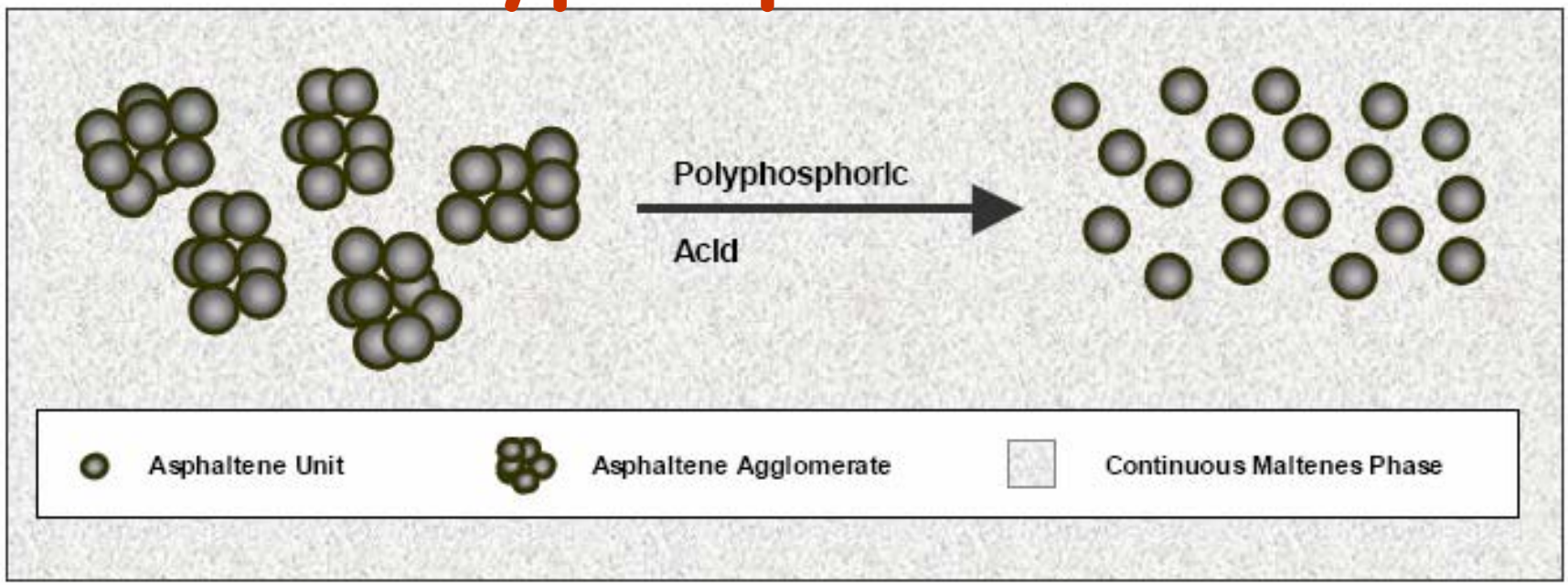
Asphalt – Roads for life

- Held at the Bella Centre Copenhagen
- 21 – 23 May 2008
- 734 delegates (6 RSA)
- 203 papers, 80 posters, 45 exhibition stands
- 23 papers presented (2 RSA)
- Only plenaries no workshops
- Rapporters sumarised papers for each session

Advances in binder technology

- Modification of bitumen with polyphosphoric acid (4)
- Development of plant based binders (3)
  - Fluxing of bitumen with vegetable oils
- Performance of modified binders & adhesion agents (3)
- Developments in testing of binders (15)

Modification of bitumen with Polyphosporic acid



Proposed theory

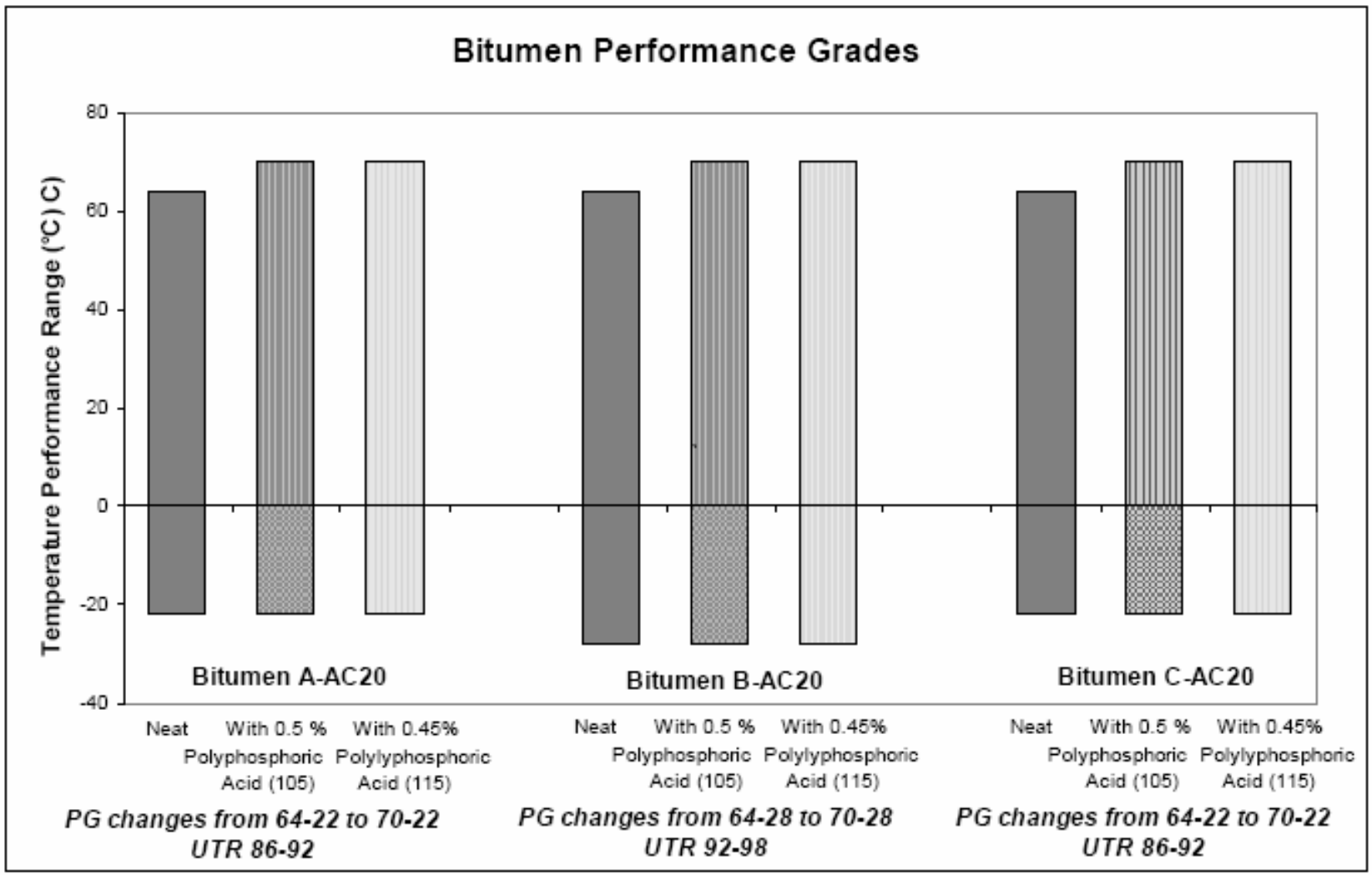
- PPA reacts with various functional groups in the bitumen
- Breaks up asphaltene agglomerates, allowing individual asphaltenes to form a better dispersion in the maltene phase
- Individual asphaltenes are more effective in contributing to elastic behaviour

Properties of bitumen modified with PPA

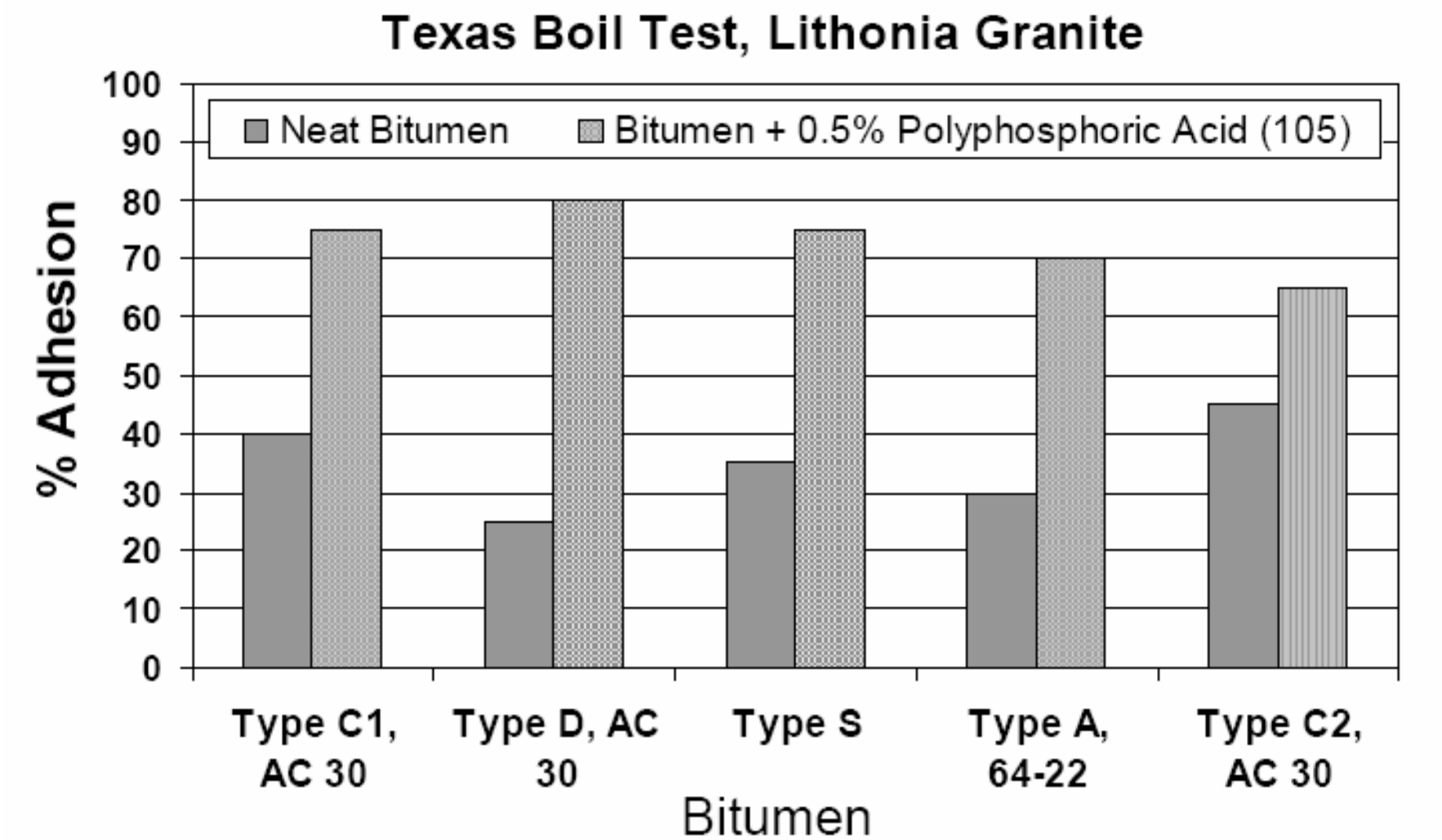
Bitumen	Viscosity Abs @ 60 C (M Pa s)	Softening Point (°C)	Penetration (dmm)		Approximate ASTM D3381 Viscosity Grade Classification	Approximate ASTM 946 Penetration Grade Classification
			25° C	4° C		
A Neat	285	52	51	24	AC-30	40-50
A + 0.50% Polyacid 105	697	58	46	26	AC-70	40-50
B Neat	261	48	84	31	AC-30	85-100
B + 0.50% Polyacid 105	566	55	72	35	AC-50	60-70
Polyacid = Polyphosphoric Acid						

- 0,5 - 2,0 %m/m PPA added to bitumen
- Reduces penetration value
- Increases the softening point
- Effect of PPA is dependant upon origin and composition of the bitumen

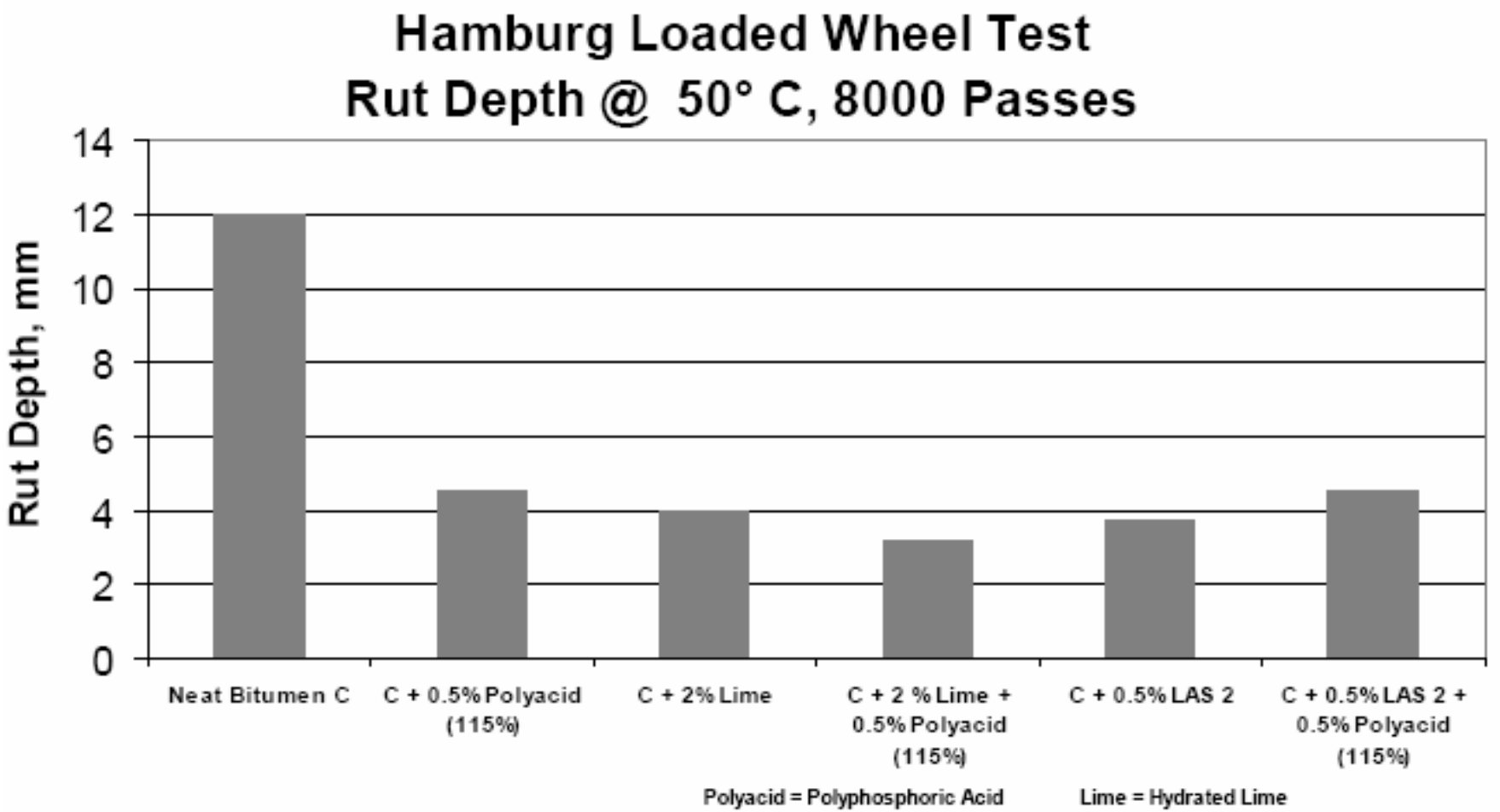
Bitumen Performance Grade changes with addition of Polyphosphoric Acid



Bitumen/Aggregate adhesion Texas Boil Test



Rutting Performance – Hamburg Wheel Test



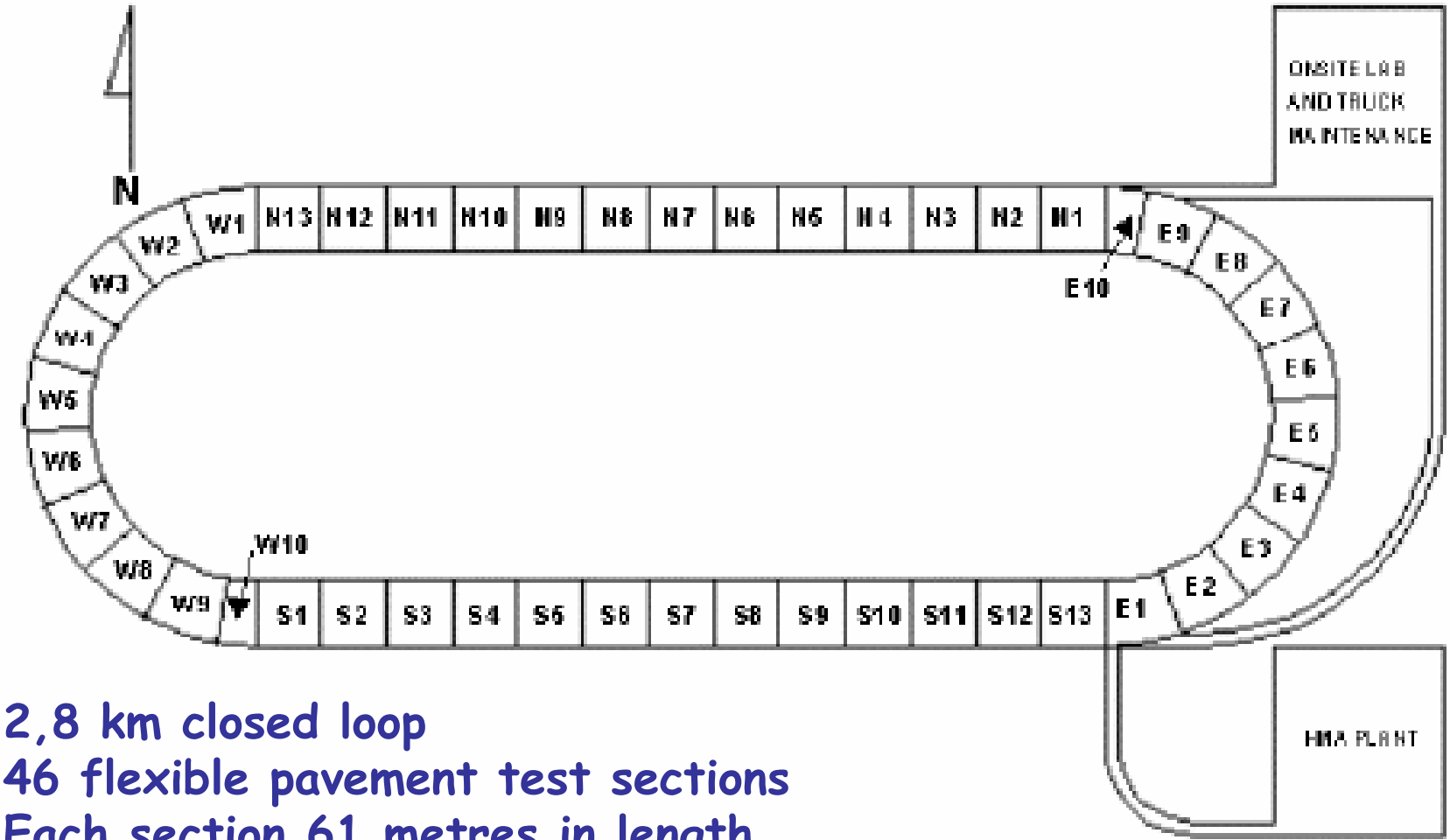
PPA and SBS modified asphalt:

Evaluation of paved sections at the NCAT test track in 2000 and 2003

Typical formula:

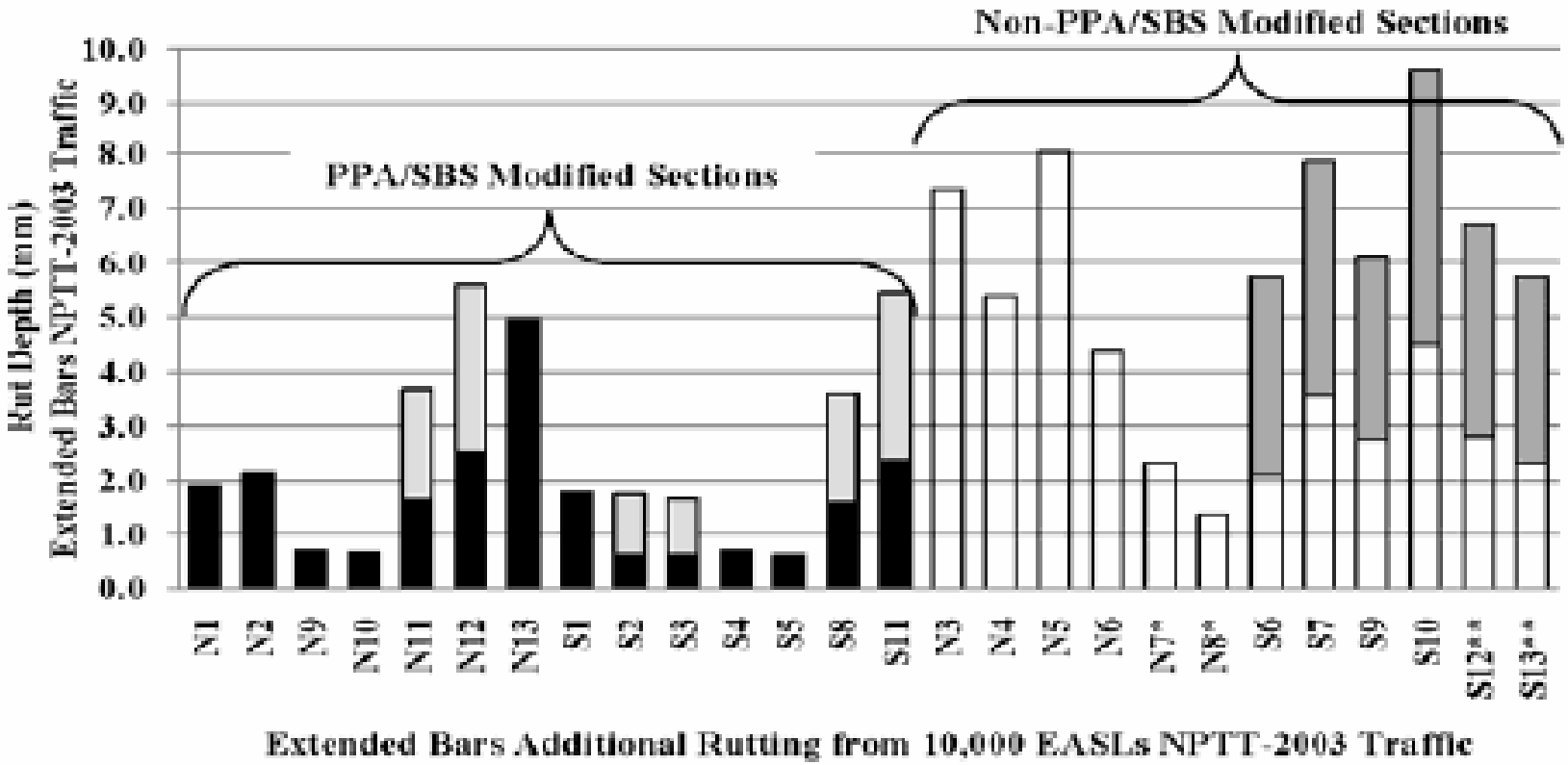
Bitumen (PG 76-22)	= 95.75%
SBS (radial)	= 3,5
PPA (105%)	= 0,25
Antistripping agent (amine)	= 0,5

NCAT Test Track layout



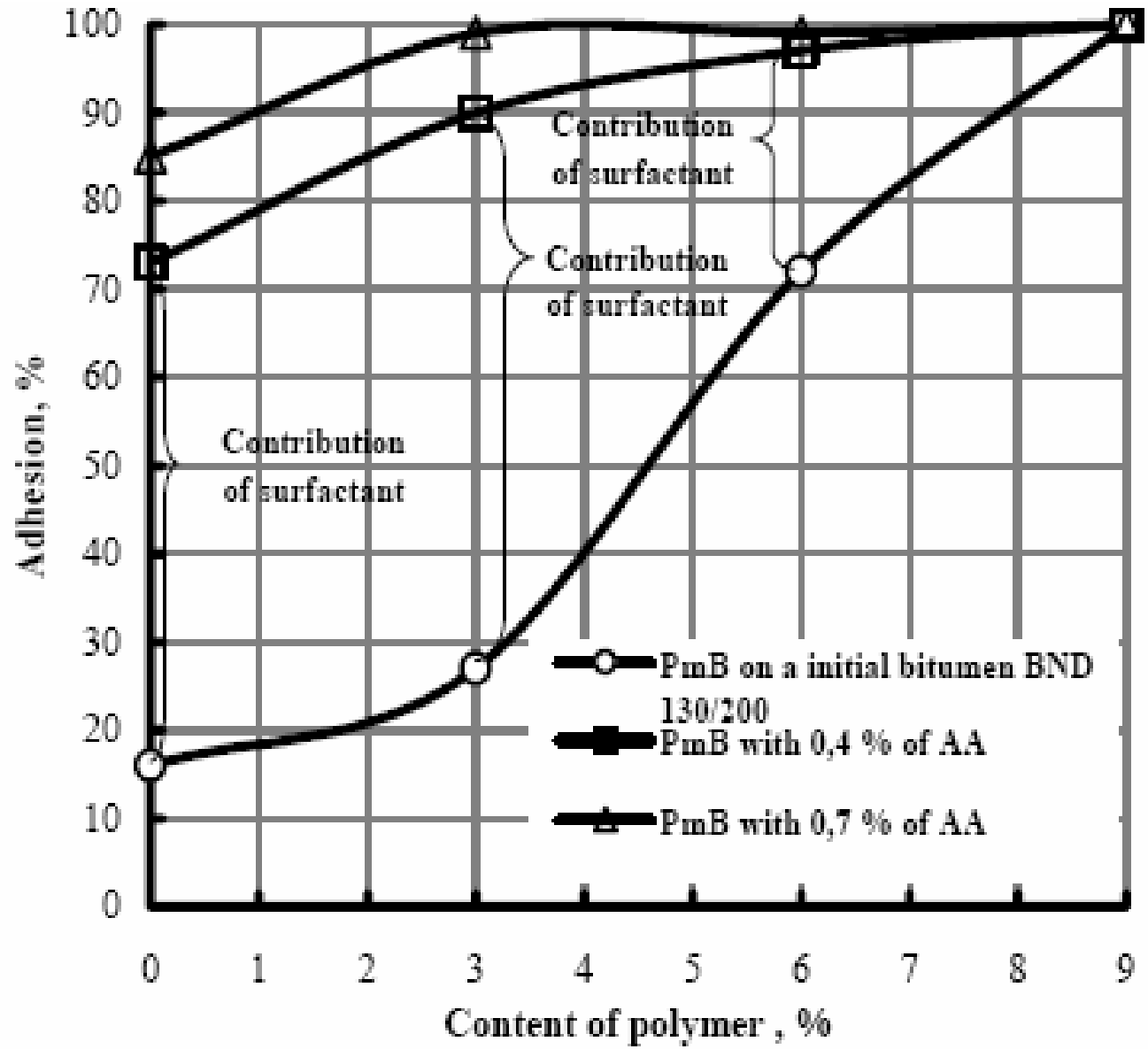
- 2,8 km closed loop
- 46 flexible pavement test sections
- Each section 61 metres in length
- A design lifetime of 10 million equivalent single axle loadings (EASLs) is applied in an accelerated manner over a two-year period

Conclusions



- In general rut resistance was better for SBS/PPA mixes
- Only one of the SBS/PPA test sections showed fatigue failure
- All the SBS/PPA mixes showed good moisture resistance

Influence of polymer content and AA on adhesion on a glass surface

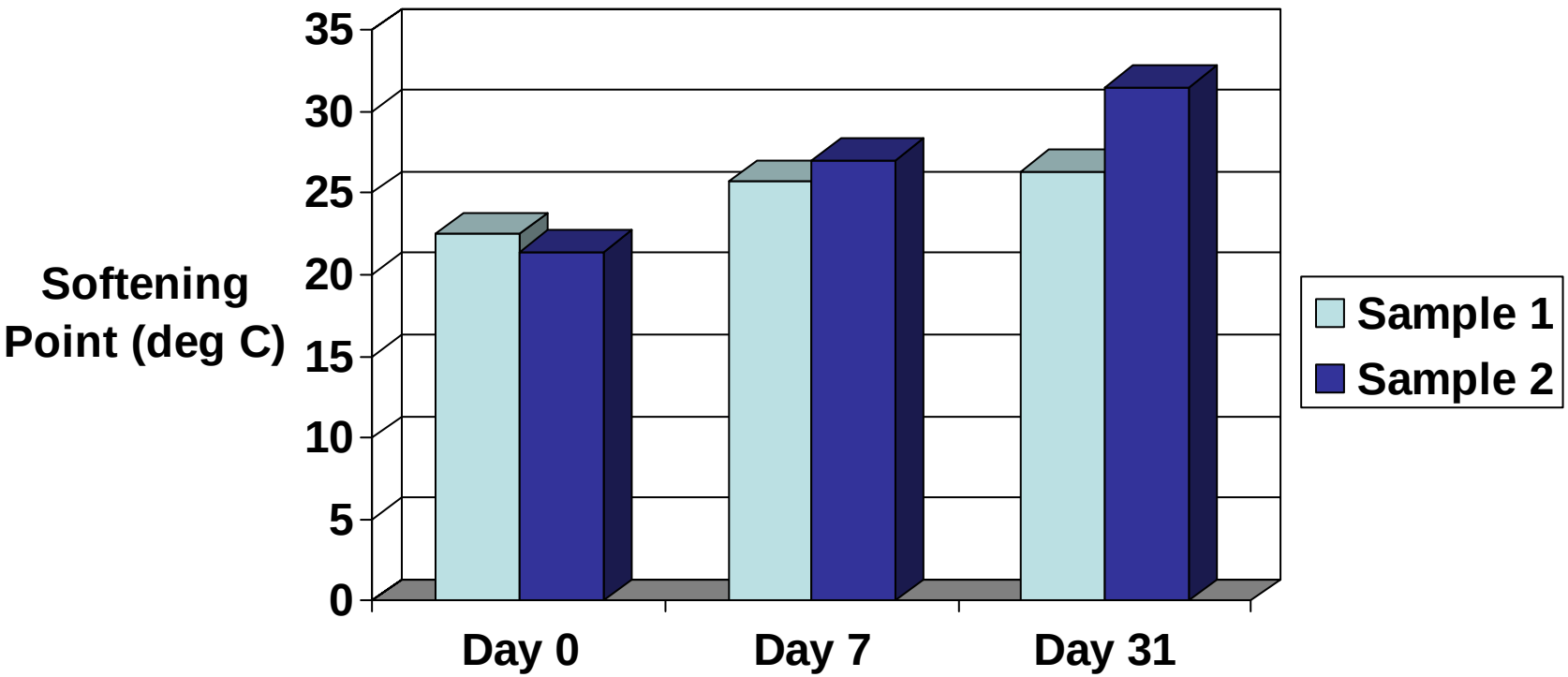


Bituminous binders fluxed with vegetable oils methyl esters

Properties of vegetable oil based fluxes

- Non-volatile
- No fumes
- Non-flammable
- Viscosity increases by oxidation
- Require a catalyst as organic salts of cobalt, manganese and zirconium to accelerate oxidation
- Asphalt van be produced at 110 °C and compacted at 70 °C

Softening Point results



Sample 1: Rapeseed oil methyl esters of fatty acids + benzoic peroxide (1%) + dimethylaniline

Sample 2: Linseed oil methyl esters of fatty acids + cobalt catalyst (0,15%)

Relevance of ductility specification for PMB

- Among all traditional empirical bitumen tests, the relevance of the ductility test for asphalt performance is least understood.
- The test, of which the relevance is already uncertain for the performance of unmodified bitumen in asphalt mixes, leads to results for PMB's that cannot be compared to the results obtained on unmodified bitumen, which obscures it's relevance even further.
- Excellent performing binders can thus be excluded from being used due to erroneous specifications

Advances in HMA

- Use of RAP
- Warm Mix Asphalt Technology
- Perpetual Pavements
- Bitumen Rubber Asphalt

Influence of RAP on ITS

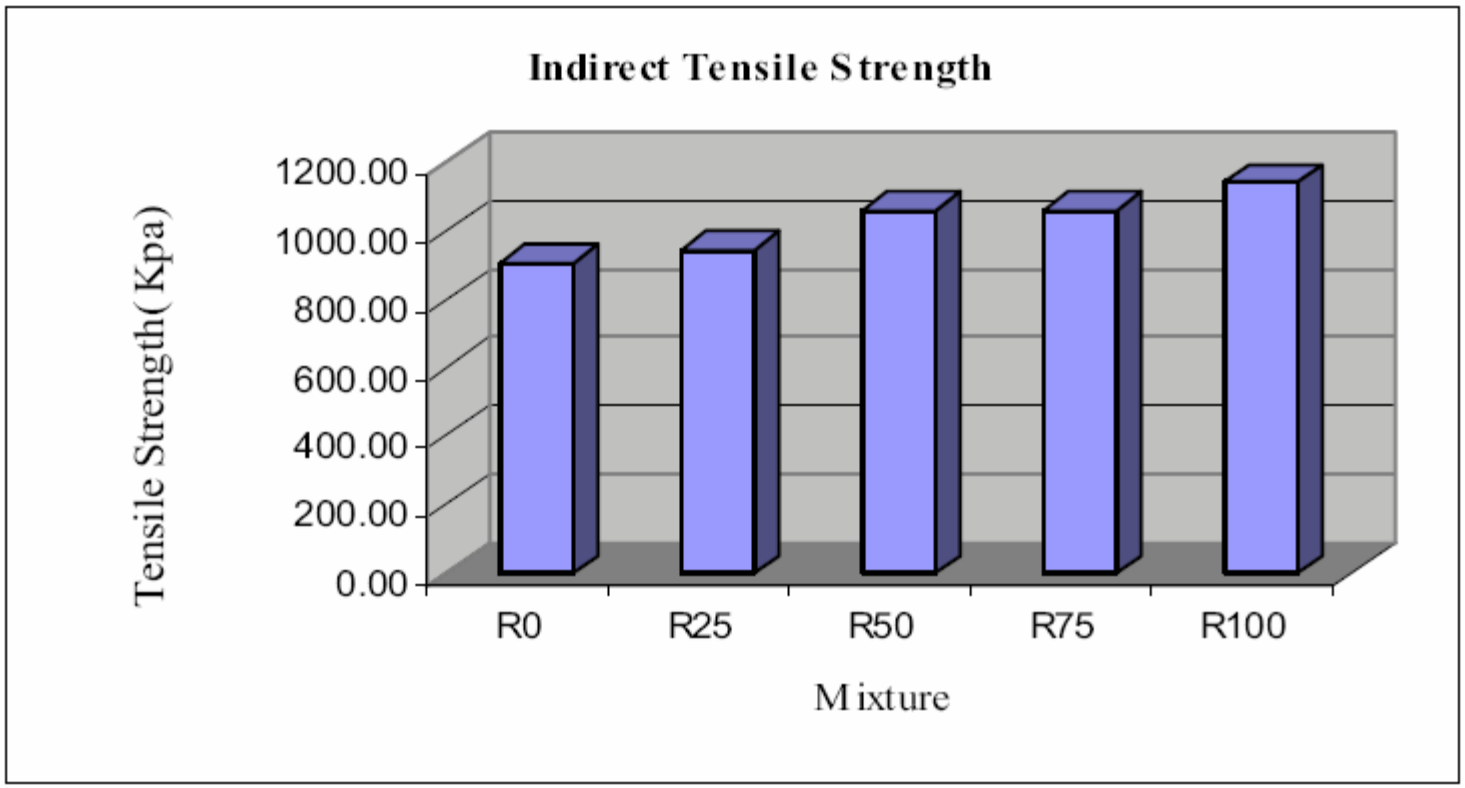


Figure 4: tensile strength comparative chart for mixes with different percentage of RAP

Influence of RAP on res mod

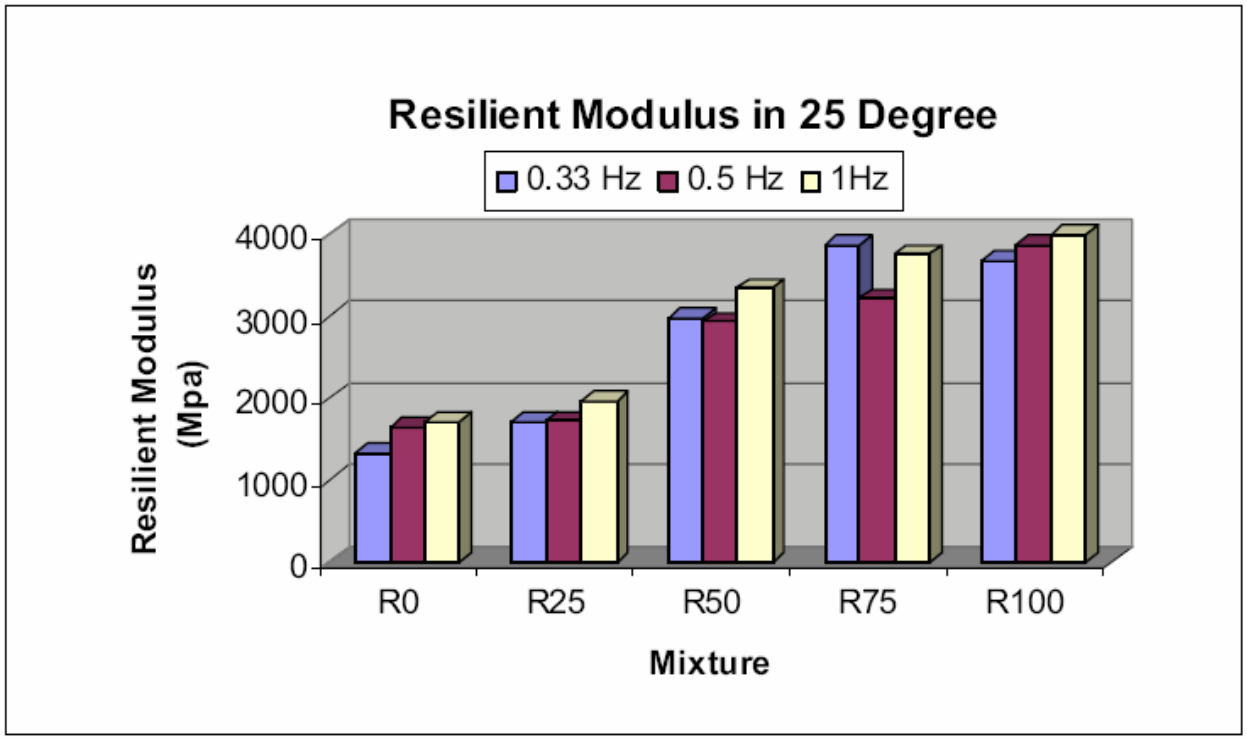


Figure 5: resilient modulus chart for mixtures including different percents of RAP in 25^{oc} and at 0.33, 0.5 and 1 Hz loading frequencies (Mpa)

Separate RAP drying drum for high RAP content mixes > 50% essential to preheat RAP

Lab protocol for RAP

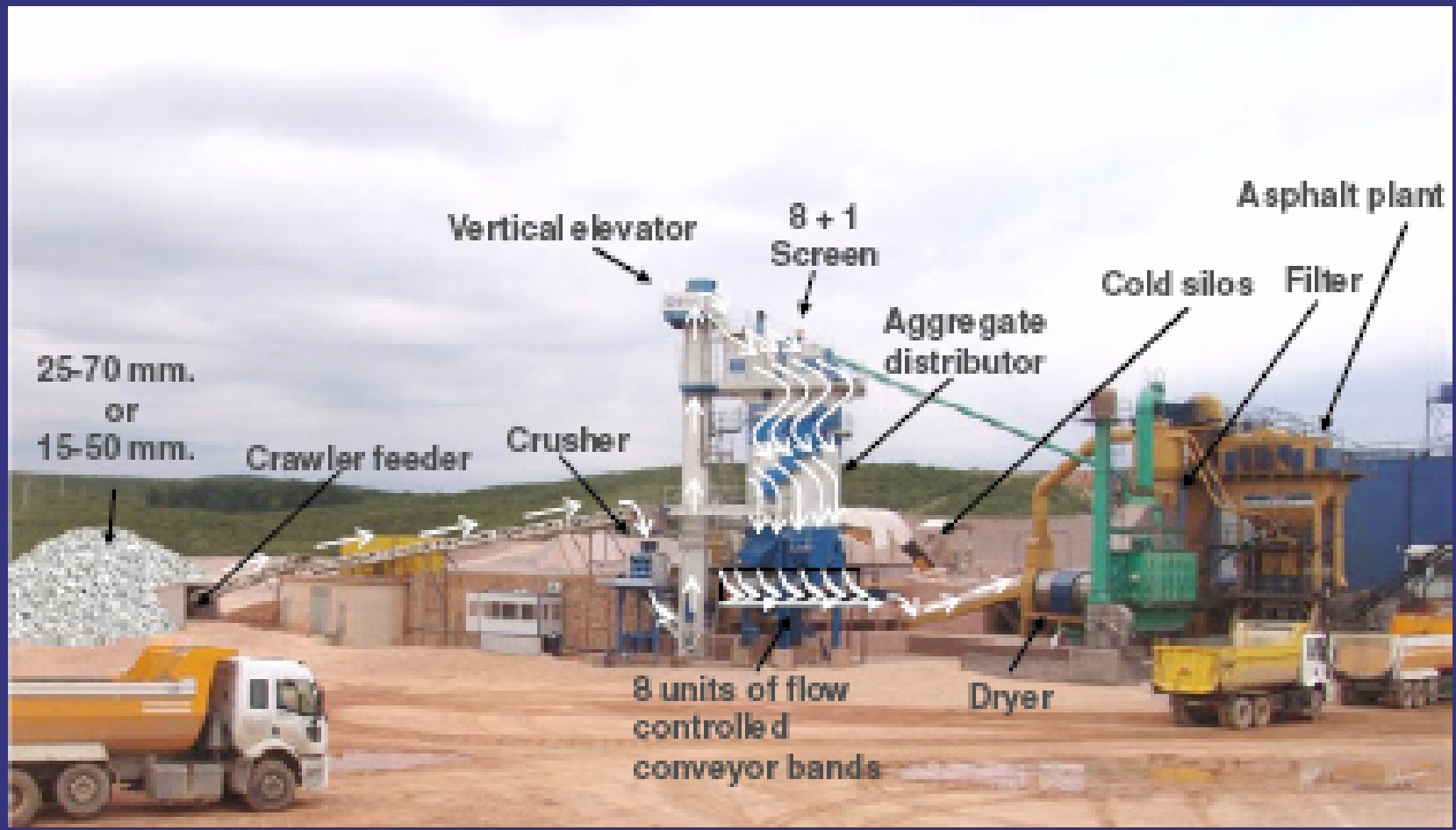
- Short term ageing at mixing temperature for 2 hours (to simulate RTFOT)
- Preheating of the Aggregates and RAP as well as mixing time have an influence on compatibility of the asphalt
- Overheating of the virgin aggregate improves coating if done prior to introduction of RAP
- Lengthening of the mixing time improves compatibility if all the constituents are preheated at 180^{o}C (Compare well with plant mixed asphalt)

Energy saving and cost reduction by integrating the new closed aggregate preparation system to asphalt plants

S. Emre GENCER, M. Nezir GENCER, Gülseren KUNDURACIOĞLU,
Prof. Dr. Mustafa KARAŞAHİN, Gülay MALKOÇ,

1. Reduction of energy consumption

"New System" Integrated Asphalt Plant



Advantages of the new system in HMA, WMA, SMA, Mastic Asphalt production

Roads for Life

Main advantages of the new process

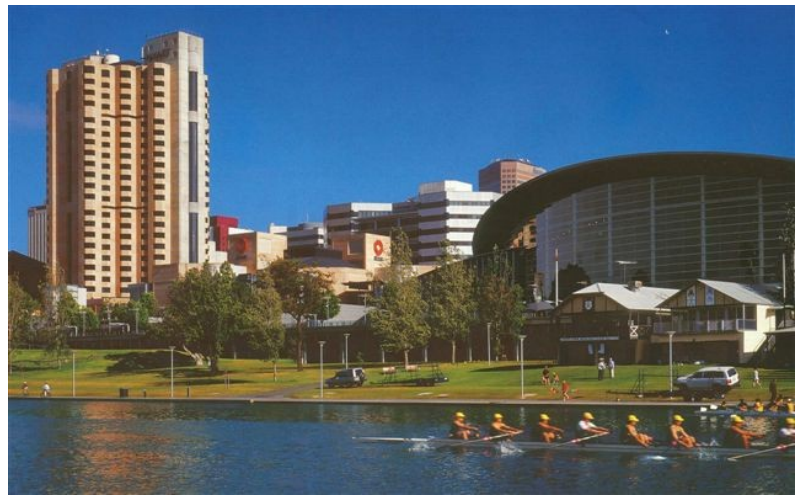
1. Reduction of energy consumption
2. Reduction of CO_2 emissions
3. Reduction of particulate matter (dust)
4. Reduction of aggregate loading and unloading
5. Reduction of transport and stockpiling costs
6. JIT (Just In Time) aggregate supply for most type of asphalt production, thus preventing contamination during stockpiling
7. Improvement in aggregates' geometrical requirements
8. Increase in asphalt plant capacity
9. Extended work season

DESTINATION COPENHAGEN

1st International Spray Sealing conference

Cost effective high performance seals

- Held at the Adelaide convention centre from 27 – 29 July
- 392 delegates attended
- 40 South Africans
- Followed by 23rd ARRB conference at same venue



Conference papers

- Abstracts submitted and managed thru website
- All papers were refereed & those accepted were presented in plenary sessions
  - One parallel session
  - No workshops
- 39 papers were accepted for presentation
  - 14 from Australia
  - 11 from Southern Africa
  - 5 from New Zealand
  - 9 from USA, EU & Asia

Papers can be viewed @ www.arrb.com.au/ss08

Conference program

Sunday evening

- Registration

Monday

- Overview of international practice
- Selection & pretreatments

Tuesday

- Materials & equipment
- Seal design
- Testing/invited workshop

Next conference in 2010 in Australia

Australian & South African SS workshop

Held @ ARRB, Melbourne on 6 August 2008

Comparison between road networks

Area (Sq km)	1,219,912	7,686,850
Population (million)	44	20
Road Network (km)	750,000	810,000
Surfaced Roads (km)	**150,000**	307,000
Bitumen Consumed (ton)	350,000	800,000

- +-80% of both road networks covered with a spray seals
- Max air temperature +10ºC

Sand patch methods

Different methods used to measure texture depth

Ball penetration methods

Different equipment used to measure ball penetration

Primer sealing

Primer seal: cutback (10% cutter) and 7mm aggregate on limestone pavement

Variable Spray Rates

Part of seal design method

- **2 separate spray runs or 2 sprayers**
- **Dedicated variable spray rate sprayer**

Construction

Precoating

- Use emulsion and cutback bitumen precoating fluids
- Precoat stone at quarry in drum mixer
- Precoat at least 7 days before use – must be dry

Further development work was needed to:

- extending spray sealing season
- improve the accuracy of aggregate spreading
- quantify the rolling requirements

Summary

- 220 delegates attended feedback seminars held in Pretoria, Cape Town & Durban
- Local potential to use PPA to modify bitumen at refinery
- Cutting back hot binders with vegetable oils to spray at lower road surface temperatures
- Increase use of RAP, WMA and HiMA to build more sustainable pavements
- ARRB to establish a website to exchange info on spray seals between SANZA