Specifications for modified binders - is change needed?

BMLC - Pretoria

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development of modified binder specifications

- **Early 80s**
  - introduction of modifiers
- **1991**
  - Sabita roadshow “ Flexible solutions for the road ahead”

development of modified binder specifications cont...

- **1994**
  - publishing Sabita manual as a draft "Technical guidelines for seals using homogenous modified binders"
- **1998**
  - Colto "Standard specifications for road & bridge works"
  - Sabita modified binders seminars

why modify bitumen?

- ✓ increase the softening point
- ✓ increase the cohesive strength
- ✓ improve elasticity
- ✓ improve low temperature flexibility
- ✓ increase viscosity @ higher road in-service temperatures

Sabita manual 15 & Colto specifications

modified binder specifications for <u>seals</u> only

- ✓ hot applied and modified emulsions
- ✓ polymers - SBR, SBS & EVA*

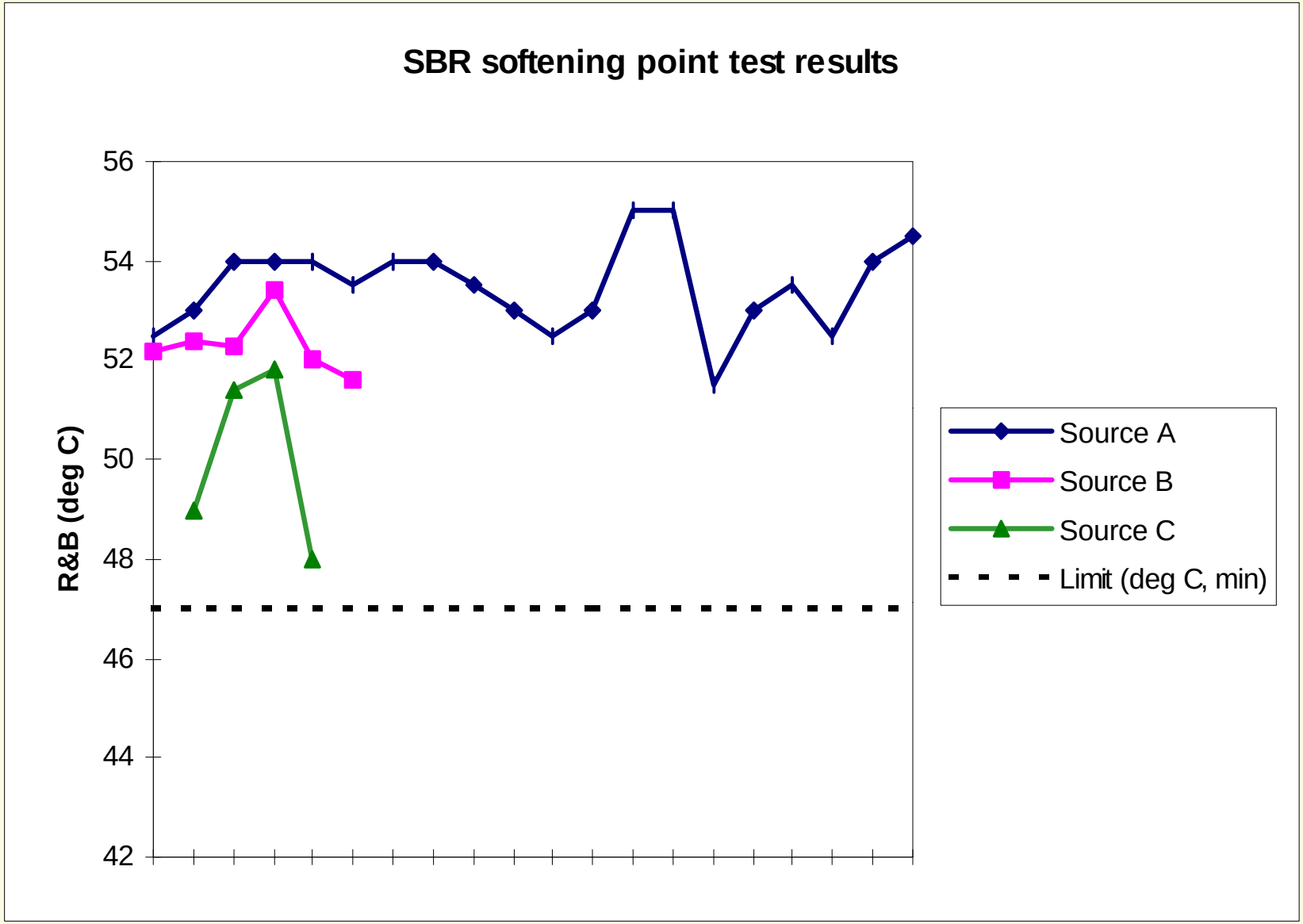
  (no values specified for B8 nor modified emulsions)
- ✓ base bitumen - B8 & B4
- ✓ polymer content not specified

hot applied modified binders tests

- ✓ ring & ball (softening point)
- ✓ dynamic viscosity (Brookfield)
- ✓ ductility @ 10 C
- ✓ elastic recovery
- ✓ stability
- ✓ adhesion test (modified Vialit)

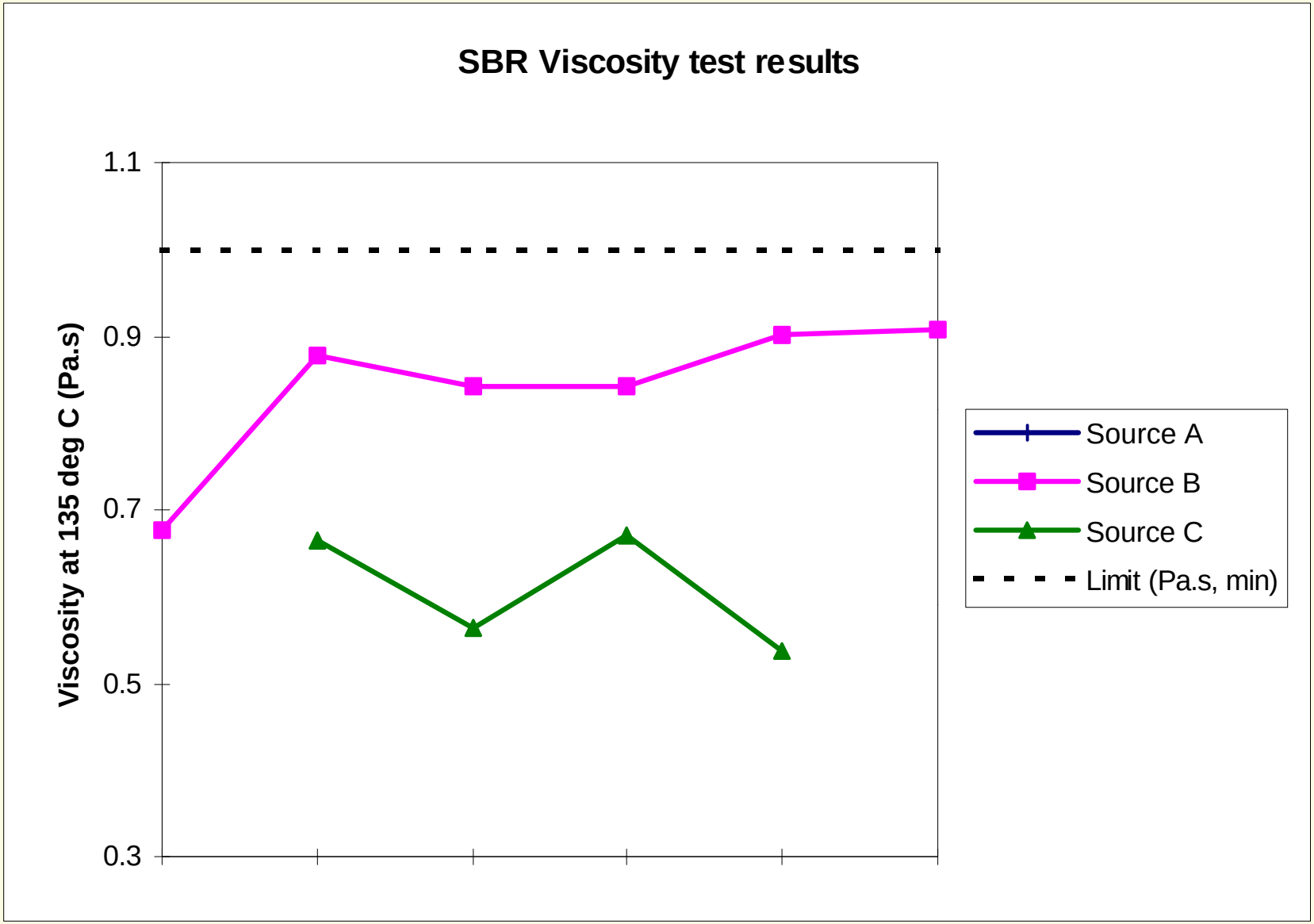
ring & ball softening point

- ✓ good correlation with polymer %
- ✓ comparison between consistency of modified and pen bitumen
  - SABS 307 for 80/100: 42 - 51 C
  - COLTO for SBR: 47 C min
  - COLTO for SBS: 49 C min
- ✓ field results above specified minimum


SBR softening point test results
R&B (deg C)
56
54
52
50
48
46
44
42
Source A
Source B
Source C
Limit (deg C, min)

dynamic Brookfield viscosity

- ✓ min value of 1.0 Pa.s specified @ 135C
- ✓ modified binders display non Newtonian behaviour @ 60 C
- ✓ SHRP specification has only max value
- ✓ specify a range to ensure sprayability without binder degradation or tramlining - spray viscosity of 0.1 Pa.s

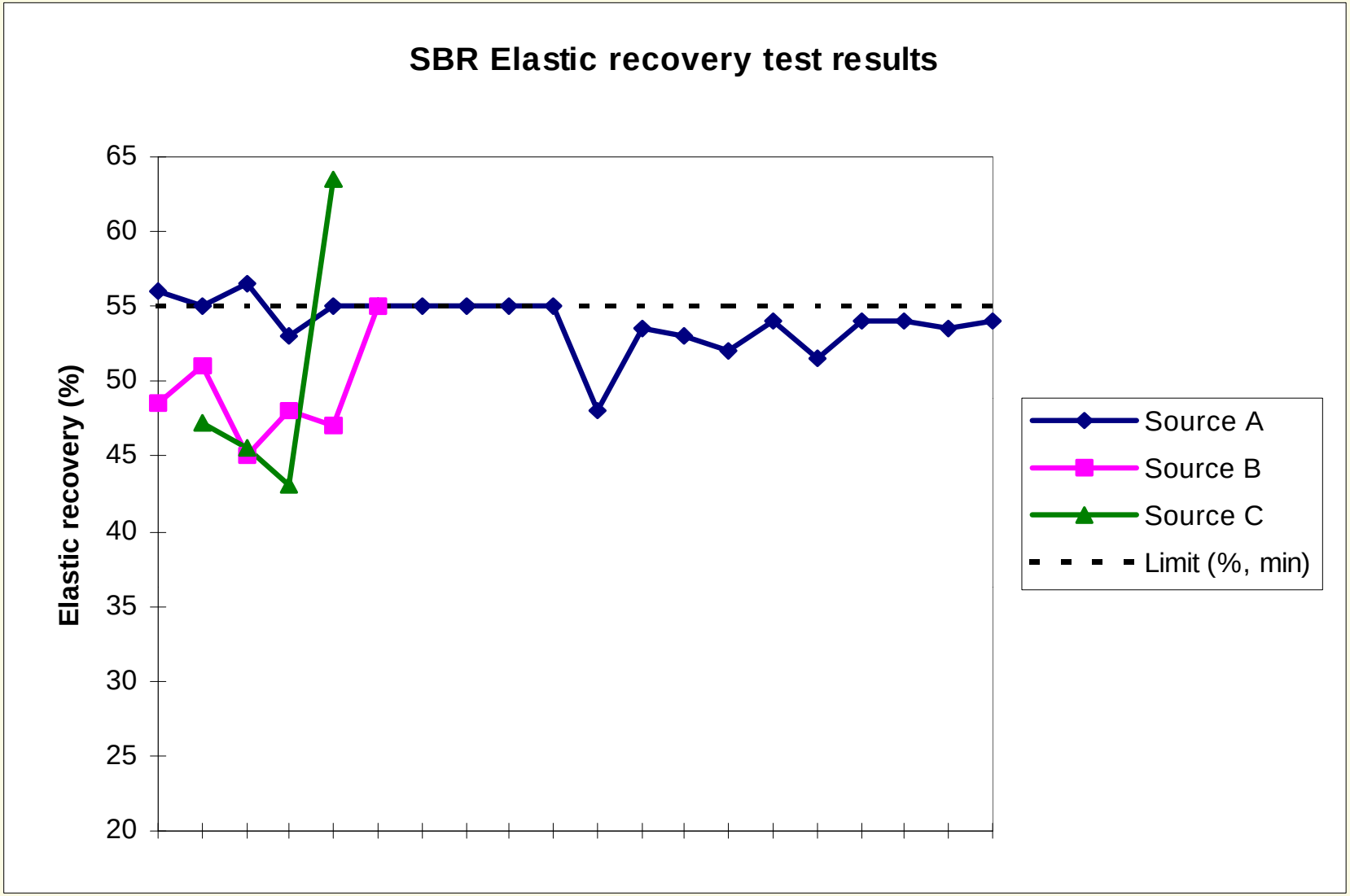

SBR Viscosity test results
Viscosity at 135 deg C (Pa.s)
1.1
0.9
0.7
0.5
0.3
Source A
Source B
Source C
Limit (Pa.s, min)

low temperature ductility

- ✓ indication of compositional balance and cohesive strength at low temperatures
- ✓ min value specified @ 10 C
  - SBR 1000 mm
  - SBS 500 mm
- ✓ more applicable to unmodified binders
  - force-ductility test more appropriate to compare modified binders

elastic recovery

- ✓ indicates compositional balance and sufficient polymer for elasticity
- ✓ choose appropriate product to accommodate crack activity
- ✓ min value specified @ 10 C
  - SBR 55 %
  - SBS 60 %
- ✓ SBR field results are below specified min, SBS above


SBR Elastic recovery test results
Elastic recovery (%)
65
60
55
50
45
40
35
30
25
20
Source A
Source B
Source C
Limit (%, min)

stability

- ✓ measures difference between lower and upper sections of sample
- ✓ max difference in R&B of 2 C specified
- ✓ indicates whether the modified binder is storage stable @ a temperature of 160 C for 3 days, or whether agitation is required during transport and storage

adhesion

- ✓ determines adhesiveness and cohesive properties of binder to stone
- ✓ min values specified
  - @ 5 C 90 %
  - @ 50 C 100 %
- ✓ conduct test on project aggregate prior to contract commencement

cold applied modified binders tests

- ✓ modified binder content
- ✓ Saybolt Furol viscosity
- ✓ residue on sieving
- ✓ particle charge
- ✓ sedimentation
- ✓ recovered binder properties

nett modified binder content

- ✓ Only min percentage specified
- ✓ includes bitumen, polymer, flux and emulsifiers
- ✓ revise specification to include upper limits similar to SABS 548

Saybolt Furol viscosity

- ✓ min value specified @ 50 C
- ✓ necessary to prevent run-off on steep gradients
- ✓ revise specification to include upper limits similar to SABS 548 to protect against high viscous binders

residue on sieving

- ✓ max value specified
- ✓ indicates degree of dispersion and if problems might occur with blocked nozzles
- ✓ specification should be revised to 0.5g /100ml for latex modified emulsions which have coarse dispersions

recovered binder properties

- ✓ tests performed on recovered binder residues of emulsions same as hot applied binders
- ✓ softening point requirement 55 C vs 47 C for hot applied SBR
- ✓ elastic recovery requirement 52 % vs 55 % for hot applied SBR

summary

- ✓ the Sabita specifications are a consensus view and were based on limited samples submitted to CSIR
- ✓ published as a draft to be revised over time as interim spec until penetration bitumen specs finalised
- ✓ specifications are necessary, however they must be appropriate, specific, achievable, practical, cost effective

recommendations

reconvene BMLC sub committee on modified binders to develop a specification which will adequately:

- ✓ ensure quality control measures during manufacture, handling and application
- ✓ predict product performance

ie a Total Quality System