



CERANOVUS[®] Polymer Additives Enhance the Performance of PG 64-22 Base Asphalt

GREENMANTRA[®] combines TECHNOLOGY with SUSTAINABILITY to create unique CERANOVUS[®] A Series Polyethylene and Polypropylene Polymer Additives from recycled plastics.

CERANOVUS[®] A Series polyethylene (PE) and polypropylene (PP) additives have low viscosity and penetration hardness but also exhibit amorphous polymer characteristics and greater polarity due to higher molecular weights and short chain branching.

CERANOVUS [®] Additive	Product Type	Density (g/cm ³) ASTM D1298	Drop Point (°C) ASTM D3954	Penetration @ 25°C in dmm ASTM D1321	Viscosity cps @ 140°C BROOKFIELD	Viscosity cps @ 190°C BROOKFIELD
A115	Polyethylene	0.92	116	2	225	-
A120	Polyethylene	0.93	122	2	700	-
A125	Polyethylene	0.94	126	1	2025	-
A155	Polypropylene	0.90	155	2	-	75

CERANOVUS[®] A Series additives were evaluated at 2% by weight in PG 64-22 asphalt by the University of Massachusetts per AASHTO protocols. Test results confirm that CERANOVUS[®] additives enhance asphalt performance by delivering the following benefits:

- Increases penetration hardness
- Lowers viscosity during production
- Improves resistance to rutting and deformation
- Enables grade bumping while maintaining low temperature properties

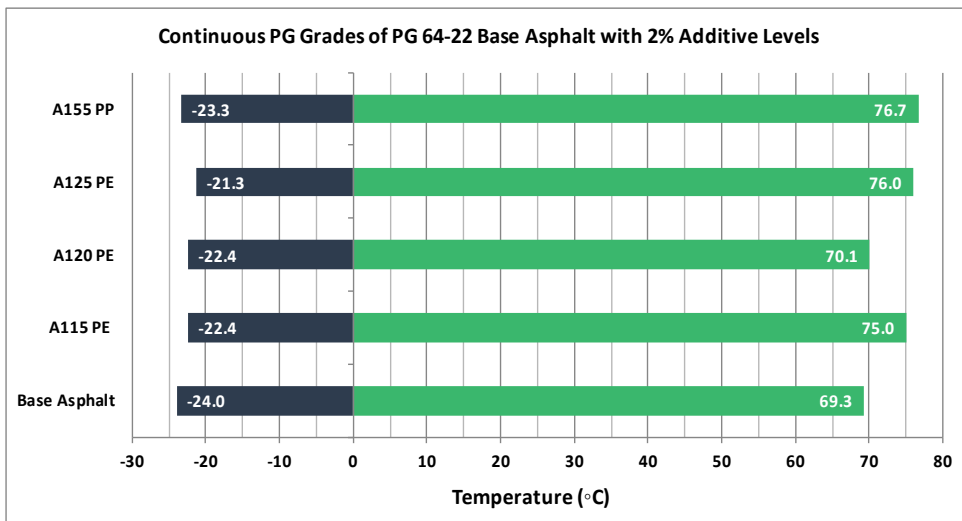


Chart 1

Continuous Performance Grade AASHTO M320*

- A155 PP additive bumps high temperature performance by +2 grades above 76°C and maintains low temperature below -22°C
- A115 and A120 PE additives bump performance by +1 grade above 70°C and maintain low temperature below -22°C

*AASHTO M320 includes T 313, T 315 and T 240

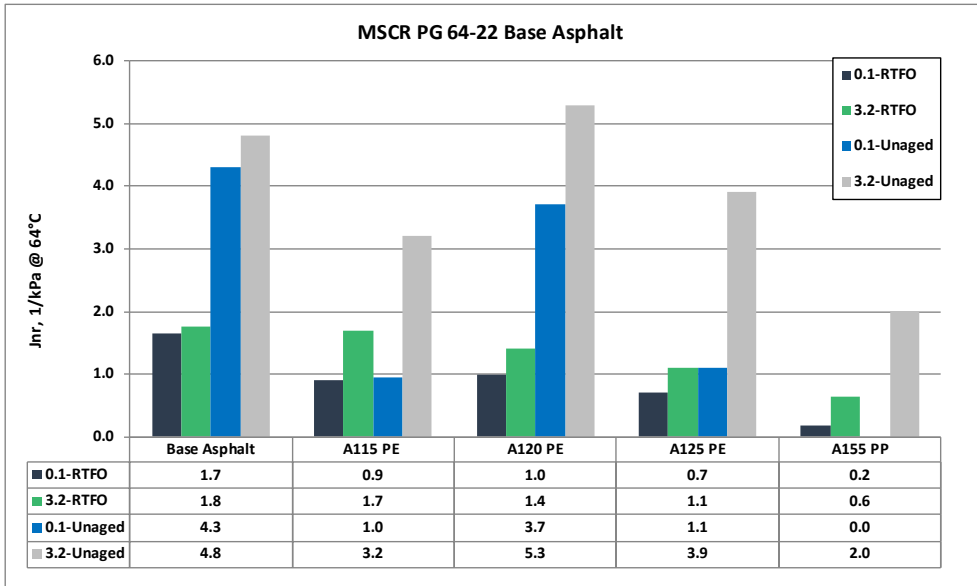


Chart 2

Multiple Stress Creep Recovery
AASHTO M 332

- **CERANOVUS**® PE additives show slight improvement in the elastic recovery
- A120 and A125 PE additives meet the Jnr Diff guideline of > 0.75 for PMA asphalt
- A155 PP additive performance is shear dependent and can deliver significant improvement to a Very Heavy Traffic Grade

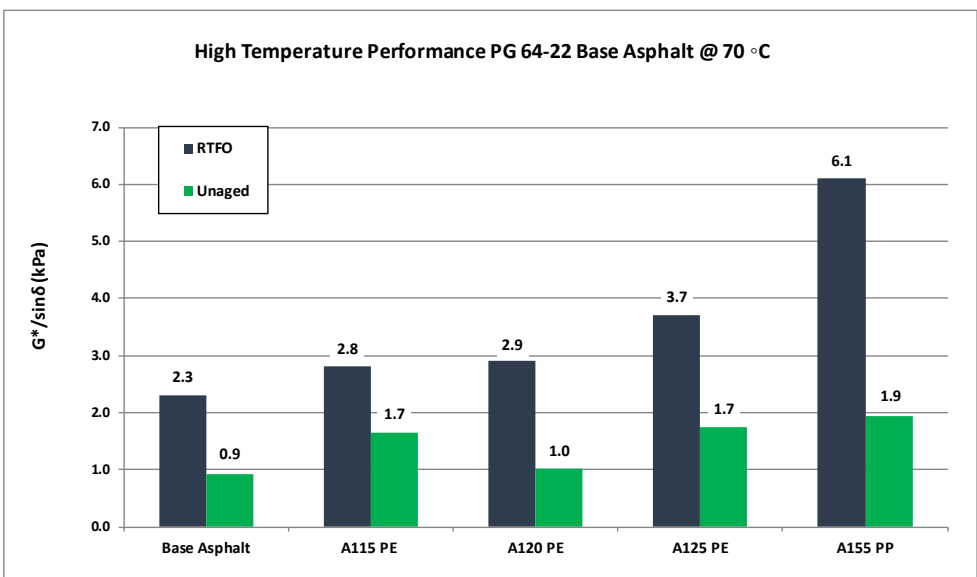


Chart 3

Complex Shear Modulus
AASHTO T 315

- All **CERANOVUS**® polymer additives show improvement of the complex shear modulus of the base asphalt indicating improved resistance to rutting and deformation
- A155 PP additive delivers the most significant improvement in stiffness and would still pass test at 76°C

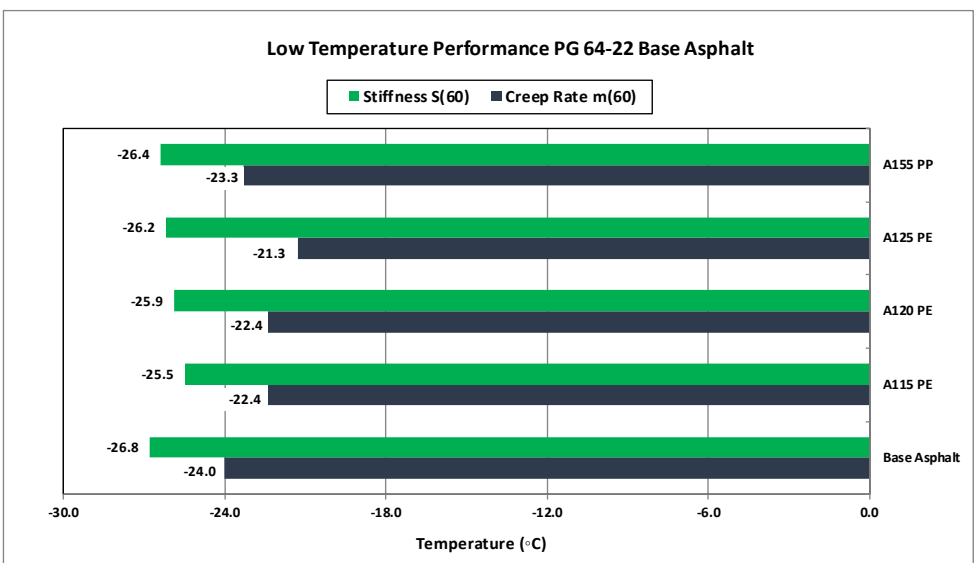


Chart 4

Bending Beam Rheometry
AASHTO T 313-12

- A155 PP additive maintains low temperature creep and stiffness
- A125 PE additive reduces the low temperature PG grade by 1 level to -16°C



MADE WITH 100% RECYCLED CONTENT
PRE-CONSUMER AND POST-CONSUMER

CERANOVUS® A Series
polymer additives are made from
100% post consumer and post
industrial recycled plastics as
certified by SCS Global Services



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Products containing
CERANOVUS® A Series
polymer additives contribute
towards LEED certification
and credits programs.