

Maximizing Recycled Binder Performance

EVOFLEX CA

Evoflex CA allows you to:

- Solubilize RAP and RAS to increase recycled binder contribution
- Facilitate blending of both virgin and oxidized asphalts
- Improve low-temperature mix performance
- Maintain the intermediate temperature of the desired binder grade
- Reduce the need to alter binder grades when utilizing recycled materials

Why Evoflex® CA?

Binder incorporation is critical when using high amounts of recycled material.

State transportation agencies and private road owners view the increased use of recycled materials as an environmentally responsible way to stretch limited transportation funding dollars. To meet these objectives, Ingevity has developed Evoflex CA, an engineered family of additives that allows greater use of reclaimed asphalt materials. Designed to work with Evotherm®, Evoflex CA more effectively mobilizes the bituminous content of RAP and RAS, even when using WMA production temperatures less than 275 F.

Ingevity derives Evoflex CA additives from forestry products, providing an environmentally friendly, nontoxic solution to increasing the amount of RAP and RAS incorporated into mixes. Evoflex CA accomplishes this by effectively solubilizing the asphalt in recycled materials, increasing the blending of the virgin and the oxidized binders. Mixes with high amounts of recycled content made with Evoflex CA have improved coating and workability with a wide variety of paving materials.

How Evoflex CA Works for You

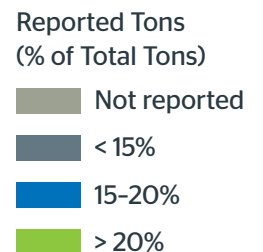
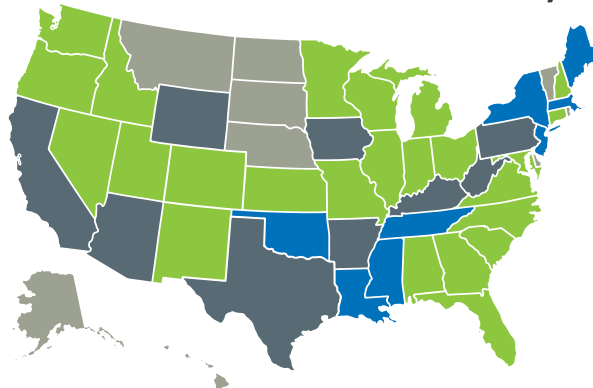
When oxidized binders are fully incorporated into mixes, producers can maximize the full value of their reclaimed materials. As more RAP and RAS are used, the difficulty of effectively blending the recycled binder with virgin materials also increases.

This is where Evoflex CA excels. Evoflex CA additives are designed to improve the contribution yield of binder from recycled materials. Evoflex CA additives also function as rejuvenators and offset the potential negative impact of increasing the use of highly oxidized materials. Greater amounts of reclaimed products can be added while Evoflex CA maintains the flexibility and low-temperature crack resistance of the mix.

Trend of High RAP Usage is Growing

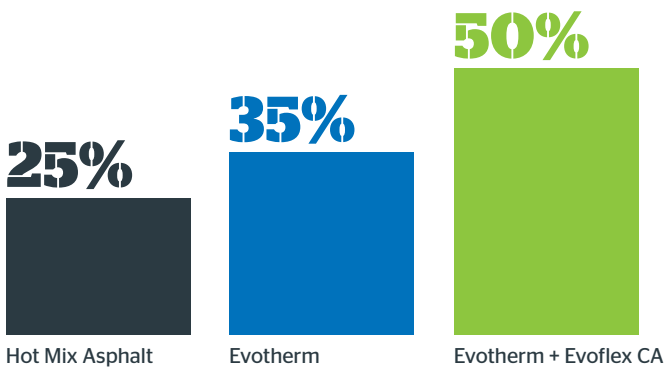
The Federal Highway Administration encourages the use of recycled materials in the construction of highways to the maximum economical and practical extent possible with equal or improved performance. It promotes the use of RAP because its utilization can have the greatest economic, environmental and engineering impact in pavement recycling.

NAPA RAP Survey



Performance Benefit	Evotherm	Evoflex CA	Evoflex CA + Evotherm
Improved workability and compaction of stiff mixes	■ ■	■ ■	■ ■ ■
Higher effective binder from RAP and/or RAS content	■	■ ■ ■	■ ■ ■
Extended haul; extended season	■ ■ ■		■ ■ ■
Reduced thermal segregation	■ ■ ■		■ ■ ■
Improved resistance to cracking	■ ■	■ ■	■ ■ ■
Reduced moisture susceptibility	■ ■ ■		■ ■ ■
Polyphosphoric acid-modified asphalt compatibility	■ ■ ■	■ ■ ■	■ ■ ■

■ Good Performance ■ Better Performance ■ Best Performance

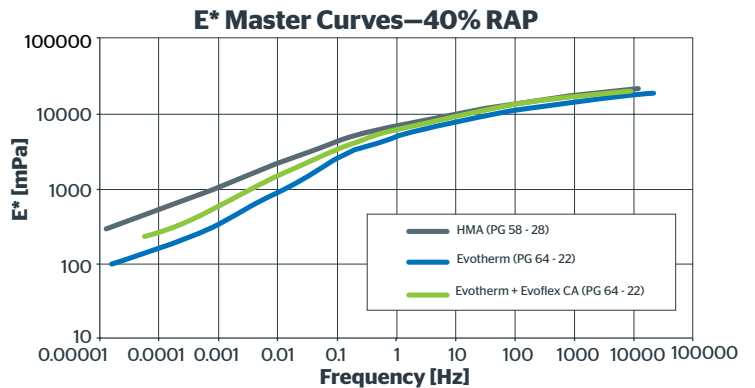


Recycled Content Possibilities

Proof of Blending

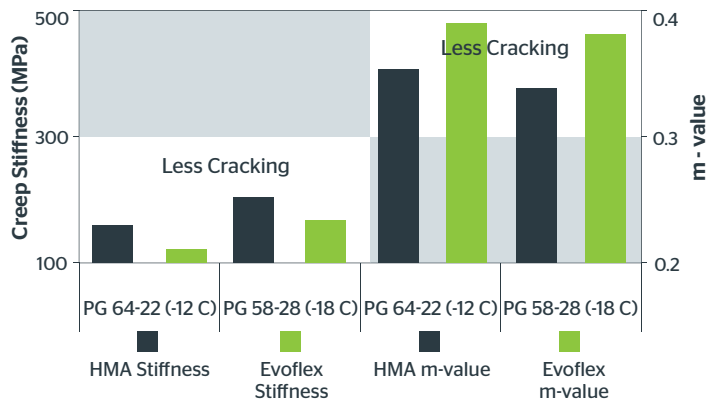
Sufficient blending of the virgin and oxidized binders must occur to prevent rutting and moisture susceptibility.

Shown at right, the AMPT dynamic modulus master curves show that PG 64-22 Evotherm WMA containing 40 percent RAP (blue line) is much softer than PG 58-28 HMA (gray line). Adding Evoflex CA (green line) stiffens the mix by incorporating more of the oxidized binder from the RAP into the mix.



Reduced Cracking

Greater amounts of RAP and RAS can be added while Evoflex CA maintains flexibility and low-temperature crack resistance.



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