

Invigorate[®] Rejuvenator Exceeds High RAP Benchmarks in Iowa

Colorbiotics and researchers at Iowa State University have been studying and testing the performance of Invigorate Rejuvenator on projects across the country. The soybean oil-derived rejuvenator triggers chemical reactions inside recycled binder to break down asphaltene aggregation and reverse the effects of oxidation.



High RAP Performance in Northern Iowa

Late in the 2020 paving season, Heartland Asphalt, Inc. of Mason City, Iowa, ran trials with a new type of binder rejuvenator — called Invigorate Rejuvenator — that worked differently from petroleum-based products. Invigorate offered the opportunity to boost RAP content and lower the virgin binder percentage alongside the amount of aggregate, without demanding the usual bump to more costly binder.

The trials were conducted during the Cerro Gordo County Road S62 overlay project, which required 5,000 tons, each, of a surface and intermediate mix. The mix design for the project included a maximum 0.5-inch virgin aggregate size and RAP size of 1.0-inch minus.

The team at Heartland Asphalt used their standard PG 58-28S binder. For the trial mixes with Invigorate, the rejuvenator was pumped from a separate on-site tank directly into the AC line before being pumped into the drum mixer. “All asphalt was produced by our five-year-old Duo Drum plant, and injecting the rejuvenator into the AC line gave it extra time for the rejuvenator to mix with the binder,” said George Jessen, president and general manager of Heartland Asphalt.

Invigorate can be injected into the mix in multiple ways, depending on the project and the producer. It can be blended with the binder at the terminal, blended in the tanker or injected separately in the AC line at the plant like Heartland Asphalt did for the Cerro Gordo project.

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Trial Results

The trials featured mixes with several different levels of RAP content. The control sample was mixed with 20% RAP, while a representative range of RAP content — 30%, 40% and 45% — was mixed both with and without Invigorate. The mixes were laid in 600- to 700-ton strips.

Other than adding the binder, the process remained the same as if Heartland Asphalt were running their usual mix with RAP. The asphalt was mixed at the same temperature, transported to the jobsite in the same belly dump trucks and laid out in the typical window of any other county road project.

However, using the new type of rejuvenator did significantly lower the virgin oil content required. “The 45% high RAP content mix with 5% Invigorate brought virgin oil content to 61.7% with 38.3% of binder coming from the RAP,” said Rich Millard, quality control manager for Heartland Asphalt. “This can result in economic savings.”

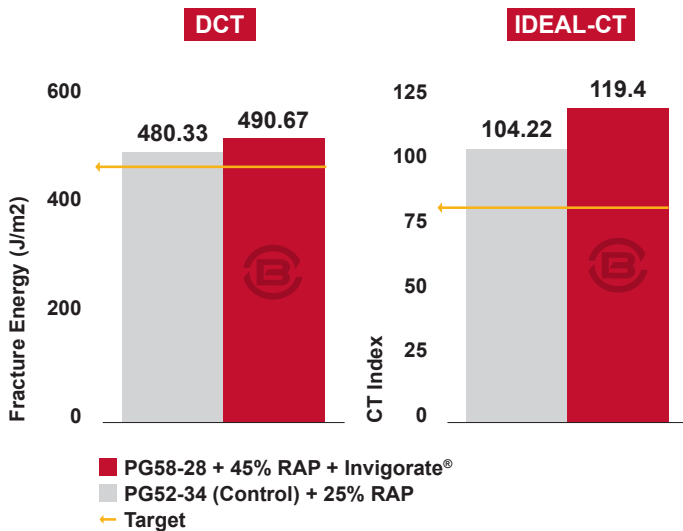


Jessen also mentioned those benefits for their business. “If using the rejuvenator is cost-efficient and good for the environment, that makes us more competitive, so it makes a lot of sense to consider using more RAP,” he said.

In the field, spec compaction densities were 92.5%. Running two days of density tests for the Invigorate mix samples showed density readings of 94.4% and 93.8% respectively, indicating that even with higher RAP content, density was readily obtained by the compactors.

Engineers from Iowa State University also ran tests for performance grade and ΔT_c on the lab samples. All Invigorate samples with the proper dosage, even those with high percentages of RAP, improved the performance grade of the binder over the standard PG 58-28S spec. The Invigorate samples also passed all ΔT_c tests, showing its efficacy with high RAP content mix designs.

“It makes sense to recycle as much as we can,” said Jessen. “This is the future — finding ways to incorporate more RAP into our product in a responsible way.”



Want to learn more?

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Put that RAP to work.