

# Cargill Road Construction Case Study: RAP Weathers the Cold - MnROAD Test Shows Strong Performance

## SITUATION

In one of the coldest climates in the United States, Cargill and the Minnesota Department of Transportation forged a partnership to conduct a long-term field test on the durability of asphalt rejuvenators and the effects of recycled asphalt pavement (RAP) overall.

Started in 2018, the test section located on a major stretch of Interstate 94 just west of the Twin Cities metro area has provided an in-depth look at how RAP, using Cargill's bio-based Anova® Rejuvenator, has held up year-round, especially in the harsh winters Minnesota is known for.

This test, at the Minnesota Road Research Facility (MnROAD), is being conducted at the same time as a warm weather test track in Alabama with the National Center for Asphalt Technology (NCAT) at Auburn University in partnership with the Virginia Department of Transportation.

Together these comprehensive tests, which will extend beyond five full years of data when officially completed, will serve as the gold standard for testing the viability of rejuvenated RAP binders in real-life environments, providing the industry with invaluable data to make educated decisions on pavement solutions for years to come.

## GOAL

The partnership between MnDOT, Cargill, and Minnesota Paving and Materials (formerly Harddrives, Inc.) allowed MnROAD to work directly with the partners to repave the transition sections in and out of the mainline test track using state construction funding.

The agreement stated that MnDOT would provide reconstruction plans, collect and share material samples, contribute to performance material testing, long term monitoring and report development on the results, while Cargill would conduct the majority of the material performance testing. Cargill contracted the mixture portion of performance testing to NCAT. Findings from the study are shared with the National Road Research Alliance for industry knowledge.



Paving crews laying down Cargill's Anova® Rejuvenator.

"Science has always been our path to evolution," said Greg Tischbirek, asphalt plant operation manager with Minnesota Paving and Materials. "We need the testing and innovation done now to provide production insight and experience with additive products, so that in the future we can produce an asphalt that provides cost savings and quality to customers."

## SOLUTION

Test sections using Anova® Rejuvenator and corresponding control sections were constructed on both ends of the one-mile interstate track. The control mix met MnDOT requirements for the location and traffic volume with 25% RAP, while the test section used a 45% RAP mix with the rejuvenator. For those familiar with MN asphalt designations, these mixes were SPWEB540B: surface mix for traffic level 5 using a B-oil.

Minnesota Paving and Materials furnished all materials, volumetric mix designs, equipment, and traffic control to construct the transitions according to state guidelines and standard practices. Cargill provided the Anova® Rejuvenator, technical support, and conducted laboratory performance testing on the mixes.

## CASE STUDY

This partnership allowed MnDOT to work with Cargill to better understand asphalt mix rejuvenators and their long-term benefits and allowed MnDOT to repave the MnROAD transitions at a 40% reduction of cost over what was initially estimated for engineering.

### RESULTS

To reduce the impact on I-94 traffic, the project was constructed using overnight work. Construction was completed on October 13, 2018 after 3 nights of work. The weather was cold, between 30-35° F and snowflakes were observed at times during the construction. Despite the cold temperatures and a 45 minute haul distance from the mix plant, consistent density (averaged 94% in-place density) and ride was achieved.

Approximately 3,000 tons of asphalt concrete were placed with 1,500 tons of the control and 1,500 tons of the Anova® mix.

One of the key findings shows the Anova® sections not only demonstrated significant improvement in the achievement of consistent and desirable densities during construction, but also performed very well during service, showing no adverse impact with the use of a significantly higher recycled content. These mill and inlay sections showed expected light reflective cracking, which is normal, especially after two severe freeze and thaw seasons in Minnesota.

“It is more what we are not seeing,” said Michael Vrtis, Ph.D., P.E., and research project engineer for the Minnesota Department of Transportation. “These mixes [Anova® and control] were placed in problematic areas for us at MnROAD and it is noteworthy that we are not seeing significant distress.”

According to MnDOT, given the placement of the mix in more problematic areas of the test section, it was noteworthy that they haven't seen any signs of significant stress. MnDOT reports that they are seeing the same positive field performance as the control mixes, even with 15% more RAP using the Anova® mix.

According to the state agency, it's still early in the testing process, but if the positive performance continues over the next five years as the asphalt reaches its expected critical aging, then there

will be a lot more attention on the project as it delivers a very comprehensive and long-term study on the effectiveness of RAP and the role binders play in its success. What's more, state agencies and construction firms are seeing real cost savings using RAP.

“Simply put, RAP usage just makes sense,” added Vrtis. “Both environmentally and economically, RAP usage is beneficial for agencies and industry.”

“We have experienced Cargill's Anova® Rejuvenator's flexibility with the higher rap mix designs at lower mixing temperatures,” said Tischbirek. “The slightly lower drying costs and reduced amp draw on our plant components are providing noticeable savings. Still, we're able to produce a darker, rich black pavement with high compaction results.”

### KEY LEARNING

The MnROAD and NCAT tests over the last couple of years are starting to make an impact on the industry with shifts in mix specs allowing for more RAP use and a general increase in understanding and credibility for the technology.

“With mineral resources depleting and cities growing, logistically getting virgin materials into large metropolitan areas is becoming challenging and expensive,” said Tischbirek. “As our cities and suburbs grow, I'm happy to see there is testing going on to find alternatives to using less virgin aggregate in asphalt mixes.”

The public-private partnership behind this level of testing is allowing the entire industry to rethink RAP and its role in meeting road preservation goals.

“Collaboration between all stakeholders (contractors, suppliers, and agencies) of the asphalt industry is imperative for innovation that will improve value, quality, performance, and environmental friendliness,” said Vrtis.

“It is encouraging to see the investment being made by the government and private companies coming together for one common goal: to make asphalt better,” added Tischbirek.

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