The Recycling Issue

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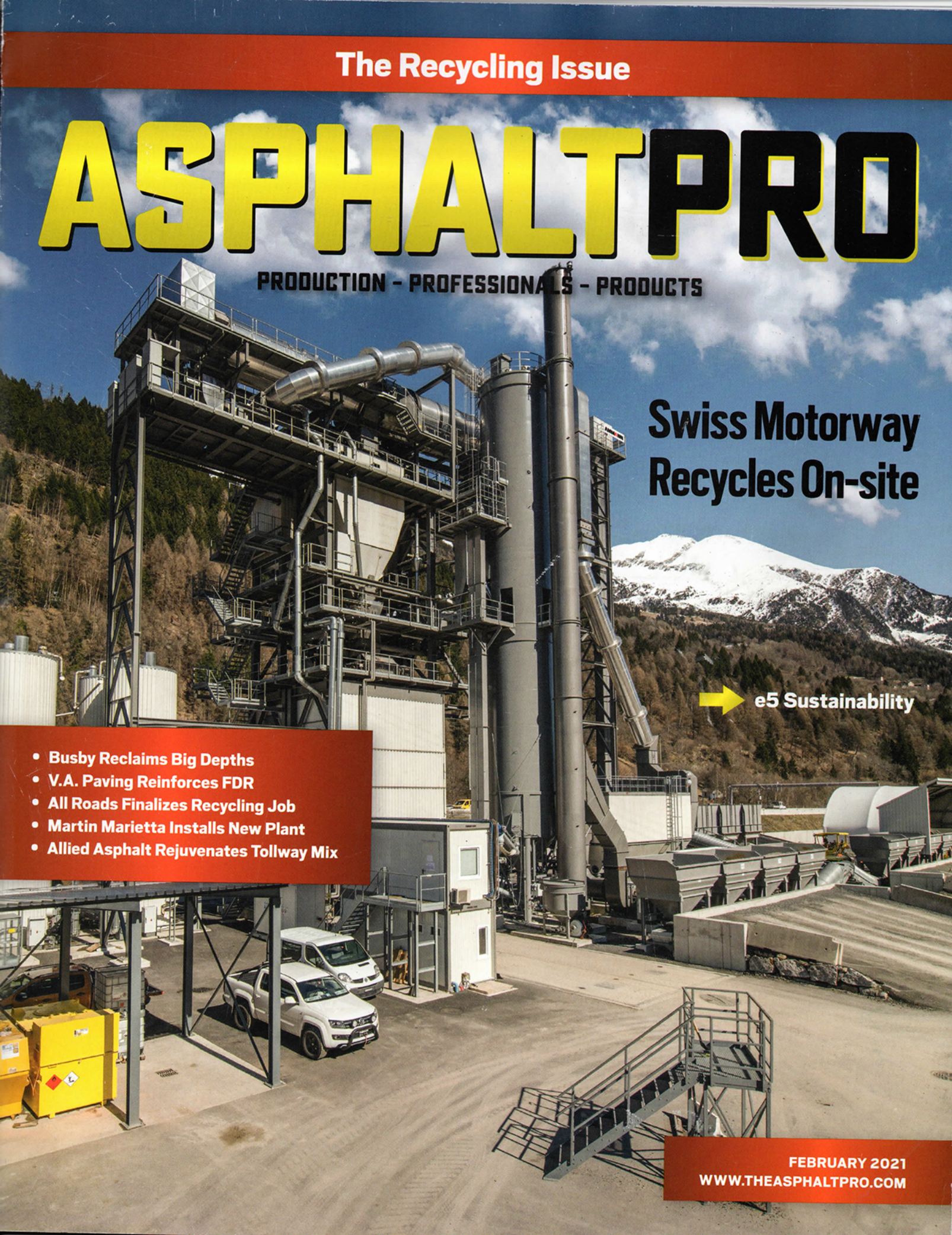
PRODUCTION - PROFESSIONALS - PRODUCTS



## Swiss Motorway Recycles On-site

e5 Sustainability

- Busby Reclaims Big Depths
- V.A. Paving Reinforces FDR
- All Roads Finalizes Recycling Job
- Martin Marietta Installs New Plant
- Allied Asphalt Rejuvenates Tollway Mix

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# REJUVENATING AGENT MAXIMIZES ILLINOIS TOLLWAY RECYCLE

The Illinois Tollway is a 294-mile, heavily trafficked, user-fee-supported roadway, which "...seeks to minimize the environmental impact of roadway construction and maintenance by reducing, recycling and reusing materials using green technology, while using best practices to protect and enhance the natural and physical environment," according to the tollway's website. One of the most effective ways of achieving these goals is by maximizing the recycled asphalt pavement (RAP) and recycled asphalt shingle (RAS) content in the paving mix. The use of high-quality engineered asphalt rejuvenators such as ReLIXER™ from Sripath Technologies®, can increase the recyclables percentage while maintaining performance specifications.

This drive for high performance additives comes at a time when transportation agencies worldwide are facing multiple challenges including funding pressures, environmental sustainability issues, higher traffic loads and durability concerns. High quality, proven, engineered rejuvenators offer the potential to address these concerns. ReLIXER is designed to allow mixes with 40–50 percent RAP, even up to 100 percent RAP, while delivering performance equivalent to conventional mixes. ReLIXER has also proven to ease compaction and workability issues posed by stiff, high RAP/RAS mixes.

The advantage of using high RAP/RAS levels in road construction is realized through a reduced need for virgin asphalt and aggregate. This reduction lowers emissions and energy associated with existing resource extraction, lessens transportation costs, and avoids the cost of landfilling old pavement while creating significant savings in highway construction dollars. According to the 10th annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage (IS-138) available from the National Asphalt Pavement Association (NAPA) website, almost 90 million tons of RAP/RAS were used in 2019. This usage was estimated to have reduced the need for 4.5 million tons of asphalt binder and 84 million tons of aggregate with a total estimated value of more than $3.2 billion.


Since the 1960s, Plote Construction has provided quality hot-mix asphalt, warm-mix asphalt, cold patch, and asphalt paving materials for highways, driveways, runways, and commercial parking lots.

When people think about recycling, they usually think about aluminum cans. Those have an approximate consumer recycle rate of less than 50 compared compared to the near 100 percent recycling rate for asphalt pavements.

Rejuvenators have been used for some time with mixed results. Their performance claims are being carefully vetted by contractors, mix producers, testing agencies and independent labs. Rightly so, because their potential is so great, yet the possibility of premature road failure is sizable if mixes are poorly designed.

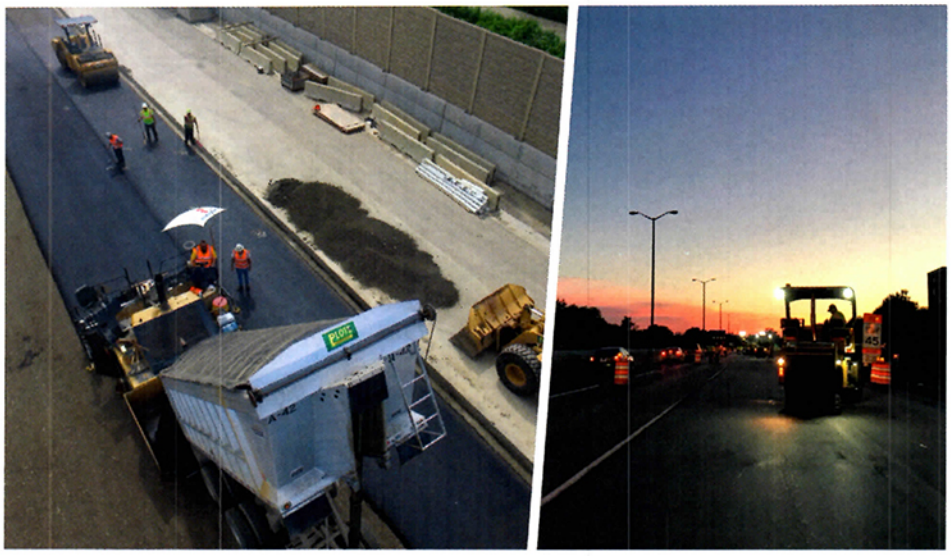
In 2015, after two years of development and testing, ReLIXER was commercialized in the United States. The product was introduced worldwide in 2017. To date, over 10 million tons of high RAP/RAS mix using ReLIXER has been laid down in ports, state/local roads and well-trafficked highways.

## ILLINOIS STUDIES RELIXER

A case study of an Illinois Tollway Authority trial project provides lessons on how to bring all interested parties to the table to achieve the goals of creating the best pavement at the lowest cost. In meetings with them, representatives from the Modified Asphalt Research Center (MARC) at the University of Wisconsin, Madison, S.T.A.T.E. Testing, Plote Construction and Sripath Technologies proposed a plan that maximized the RAP/RAS content in mixes with the use of ReLIXER.

At that first meeting, the history of ReLIXER was reviewed by Hussain Bahia, director of MARC, who played a key role in product development and introduction. Krishna Srinivasan, president of Sripath Technologies, reviewed the product's performance and use in a wide variety of settings. Jay Behnke, president of S.T.A.T.E. Testing discussed the role of his third-party testing/auditing lab, which is accredited by the American Association of State Highway and Transportation

Krishna Srinivasan of Sripath Technologies stated: "Our environmental impact can be minimized through the use of high ABR mixes that are possible using rejuvenators like ReLIXER."



Paving occurred over an eight-day period, including nighttime paving, on sections of the Illinois Tollway's Interstates 294 and 88.

**Table 1. Production Mix Data: 40 Percent ABR (FRAP + RAS)**

| | PG 46-34 Mix | PG 58-28+ReLIXER™ (2.0% Tot AC) Mix | PG 58-28+ReLIXER™ (3.6% Tot AC) Mix | Specification (Target) |
|---|---|---|---|---|
| DCT -12°C (J/m²) | 435 | 497 | 544 | 450 |
| Hamburg (mm@20,000 cycles) | 6.34 | 8.70 | 8.77 | 12.5 (@ 10,000 cycles) |
| Voids (%) | 3.7 | 3.6 | 4.9 | 4.0 |
| Extracted Total AC (%) | 6.0 | 6.1 | 6.0 | 6.1 |
| Recovered AC Grade (AASHTO M320) | PG 64-22 | PG 64-22 | PG 64-28 | PG 64-22 |
| Extracted Delta Tc (°C) | -5.8 | -5.4 | -3.7 | -6.0 |

*Source: Sripath Technologies*

**To date, over 10 million tons of high RAP/RAS mix using ReLIXER has been laid down in ports, state/local roads and well-trafficked highways.**

Officials (AASHTO), in product qualification. Tollway Authorities green-lighted the plan for their two-step validation process for emergent technologies.

"It's always good for progressive agencies, like the Tollway Authority, to investigate and implement performance-based mixes on high volume roadways that deliver performance, while utilizing valuable resources that would have otherwise gone to landfills," Behnke said. "The use of rejuvenation technologies, like ReLIXER, should help agencies and DOTs gain confidence to employ proven, eco-friendly technologies that promote sustainability and deliver cost savings, while meeting performance specifications."

The first step in the approval process was to obtain representative samples of the asphalt, aggregate, fractionated RAP (FRAP) and RAS that were to be used in the trials. After the FRAP and RAS asphalt extraction and characterization, mix formulations were generated and tested to determine ReLIXER dosages for the two mixes that were employed in the trials.

The first mix met the current standard specification of 30 percent asphalt binder replacement ratio (ABR). The second mix was created at 40 percent ABR in an effort to comply with possible future requirements. Testing continued after each plant trial on mix samples to ensure all specifications of the dense-graded Superpave mix design for N70 were met. Plote Construction developed all of the mix designs, which were subsequently verified by the Tollway.

Having pioneered technologies like FRAP, crumb rubber (CRM) and RAS in the Midwest, Plote Construction, a construction materials producer and paving company in Northern Illinois, was eager to work on rejuvenation technologies for this project. Dan Plote, president of Plote Construction, stated that he was especially pleased, despite the COVID-19 environment, to see the

Plote-S.T.A.T.E-MARC-Sripath team working together, showing a can-do attitude, to demonstrate the effectiveness of ReLIXER in high RAP/RAS mixes.

All variables under consideration were evaluated in two plant trials, carried out over eight days, using mixes from two different plants.

Trial 1 consisted of 1,600 tons of mix produced in Plote's Allied Asphalt Franklin Park plant using their Dillman Dual Drum system.

In the second trial, 3,800 tons of mix were produced at Plote's West Chicago plant, which used an Astec Double Barrel® system.

In both trials, an AquaFoam® additive pump system was used to meter in the ReLIXER and the mix production temperature of 300°F was held constant. Well over five lane-miles of base and top courses on Interstates 88 and 294 of the Tollway were completed as well as private roads in the area. Depending on the mix placed, a variety of rollers were used including a Caterpillar tandem vibratory, a Sakai static three-wheel and a Sakai 800 Series oscillating roller. Ambient conditions during placement and compaction ranged between 60 and 85°F. Production samples of the mix were obtained and tested for a range of binder and mix properties by S.T.A.T.E and MARC. Representative data from the production trials is shown in Table 1.

Greg Rohlf, Plote's research and development manager, reported, "The trials mirrored the lab evaluations, and the dosage efficiency was particularly good. The high ABR mix with ReLIXER was very workable and laid down a good mat that compacted easily. The laydown process was no different than any regular mix, nor did we need any specialized equipment to make or lay down the mix."

John Lavallee, lead HMA P.E. at S.T.A.T.E., said, "...We were looking for effective rejuvenation technologies and ReLIXER delivered on all counts—product performance, ease of use in the plant and good finished compaction."

TOP: The dosage accuracy of ReLIXER metered into the mix was assured using a calibrated Aquaflow additive pump system. BOTTOM: Paving occurred over an eight-day period, including nighttime paving, on sections of the Illinois Tollway's Interstates 294 and 88.

Bahia from MARC, has been working with ReLIXER since 2011, and was also pleased with the trial results. "We have worked very successfully with Sripath to bring multiple innovative products to the asphalt industry, and it is gratifying to see successful adoptions of ReLIXER. It is really a high-performance product that we have tested over the past few years for multiple customers of Sripath in North America and Asia."

Rohlf, from Plote, summed up the total experience by saying, "We have evaluated multiple rejuvenation technologies and found ReLIXER to be best-in-class from a performance-economics-usability point of view." AP

**– BY STEVEN ROTZ**

*Steve Rotz, founder and president of Additive Advisors LLC, brings over 25 years of experience in the asphalt and asphalt additives industries to his consulting practice. Sripath Technologies, formed in 2006, is an innovative, technologically driven company serving the asphalt additive needs of the paving and roofing industries. For more information, visit www.sripath.com.*