By Daniel C. Brown, Contributing Editor

Riding the **CIR Train**

Nevada lets a statewide CIR contract every year.

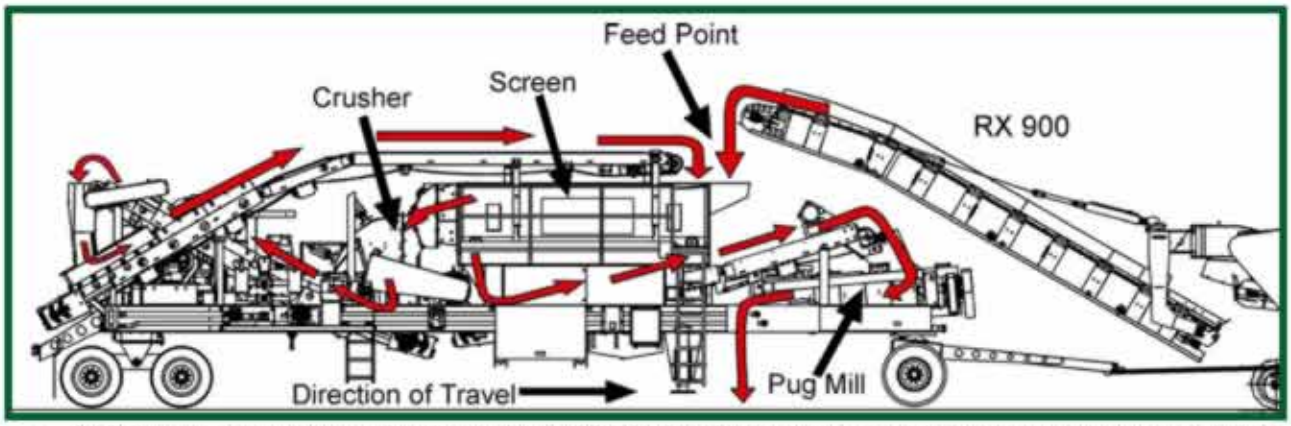
Last spring Coughlin Company Inc. successfully completed approximately 120 lane miles of cold-in-place asphalt recycling (CIR) on low-volume roads in Nevada. Coughlin, of St. George, Utah, performed the CIR as a subcontractor to Frehner Construction, Elko, Nev. Frehner, in turn, was working under a contract for some $10 million with the Nevada Department of Transportation (DOT).

The Nevada DOT likes cold-in-place recycling for low-volume roads, according to Bill Hoffman, chief maintenance and operations engineer at the department. After extensive research on rehabilitation strategies for low-volume roads, the DOT has determined that CIR with a chip seal surface treatment can effectively rehabilitate a low-volume road at almost half the cost of a 2-inch hot-mix overlay and surface treatment.

To put it another way, the Nevada DOT estimates that CIR plus a double chip seal saves $104,000 per centerline mile (two lanes) versus a 2-inch hot mix overlay. That's because the cold process is all in-place; it requires no hauling to and from the hot mix plant, nor is any hot mixing required. "It is already our standard practice to let a statewide CIR contract for low-volume roads each year," says Hoffman. "On that pavement a double or single chip seal is placed by our department's maintenance personnel."

Coughlin began the CIR work in mid-July 2008, worked through September, rested the project for the winter and finished the contract in March 2009. Coughlin owns and operates the CIR train that recycled the asphalt, added an emulsion, and laid down a windrow of rejuvenated asphalt onto the roadway. Frehner followed behind the recycling train with a Cedarapids pickup machine that placed the asphalt into a Blaw-Knox paver. Compaction followed with two steel-drum rollers and one pneumatic-tired roller.

The project was divided into five locations in Nevada: one on SR 447, the Pyramid Lake Highway; another on SR 757 near Minden; another on U.S. 50 near Austin; another on SR 93 near Legge's Junction; and a fifth on SR 373 near Armagosa. The SR 93 section received a 3-inch hot mix overlay on top of the recycled pavement. All other sections were chip-sealed.



RAP flows from the milling machine into the Roadtec RT-500 Mixing Trailer, then over a screen. Oversize material goes to a crusher and back over the screen. RAP that passes the screen goes to a pugmill for mixing with the emulsion or additive, and from there it is discharged.
Schematic courtesy of Roadtec.

On U.S. 89 in Utah, a Roadtec RX-900 milling machine (conveyor visible) feeds RAP to the RT-500 Mixing Trailer. Note the front-discharge pugmill just behind the front axle of the trailer.

Photo courtesy of Roadtec.

Leading off the recycling train was a Roadtec RX-900 milling machine working 13 feet, 4 inches wide and cutting 3 inches deep, said Darren Coughlin, president of Coughlin Company. As the train moved along, it recycled between 400 and 500 tons per hour, Coughlin said.

Working in a down-cutting mode, the RX-900 fed recycled asphalt pavement (RAP) directly into a Roadtec RT-500 Mixing Trailer. The mill's conveyor placed the RAP onto a JCI double-deck screen that measures 5 feet by 14 feet in size. Fully 100 percent of the material was screened to 1-1/4-inch minus; oversize RAP ran through a Telsmith impact crusher aboard the Mixing Trailer. A return circuit would run the RAP from the crusher back over the screen.

Material that passes the screen drops onto the 48-inch wide belt with a weigh-bridge on it. The weigh bridge sends a signal to the blending computer that adjusts the flow of additives to the Kolberg-Pioneer pugmill mixer located in front of the machine (see diagram). After a full mixing cycle, the rejuvenated RAP is discharged onto the roadway in a windrow.

Roadtec says the belt scale system provides accuracy to within plus or minus 1 percent.

"We added from 2 percent to 3 percent of emulsion by weight of the RAP," said Coughlin. "For emulsion we used ReFlex, a product that was made by SemMaterials. I can add water at the milling head and I can add water at the pugmill; it just depends on the mix design.

"All additives are calculated by the dry density weight of the RAP," says Coughlin. "Every additive is interlocked to the weight of the material on the weigh bridge."

The only problems occurred when the subgrade gave way in a few areas on SR 447. "That was an issue with the subgrade," he said. "Everything with the CIR process performed over and above our expectations."

What are the keys to success with the CIR train? "You just have to make sure you are very accurate with your additive," says Coughlin. "You want to hit the mix design as accurately as possible. We got certified weights of emulsion from each delivery truck and compared them to the amounts of material showing on the machine's computer. Once we got the machine calibrated, we could hit the additive amounts right on the nose."

In May, Coughlin completed a 6.5-mile CIR project on U.S. 89 near Thistle, Utah. For that one the contractor used two milling machines. A Roadtec RX-60B premilled a pass 7 feet wide and windrowed the RAP in front of a Roadtec RX-900. The second, larger, milling machine picked up the first windrow, milled another 9 feet width, and placed the RAP into the RT-500 Mixing Trailer. Both mills worked 4 inches deep.

For the U.S. 89 project, Coughlin added 2-1/4 percent of ReFlex emulsion in the pugmill and 1.5 percent of lime slurry as an anti-stripping agent at the milling machine's cutter head. "We started May 11, and we'll be done with that project by May 19," said Coughlin.

"Our collaboration with Roadtec has worked well for this CIR process," says Coughlin. "We're very comfortable with calibration of the machine. We don't have any problem with any of the state transportation departments, and Nevada is one of the toughest states on specifications." ❖