case history

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In-Place Concrete Pavement Recycling Makes A Green Statement

An in-place concrete recycling system makes recycling concrete paving more efficient and environmentally sound than ever. Bringing the recycling process to the jobsite not only saves natural resources, but also reduces the fuel required to haul materials.

Normally when contractors recycle concrete, they must haul it to an off-site recycling plant and haul it back to the highway to be used in the subbase. Using an in-place system saves on wear and tear of highways and roads, saves fuel, and improves air quality by reducing exhaust fumes.

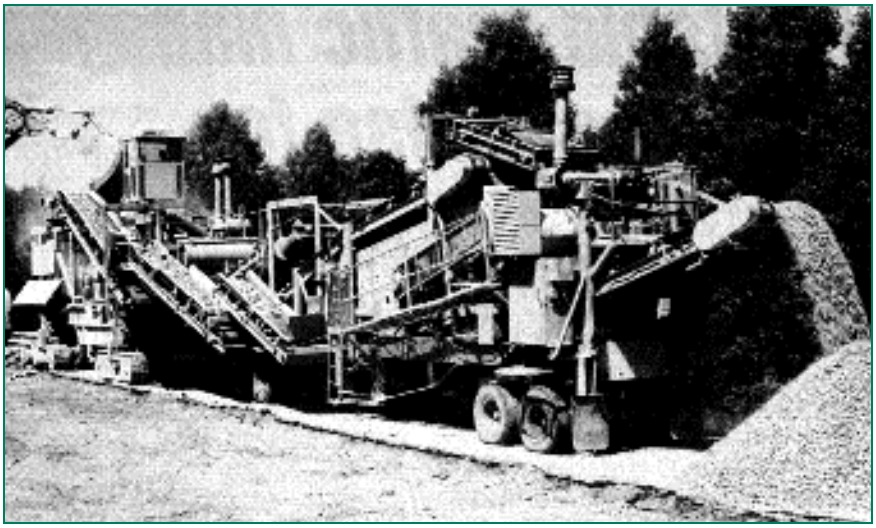
Recycling concrete is already a smart and environmentally conscious choice that saves resources. Now the recycling process has become more cost-effective as well. In-place concrete recycling offers the contractor a cost savings over traditional concrete recycling. The contractor doesn't have to pay for trucking the materials or finding a location to use as a recycling center. This benefits owners and taxpayers in reduced construction costs. A system called Paradigm is a leading example of how in-place recycling works.

Paradigm's Design

Paradigm is the brain child of three firms: Manatt's Inc., Brooklyn, Iowa; Duit Construction, Edmond, Okla.; and Wendling Quarries, DeWitt, Iowa.

The contractors and subcontractors first tried this in-place recycling technique on a 4.8-mile highway reconstruction project on I-80 near Des Moines, Iowa. Duit supplied the primary crusher, which is specially adapted for in-place recycling by placing it on crawler tracks. Wendling supplied a secondary crusher that is towed by the primary crusher and sits on crawler tracks. Manatt's acted as prime contractor on the original Iowa job.

A patent is pending on the process.



Crushing train in action

Arkansas Recycles

Ballenger Paving Co., Inc., Greenville, S.C., used Paradigm for work on Interstate 30, about 20 miles outside Little Rock, Ark. The project called for 187,500 square yards of pavement to be

removed and recycled. Half was used in the base of the new road, and half used as partial inlay on shoulders.

The DOT originally gave the option of recycling the pavement and left the method up to the contractor. Ballenger's choice of in-place recycling was the first time that in-place recycling had been used on a project in Arkansas.

Ballenger first used the Paradigm system on the eastbound lanes during the summer of 1994. In 1995, work commenced on the westbound lanes. Production rates with in-place recycling depend on the material being processed and how much reinforcing steel is involved.

In this case, production averaged about 2,000 feet per day for one-lane width construction in the eastbound lanes. This process went faster in the westbound lanes after Ballenger expanded their crushing equipment to span the full width of the road. The recycled concrete from I-30 was used as aggregate in the new subbase, and the reinforcing steel was taken out and sold as scrap.

In-place recycling saved on the consumption of 25,000 to 30,000 gallons of truck fuel, in turn saving the contractor/owner/taxpayers about $15,000. Because the pavement was 100% recycled, it eliminated the need to quarry in excess of 95,000 tons of crushed stone base. This system reduced the bid prices, passing on substantial savings to the highway department.

Step by step

Ballenger's first step was to remove the joint seal material. Next, they cut ditches for drainage during the project because the existing drainage was not functioning. Ballenger used Duit Construction of Edmond, Okla., and Manatt's Inc. of Brooklyn, Iowa, as its subcontractors for the pavement recycling.

After the drainage was in place, Duit and Manatt's used an 8-foot wide truck-mounted guillotine breaker to break up the pavement and to expose the existing reinforcing steel. A trackhoe with a rhino horn followed behind to pull up the pavement. This made the pavement ready for the laborers who came in with bolt cutters to cut the existing wire mesh and dowels. The pavement was reinforced with dowel baskets every third joint and wire mesh. Crews cut out as much of the reinforcing steel as they could before the in-place recycling train came in.

Then, instead of trucking broken concrete away, Duit and Manatt's brought in the crusher train—a bucket-equipped trackhoe which feeds broken concrete into a primary impact crusher. This crusher rolls on a crawler-type track and tows a three-deck screen and the 8,000 gallon water truck that wets recycled concrete to keep dust down. After placing the recycled aggregate, Ballenger used conventional methods to shape and compact it for the subgrade.

Soil Condition Cause Problems

Poor soil conditions (highly expansive soil) in Arkansas meant that some changes had to be made on the second half of the project. The expansive soil and wet subgrade created stability problems on the project which had caused faulting at the joints in the existing pavement.

The original contract called for 4 inches of aggregate base course to be placed on the existing subbase, then 4 inches of asphalt permeable base course. A 12-inch thick concrete pavement was then placed.

To combat the subgrade problem, the Arkansas Highway and Transportation Department and the contractor partnered to revise the construction process through a change order. In the last half of the eastbound lanes, a stabilization fabric was placed on the existing subbase. The original sections were then placed.

In the westbound lanes, 4 inches of the existing subbase was removed and used in the construction of a haul road. Stabilization fabric was laid down and 8 inches of the recycled material was placed over it. After crews placed the recycled material over the fabric, 4 inches of Asphalt Permeable Base and a 12-inch concrete pavement were typically placed.

This project, the first of its kind in Arkansas, helped the contractor to realize significant savings and resource conservation. In addition, the Paradigm system received the Construction Innovation Forum's prestigious NOVA award for 1996, given to innovative solutions, processes, or products that improve the quality, efficiency and cost effectiveness of construction.

The Environmental Council of Concrete Organizations is a coalition dedicated to promoting the environmental benefits of concrete and its role in safe and sustainable construction.

ECCO members are companies, organizations, and individuals affiliated with the concrete industry. Together, they are committed to developing and disseminating information on the environmental benefits of concrete and concrete products.