

## Innovation Update

### **Fly Ash: Stabilizing the Base**

*Research and case studies show the benefits of using fly ash in road construction*

#### **Overview**

Many states currently use fly ash to stabilize foundation materials during road construction projects. In Minnesota, the recent implementation of new specifications, tools, and projects at the local level is supporting increased use within the state.

In 1994, the Minnesota Local Road Research Board (LRRB) funded a study that explored the use of several materials, including fly ash, to stabilize soils for road reconstruction projects. The LRRB also supported follow-up studies, including evaluations of several demonstration projects. In addition, the Minnesota Department of Transportation (Mn/DOT) is developing a technical memorandum to outline specifications for its use in projects throughout Mn/DOT districts.

#### **Benefits**

Fly ash offers benefits in a number of applications – from upgrading gravel roads and rehabilitating existing roads to strengthening the foundation before new construction.

##### *Construction savings*

As a less expensive alternative to using thicker asphalt or hauling more aggregate longer distances, fly ash can reduce the overall cost of road construction projects. Some estimates of these savings run as high as 66 percent. In addition, the use of fly ash can provide a more cost-effective choice when considering the decision to either rehabilitate or reconstruct a road.

##### *Quality*

According to research results, fly ash adds strength to the mixture of recycled asphalt, gravel, and soil, producing roads with a lifespan comparable to or exceeding traditional construction practice.

##### *Use of recycled material*

The Minnesota Pollution Control Agency released new rules that govern the beneficial use of waste products, such as fly ash, which offers an alternative to sending them to a landfill. These rules allow coal fly ash generators to apply for permission to allow specific uses of fly ash, including soil stabilization.

##### *Smoother construction*

Crews can proceed with construction work on projects that use fly ash even in challenging weather conditions. The road also can remain open during construction, helping reduce challenges with traffic.

### **Case Study: Chisago County**

About five years ago, Joe Triplett became involved in his first project that included fly ash use – a portion of County Road (CR) 53. The success of that project led to its use on other roads. To date, Chisago County has completed road reconstruction projects that include the use of fly ash on 13 miles of four different roads: CR53, CR10, CR15, and CR72. Fly ash has worked particularly well with the county's poor soil conditions.

“We never have enough money for roads,” says Triplett, county engineer and public works director for Chisago County. “So when you do have the chance to do a road project, you try to get as much value out of it as you can.”

The county has many rural roads that are lower in traffic volume, but also need to carry heavy loads, says Triplett. Fly ash helped the county reduce its costs while increasing the strength and lifespan. “If there is a way to stabilize what's in place, then you are looking at getting more out of the road.” It can cost more than \$1 million a mile to construct a new road, compared to several hundred thousand or less with alternatives, he says. In addition, the roads now can carry 10- to 12-ton loads, compared to five- to seven-ton loads.

The roads are performing well and are generating “more bang for buck,” he says. “Fly ash is definitely a tool in the toolbox,” he says. “It really can pay off, especially now, to take this option under consideration.”

### **Research Recap**

Several key research and implementation projects have contributed to the innovative use of fly ash in road construction projects:

#### *Use of Fly Ash for Reconstruction of Bituminous Roads (August 2009)*

This study developed a practical method to design local roadways using fly ash as the stabilizing agent added to existing recycled pavement material or existing road surface gravel. The results of this project served as the basis for qualifying the contribution of fly ash to design life estimates.

Available at: [www.lrrb.org/pdf/200927.pdf](http://www.lrrb.org/pdf/200927.pdf)

#### *Demonstration of Ash Utilization in Low Volume Roads (2007)*

This project involved assessing the effectiveness and environmental suitability of fly ash as a stabilizing agent for recycled pavement material and road surface gravel through two demonstration projects – the reconstruction of a city street in Waseca and the construction of a flexible pavement on a gravel county road in Chisago County. Strength and stiffness increased with both projects.

Available at: [www.lrrb.org/pdf/200712.pdf](http://www.lrrb.org/pdf/200712.pdf)

#### *Screening Tool for Using Waste Materials in Paving Projects – STUWMPP (2004)*

This project produced computer software and a user guide for assistance with conducting environmental due diligence.

Available at: [www.lrrb.org/pdf/200503.pdf](http://www.lrrb.org/pdf/200503.pdf)

## Resources

The development of resources supports the application of fly ash to road construction projects:

### *STUWMPP*

A software tool that helps locals with the environmental due diligence when they decide to use one or more waste materials in stabilization or other pavement projects. Local agencies can download the software at [www.dot.state.mn.us/stateaid/flyash.html](http://www.dot.state.mn.us/stateaid/flyash.html).

### *Minnesota Pollution Control Agency Rules*

This web site [www.pca.state.mn.us/waste/swutil-csbud.html](http://www.pca.state.mn.us/waste/swutil-csbud.html) provides information about the guidelines for case-specific beneficial use and includes a list of authorized suppliers. Before pursuing fly ash as an option, check with Geoffrey Strack at [geoffrey.strack@pca.state.mn.us](mailto:geoffrey.strack@pca.state.mn.us) to help ensure environmental compliance.

### *Case studies*

Joe Triplett, Chisago County engineer and public works director, [jktripl@co.chisago.mn.us](mailto:jktripl@co.chisago.mn.us).

### *NCHRP practices*

The NCHRP document, *Recommended Practice for Stabilization of Subgrade Soils and Base Materials*, provides guidance for fly ash use in soil stabilization. [www.dot.state.mn.us/materials/pvmtdesign/docs/nchrp\\_soil%20stabilization%202009.pdf](http://www.dot.state.mn.us/materials/pvmtdesign/docs/nchrp_soil%20stabilization%202009.pdf)

### *Coal Combustion Products Partnership (C<sup>2</sup>P<sup>2</sup>)*

This cooperative effort among several federal agencies promotes the beneficial use of coal combustion products and the environmental benefits that result from their use. C<sup>2</sup>P<sup>2</sup> provides also provides technical assistance and resources, including case studies and a fly ash booklet for engineers, available at [www.epa.gov/epawaste/partnerships/c2p2/index.htm](http://www.epa.gov/epawaste/partnerships/c2p2/index.htm).