



In addition, new hot and cold mix plants and several types of powerful in-place recycling equipment now are available. Performance-based testing and mix design methods have improved greatly. More contractors are familiar with foamed asphalt.

What Is key?

Several elements of foamed asphalt application are critical, including the following:

- The foamed asphalt must be of a certain temperature and mixed in the correct proportion to water
- Gradation of the reclaimed material must meet certain ranges for the foamed asphalt to become a sound pavement layer

Is there more information available about applying foamed asphalt?

Yes. The LRRB report 2009-09: *Recycled Pavements Using Foamed Asphalt in Minnesota* includes general design guidelines for the use of foamed asphalt in cold-in-place recycling and full depth reclamation projects. The guidelines offer details about:

- Mix design
- Materials
- Construction requirements, including equipment and mixing and injecting
- Construction operations
- Quality control and quality assurance
- Special provision language

For a copy of the report, visit:
<http://www.lrrb.org/PDF/200909.pdf>

For a current state-of-practice review about cold-in-place recycling, visit:
<http://www.fhwa.dot.gov/pavement/recycling/cir/>

Use of Foamed Asphalt with Cold-in-Place Recycling and Full Depth Reclamation

Information on implementation



Why cold-in-place recycling and full depth reclamation?

The high cost of asphalt, the reduced availability of quality aggregates, and environmental concerns have contributed to the increasing popularity of recycled asphalt pavement (RAP) in rehabilitation projects. The performance of RAP also helped spur its growth.

As two different methods to incorporate RAP, cold-in-place recycling and full depth reclamation also offer several advantages. Because they involve processing materials on site, the methods greatly reduce the need to haul materials away. Their benefits include:

- Cost savings
- Reduced emissions
- Strong performance results
- Reduced construction times

Why foamed asphalt?

Until the mid-1990s, almost all cold-in-place recycling involved the use of emulsions. In recent years, countries and states began to turn instead to foamed or expanded asphalt.

Effective with cold-in-place recycling and full depth reclamation methods, foamed asphalt helps add strength and moisture resistance to the remaining pavement materials. It also:

- Helps reduce binder and transportation costs and decrease the environmental impact
- Cures in a short time, allowing traffic on the pavement in two to four days
- Can be compacted immediately after injection of foamed asphalt and sufficient mixing
- Can be used with 5 to 20 percent fines
- May be stockpiled without binder runoff or leaching, remaining workable for a relatively long time
- Can be used under some adverse weather conditions, such as light rain or cold weather
- Requires less binder and water than other types of cold mixing

Many parts of the world have used foamed asphalt for years in their road rehabilitation projects. In Minnesota, Olmsted and Fillmore Counties successfully have used foamed asphalt with cold-in-place recycling. Those projects were completed with Superpave 52-34 PG binder.

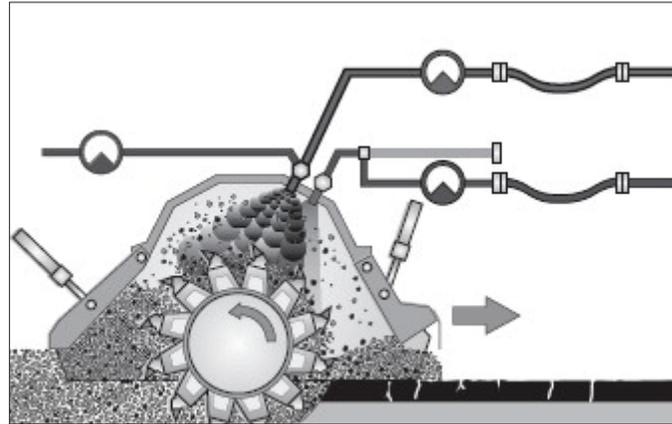


Diagram of the full depth recycling process

What does recent research show?

The Minnesota Local Road Research Board (LRRB) sponsored a recent research project to assess and evaluate the use of recycled pavements that use foamed asphalt in Minnesota.

The project confirmed that all cold-in-place recycling sections with foamed asphalt are performing very well to date and that transverse cracking and rutting appears to be reduced by using foamed asphalt cold-in-place recycling rehabilitation techniques.

How does It work?

The foamed asphalt process involves injecting a small amount of water – typically 2 to 4 percent – with asphalt binder – typically at 320 degrees to 360 degrees Fahrenheit – and mixing it with RAP in the reclaimer. As the water instantly vaporizes, the asphalt material foams.

Foamed asphalt coats the fines, forming a mastic that increases the surface area of the mixture; as a result, foamed asphalt works well with a wide range of minus 200 material – 5 to 20 percent through 8 to 15 percent is typically optimum. Lime, fly ash, and portland cement often are added to increase moisture resistance and reduce the amount of required asphalt.

What's new?

Technological improvements of early asphalt pavement recycling methods and equipment have made the process more feasible as a rehabilitation method. The development of laboratory and field equipment allows the production of foamed asphalt safely under precisely controlled conditions.