

Green Project Interstate 81 In-Place Pavement Recycling – 2011

Highway pavements do not last forever. Each car and truck takes a toll on the driving surface and underlying layers that support the daily load of heavy traffic. Rain, snow, ice, road chemicals and sunlight do additional damage.

Innovations and research in pavement materials and design are extending the service life of highways. Longer-lasting pavements mean fewer lane closures for maintenance. This saves time and money for motorists and transportation departments. Fewer work zones also reduce congestion and increase safety for drivers and workers.

The Project

The Virginia Department of Transportation (VDOT) is rehabilitating a **3.7-mile, two-lane section of southbound Interstate 81 in Augusta County between exits 217 and 213**. It is using a specific combination of reconstruction processes to recycle and reuse existing pavement material for the first time on such a project in the United States.

The processes are **cold in-place recycling, cold central-plant recycling** and **full-depth reclamation**. This project will save VDOT millions of dollars by reusing the resources at hand, rather than buying and transporting tons of new material to the site and disposing of the old.

The contract award amount for this in-place pavement recycling project is **\$7.64 million**.

VDOT's research division, the Virginia Center for Transportation Innovation and Research (VCTIR), will issue a report in spring 2011 about three pilot projects using full-depth reclamation. VCTIR will also study the asphalt recycling processes used in this pavement project.

The structure of the roadway includes three layers:

- Hot-mix asphalt – 10-12 inches deep, combination of driving surface and underlying asphalt (top)
- Compacted stone aggregate – 10-12 inches deep (middle)
- Compacted subgrade – soil (base)



The Alternatives

Conventional pavement construction and traffic-management concerns would have required building another lane throughout this section of interstate – estimated at approximately \$40 million – as well as widening bridges, lengthening overpasses and excavating and replacing fill material.

This method also would have required extensive natural resources to build the additional lane and reconstruct the failing pavement. In addition to the financial costs, the project would have taken nearly three years to complete. It would have limited VDOT's ability to maintain other pavements and drained maintenance resources.

Sources of savings for I-81 in-place pavement recycling project:

- **Fuel:** Reduces transport of new and old materials
- **Materials:** Reuses existing materials; eliminates need for third lane and other infrastructure additions for project
- **Time:** In-place pavement recycling will take 3-4 months. Traditional paving/rehabilitation method using new materials would take 2-3 years.
- **Safety:** Reduces work-zone congestion, now and for future maintenance and worker safety
- **Extended service life:** Rebuilt pavement structure is now stronger to withstand heavy traffic loads

The Problem

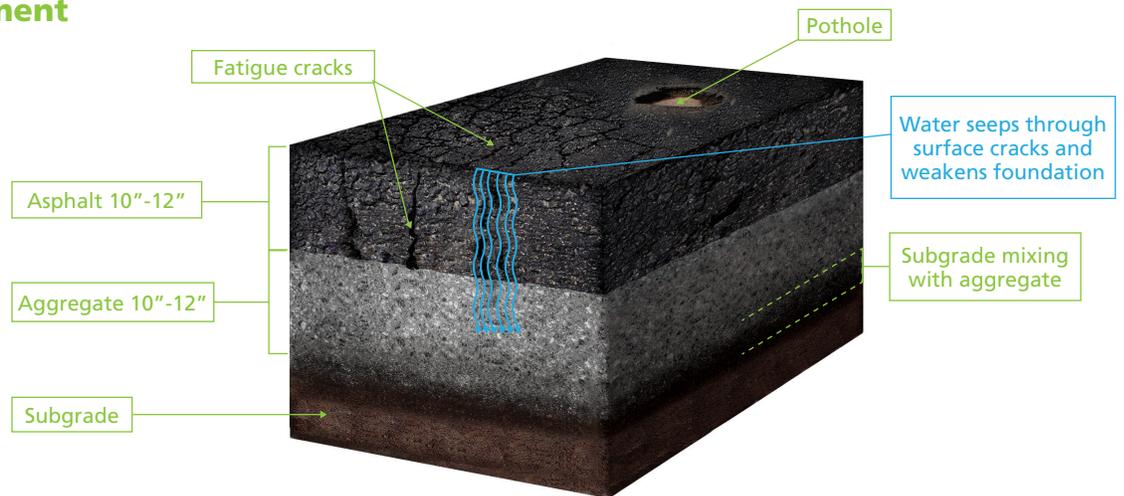
This part of I-81 was built in the late 1960s. VDOT has routinely maintained the surface asphalt by periodically patching and replacing it. The original foundation of compacted stone aggregate and soil has weakened to the point it no longer provides a stable base for the overlying asphalt layers.

Fatigue cracking, caused by years of heavy traffic loads, has deteriorated the pavement structure from bottom to top. Symptoms of this deterioration can be addressed by milling the existing surface and repaving it, but the underlying condition remains. The cause of this extensive wear can only be remedied by reworking all the material down to the subgrade.

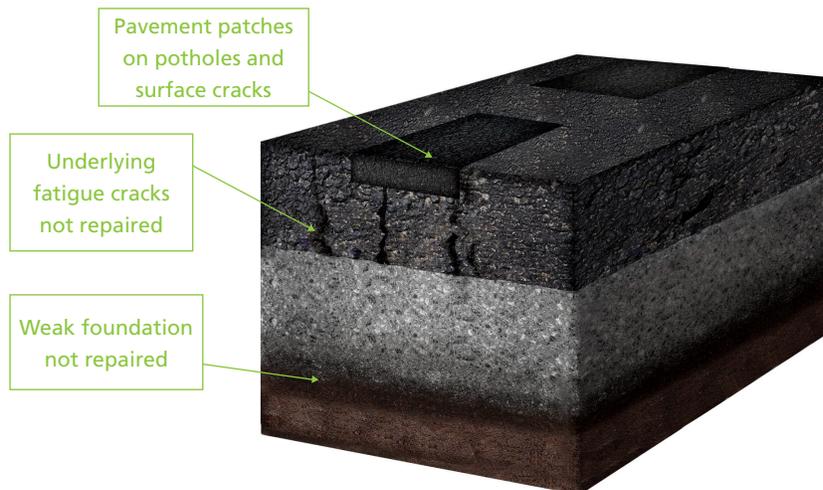
Unless the foundation is repaired, simply repaving the road surface is a temporary improvement. If VDOT were to do nothing to this section of road, the pavement would crack more. Pieces up to the size of a golf ball could come out of the road.

The fatigue cracks also allow a direct path for water to seep down to the pavement foundation. The water saturates the subgrade, further reducing its load-carrying capacity. This condition can lead to deep rutting (surface depressions) within the wheel paths that can affect skid resistance and even steering ability.

Current Pavement Condition



Temporary Patch



The Fix

The repairs will be slightly different for the right and left lanes. Since most heavy traffic loads use the right (travel) lane, it has more underlying damage than the left (passing) lane.

VDOT will use two innovative processes called “cold in-place recycling” and “cold central-plant recycling” to repair the asphalt layers of the left and right lanes respectively. Both are performed at ambient, rather than hot, temperatures.

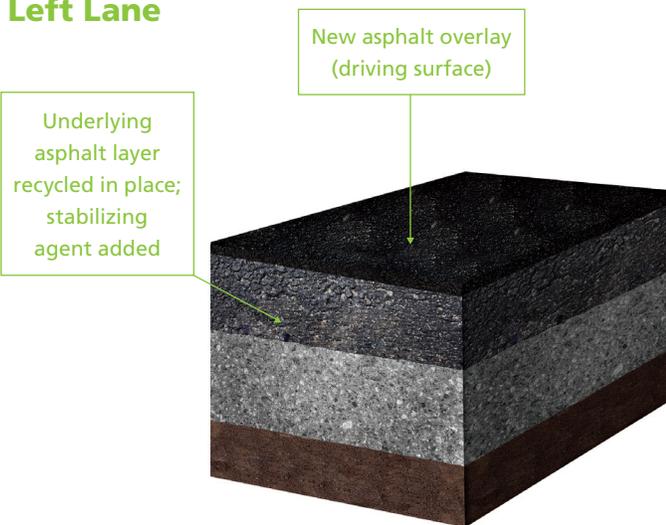
In the right lane, the stone aggregate base and subgrade will be mixed in place with a stabilizing agent to reconstruct the road’s foundation. This is called “full-depth reclamation,” another innovative way to rebuild pavement structures.

Other states are separately using cold in-place recycling, cold central-plant recycling and full-depth reclamation, which are gaining acceptance nationwide. VDOT recently conducted three two-year demonstration projects in Goochland, Powhatan and Franklin counties to gain experience with full-depth reclamation.

As noted previously, VDOT’s research division, the Virginia Center for Transportation Innovation and Research (VCTIR) will publish a report in spring 2011 on the results of these pilot projects. It will recommend that VDOT use full-depth reclamation on pavement reconstruction projects where appropriate.

VCTIR also will study the two recycling processes used in this project to determine whether they can be used at other locations in Virginia.

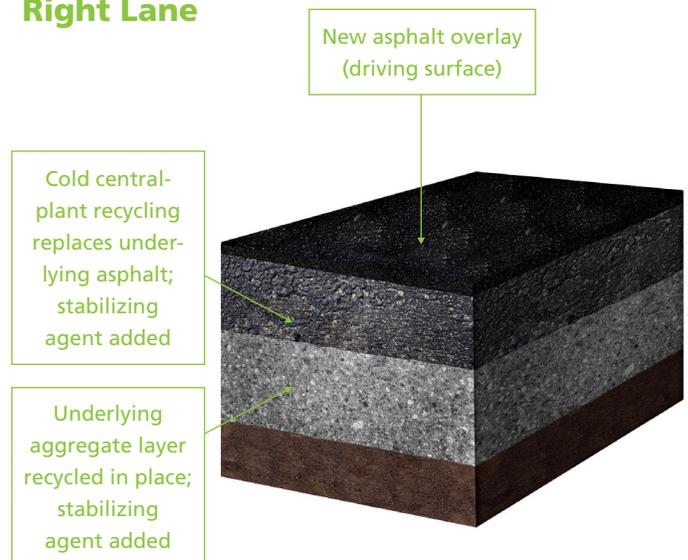
Left Lane



Left lane

The top 2 inches of the asphalt layers will be milled. The next 5 inches of asphalt will be recycled in-place using a machine to pulverize the material in-place and add an asphalt binding agent. This material will be recompact. Four inches of traditional hot-mix asphalt material will be used as the riding surface.

Right Lane



Right lane

The asphalt layers will be milled down to the top of aggregate layer (about 10 inches from the surface). This material will be stockpiled on site for reuse in the new pavement structure. The next 12 inches of material (aggregate and soil) will be strengthened with a stabilizing agent (cement or lime). This material will be recompact to form a platform for the next step.

The stockpiled milled material from the asphalt layers will be processed in an on-site mobile plant where an asphalt binding agent will be added. The resulting material will be repaved at ambient temperatures to a depth of 8 inches and compacted. Four inches of traditional hot-mix asphalt material will be used as the riding surface.