

## High Value Research - Texas

TxDOT research project 0-6880, Full Depth Reclamation in Maintenance Operations using Emerging Technologies, integrated a full-depth reclamation program within the Pavement Asset Management Section of the TxDOT Maintenance Division. Full-depth reclamation (FDR) equipment can renew damaged pavement for less than half the cost of traditional approaches using virgin roadway materials and reduce construction time.

The research phase of this project analyzed failures within the subbase and base materials of the road, usually caused by constant heavy haul energy sector traffic on roadways originally designed for low volume passenger and agricultural vehicles. Two full-depth reclamation (FDR) equipment sets were used to place evaluation sections in TxDOT districts using foamed asphalt or asphalt emulsion. Foamed asphalt or asphalt emulsion FDR provided a rapid, cost-effective solution to rehabilitate failing pavements. The process typically treated  $\frac{1}{2}$  to  $\frac{3}{4}$  lane-mile per day. Asphalt-based FDR provided a high stiffness, moisture-resistant base that does not shrinkage crack, and allowed early placement of traffic. Through the research phase of this project, TxDOT renewed approximately 38 lane-miles of pavement in 10 different TxDOT districts. FDR with asphalt as applied in 0-6880 provided an economical solution for renewing pavements in the energy sector, where treatment with asphalt binders was the only FDR option suitable for rapidly returning roadways to service under the intense energy sector traffic loads.

The FDR program continues to work with several TxDOT districts that plan to construct roadway sections in the 2020 construction season and continue to forecast potential pavement sections for development. FDR with in-house crews provides an alternate project delivery mechanism suitable for pavements that may not reach the stage of moving to construction letting. Based on seven roadway rehabilitation projects using FDR in the research phase of this project, there was an average savings of approximately \$220,000 per lane-mile as compared to other traditional pavement designs using virgin roadway materials. This figure takes into multiple factors, including:

- Shorter project duration by up to 70 percent, reducing needed traffic control costs, and allowing normal traffic back on the road quicker.
- Reduced demolition time and elimination for the need of pavement ripping equipment and dump trucks to remove old roadway materials and haul new materials to the work site.
- Reusing existing materials in place, saving over 200 truckloads of roadway material waste per lane-mile.
- Shorter curing time, and better resistance to moisture prior to sealing.
- Less maintenance as the FDR processes are less prone to shrinkage cracking and less susceptible to fatigue damage under heavy loads.

Currently, 20 of the 25 TxDOT districts are requesting FDR due to failures in the base and subbase layers within roads; primarily on-system roads not initially built for heavy haul traffic, and other road design failures. On a statewide level, 20 of the 25 TxDOT districts are expected to rehabilitate an average of 30 lane-miles of roadway per year using FDR as part of a 10-year rehabilitation plan. In the first year alone, savings to TxDOT using FDR is expected to be at least \$132,000,000 (\$132 million). Not accounting for net present value, inflation, increase in future construction costs, or greater demand for FDR by TxDOT districts, a 10-year rehabilitation plan using FDR will yield a 10-year savings to TxDOT of at least \$1,320,000,000 (\$1.32 billion).