



5-5230-01: Implementing the Ultra-High Pressure Water Cutter for Roadway Maintenance Applications

Background

Implementation study 5-5230-01 was conducted to implement ultra-high pressure (UHP) water cutting as a Texas Department of Transportation (TxDOT) maintenance strategy to rectify flushed pavements surfaced with either a seal coat or surface treatment. The UHP technique is useful for other pavement maintenance applications as well, such as treatment in advance of seal coating operations, removal of pavement markings, thermoplastic striping removal, cleanup of residue from spills, and cleaning of porous friction course asphalt pavements. The research was aimed at conducting a systematic evaluation of the UHP water cutting process for Texas roads, and it represents the first large-scale application of UHP water cutting for treatment of flushed seal coats in the United States.

What the Researchers Did

UHP water cutter treatment data were collected from January 31 through March 2, 2011, from 14 test sites located in four climatic regions in Texas. The UHP water cutter process was used at these sites to restore texture to flushed pavement surfaces and to correct other pavement problems. Two types of tests, the circular track meter and the sand patch test, were used to determine the average pavement surface texture before and after the treatment. In addition, wet-weather skid resistance was measured using both the TxDOT skid truck and the dynamic friction test. The research design included follow-on monitoring of the treatment sites at six-month intervals for an 18-month period after treatment in order to evaluate the longevity, or durability, of the initial UHP water cutter treatment results.

What They Found

This study focused on answering three questions about UHP water cutting:

- **Does it work?** This question was evaluated in terms of treatment effectiveness, expressed as the percentage increase in pavement texture and friction values achieved as a result of UHP water cutting. While effectiveness varied depending on the test site, the average increase in pavement texture was about 200 percent, and the average increase in friction was about 135 percent. On this basis, the UHP water cutter treatment does improve pavement texture and friction.
- **Does it last?** This question was evaluated in terms of the survivability and life expectancy of pavement surface texture and friction values achieved at treatment. Relative to survivability, pavement texture and friction values upon completion of monitoring (12 months to 18 months following UHP treatment) were at or above the “*desirable*” threshold for seven of 13 test sites. Pavement texture and friction values

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were at or above the “*maintenance required*” threshold for 12 of 13 sites. Relative to life expectancy, decay models indicate that improvements in pavement texture and friction achieved by UHP water cutting are predicted to last one or more years at 90 percent of the test sites. At 40 percent of the test sites, the treatment may last four or more years.

- **What is the cost?** This question was evaluated based on measured production rates and comparison of the cost of UHP water cutting versus the cost of TxDOT maintenance functions traditionally used to treat flushed pavements, mainly placement of a strip or spot seal. Under average production conditions, UHP water cutting is \$1.05/SY less expensive than the Texas statewide average for strip or spot sealing—a cost savings of 41 percent. Compared to other TxDOT maintenance functions traditionally used to treat flushing, the cost savings for UHP water cutting ranges from 25 to 77 percent.

Overall, implementation study 5-5230-01 offers a positive view about UHP water cutting as a roadway maintenance tool for Texas roads. Treatment performance at individual sites will vary depending on project-specific details.

What This Means

The findings of this study support the recommendation that UHP water cutting be implemented as a pavement preservation tool for treatment of flushed seal-coat-surfaced roads in Texas. In support of this objective, this study produced two draft specifications: one for UHP water cutting equipment and one for turn-key UHP water cutting projects. The researchers also published a guidance booklet for maintenance personnel on how to effectively introduce UHP water cutting as a roadway maintenance strategy.

UHP water cutting for treatment of flushed pavement surfaces falls within the category of retexturing pavement preservation strategies. Therefore, UHP water cutting can be considered for treatment of flushed roads at almost any project site where retexturing makes sense. After that, questions about project selection focus on the challenges associated with achieving effective treatment, production considerations (which directly relate to cost), and the durability of the treatment. Roads with heavy truck volume, for example, are less than ideal candidates. For these reasons, it is appropriate to leave the ultimate decision about whether to use UHP water cutting for a particular application to the judgment of the roadway maintenance professional.

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