Texas A&M Transportation Institute

PROJECT SUMMARY

Texas Department of Transportation

0-6638: Performance Testing of Coagulants to Reduce Stormwater Runoff Turbidity

Background

During the last two decades, policy makers have increasingly recognized that water quality is adversely affected by sediment-laden stormwater discharge from construction sites. On December 1, 2009, the U.S. Environmental Protection Agency (EPA) published a rule in the *Federal Register* establishing non-numeric and, for the first time, numeric effluent limitation guidelines (ELGs). The numeric ELGs included a turbidity limit of 280 nephelometric turbidity units (NTUs) and sampling requirements for stormwater discharges from construction sites that disturb 20 or more acres of land at one time. EPA's decision to regulate turbidity through a numeric standard was based on the agency's conclusion that turbidity is an "indicator pollutant" for identifying other pollutants flowing from construction sites. Following litigation in April 2013, EPA proposed to withdraw the numeric ELG requirement, at least for the time being. However, some future numeric limits are anticipated in the near future.

What the Researchers Did

Researchers first conducted a literature review to determine turbidity construction standards adopted by other states. Next, the team:

- Determined typical turbidity representative of the Texas Department of Transportation's (TxDOT's) construction site discharges.
- Collected performance data on innovative erosion and sediment control measures that might be expected to achieve the discharge standard.
- Provided an update to TxDOT's *Stormwater Management Guidelines for Construction Activities.*

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Texas A&M Transportation Institute

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What They Found

The polyacrylamide (PAM) application evaluated in the study was not effective in significantly reducing turbidity or soil loss on clay soils with 1:3 slopes. Due to the high range of turbidity (3,450 to 9,037 NTUs), the efficiency of PAM could not be determined. To compare the sediment removal efficiency of treated and untreated sediment retention devices, wood fiber wattles were installed in sediment retention device (SRD) test flumes. Testing showed that PAM-treated SRDs were 8 to 18 percent more successful at reducing sediment from sediment-laden water than untreated SRDs.

Researchers performed flocculation tests to understand soil and polymer characteristics, as well as to determine what doses of coagulants are necessary to promote flocculation. Colloidal clay suspensions were mixed, or clumped together using coagulants, such as PAM, chitosan, alum, or gypsum, to promote the clustering of these stabilized particles. The suspensions then settled, reducing the amount of contamination in the runoff. Testing showed that the higher the molecular weight of the application, the more likely it was to reduce turbidity. Conversely, when the influence of charge density on flocculation was tested, researchers found that as charge density increased, PAM effectiveness decreased. As a result, non-ionic PAMs are expected to be the most effective at promoting flocculation.

What This Means

When this project terminated, EPA was reevaluating its ruling regarding ELGs. Having this research in place means that when the Texas Commission on Environmental Quality (TCEQ) renews its Texas Construction General Permit—which requires compliance with EPA regulations—TCEQ will be better able to make informed decisions regarding the monitoring, sampling, and site management requirements levied by EPA regarding stormwater runoff from construction sites.

For More Information

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