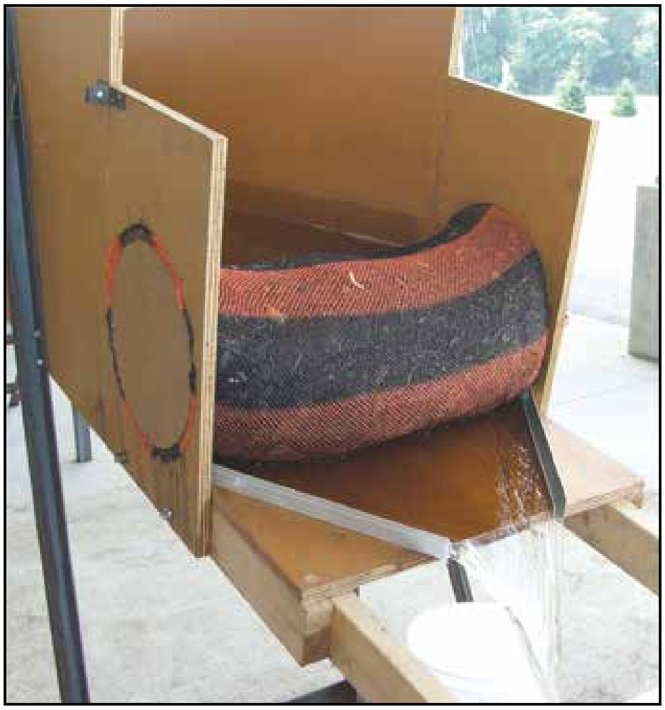
TechLink Research Summary #3302

A Comparison of Performance & Test Methods of Filtrexx® SiltSoxx™ Sediment Control vs. Silt Fence

Due to recent NPDES Phase II enforcement, evaluating the effectiveness and performance level of sediment control devices has never been more important. As states' begin to revise their erosion and sediment control manuals to reflect new information on best management practices, many are requiring that erosion and sediment control practices meet a minimum performance standard. Slope protection practices (single net straw blanket, compost erosion control blanket) normally use Cover (C) Factors (from the RUSLE) to compare and evaluate the effectiveness between these practices and products. Channel protection practices (turf reinforcement mat, rip rap, Filtrexx® Channel Protection, Bank Stabilization) normally use shear stress values to compare and evaluate the effectiveness between these practices and products. Although there is no standard test method to compare and evaluate between sediment control devices (silt fence, straw bale, straw wattle, Filtrexx® Sediment Control), generally the accepted analysis is sediment removal efficiency.

In a study evaluating the sediment trapping efficiency of silt fence, Wishowski et al, observed that as sediment particle sizes decrease, trapping efficiency declines, meaning clay and silt sediment is less effectively trapped using silt fence (1998). Barrett et al (1998) adds that most studies reporting sediment removal efficiencies for silt fence are overstated since many have used a disproportionately large fraction of sand particles with relatively low sediment-laden concentrations of stormwater runoff. Sand settles easily during ponding, therefore increasing removal efficiency. They observed 92% of the total suspended solids were clay and silt and were an order of magnitude smaller than the openings in the silt fence fabric due to very low settling velocities are normally not removed by sedimentation (Barrett et al, 1998). Barrett et al (1995) concluded that effective sediment trapping efficiency of silt fence is a result of increased ponding behind the silt fence, while a similar study by Kouwen (1990) concluded that excessive ponding is largely due to eroded sediment clogging the fabric of the silt fence. Barret et al (1998) further concluded that sediment removal efficiency by silt fence was not attributable to the filtration by the fabric but due to duration of runoff detention behind the silt fence. Some suspended solids are never removed by silt fence



Many environmental parameters can influence sediment removal efficiency (assuming prpoer installation), including: slope degree; flow rate of runoff (or rainfall intensity); sediment concentration of runoff; percent of gravel, sand, silt, clay in runoff; and duration of runoff (or rainfall) event. For example, a test method that uses a slow flow rate, on a 5% slope, with a low concentration of sediment in the runoff, where the sediment is predominantly sand, with a runoff duration of 10 minutes is probably going to produce results that make the sediment control device appear to function extremely well, by exhibiting a high sediment removal efficiency. Below is a summation of selected test methods used in performance evaluation of selected sediment control devices.

TEST METHODS

ASTM D-5141 - *Standard Test Method for Determining Filtering Efficiency and Flow Rate of a Geotextile for Silt Fence Application Using Site Specific Soil (2004).* This test method uses a 12:1 slope (8%) , a 12 in silt fence, runoff sediment concentration of 2890 mg/l of site specific soil (many tests have been conducted using predominantly sand, i.e. large sediment particles), using 50 liters of runoff, in plots 48 in long by 34 in wide, silt fence is pre-wet using 50 L of clean water.

Soil Control Lab - *Standard Test Method for Sediment and Chemical Removal of FilterMedia™ Used in Filtrexx FilterSoxx™.* This test method and results from this test method have been reviewed and published in the 2006 International Erosion Control Association (IECA) Annual Proceedings, Long Beach, CA. This test method uses a 3:1 slope, an 8 in Filtrexx® Sediment Control, runoff sediment concentration of 3000 mg/l of 33% sand and 67% silt, using 50 liters of runoff, in plots 4 ft long by 12 in wide, Filtrexx® Sediment Control is pre-wet using 50 L of clean water (Faucette & Tyler, 2006).

USDA ARS Environmental Quality Lab - *Evaluation of Compost Filter Socks in Sediment and Nutrient Reduction from Runoff.* This test method and results from this test method have been submitted for presentation and publication in the 2006 American Society of Agricultural Engineers (ASAE) Annual International Meeting, Portland, OR. This test method uses a 10:1, an 8 in Filtrexx® Sediment Control & 24 in silt fence, simulated rainfall (3 in/hr for 30 min) which produces a runoff sediment concentration of 100,000 mg/l of silt loam, in plots 44 in long by 14 in wide, compacted soil is pre-wet prior to rainfall (Sadeghi et al, 2006).

University of Georgia Institute of Ecology - *Evaluation of Storm Water from Compost and Conventional Erosion Control Practices in Construction Activities.* This test method and results from this test method followed methods developed by the USDA National Soil Erosion Research Lab Water Erosion Prediction Project (WEPP) and have been reviewed and published by the University of Georgia Graduate School and the Journal of Soil and Water Conservation (Faucette et al, 2005). This test method uses a 10:1 slope, 12 in high by 24 in wide compost filter berm & 36 in silt fence, simulated rainfall (3.2 in/hr for 60 min) which produced an avgerage runoff sediment load of 32,000 g, in plots 3 ft wide by 16 ft long, on a compacted sandy clay loam subsoil.

Table 1: Sediment Removal Efficiencies for Various Sediment Control Devices.

Sediment Control Device	**Sediment Removal/Reduction Efficiency**	**Reference**
Silt Fence	3% turbidity	Horner, 1990
Silt Fence	0% turbidity	Barrett et al, 1998
Silt Fence	0-20% clay	US EPA, 1993
Silt Fence	50% silt	US EPA, 1993
Silt Fence	80+ % sand	US EPA, 1993
Filtrexx® Sediment Control	98% total solids	Faucette & Tyler, 2006
Filtrexx® Sediment Control	70% suspended solids	Faucette & Tyler, 2006
Filtrexx® Sediment Control	55% turbidity	Faucette & Tyler, 2006
Silt Fence	67% suspended solids	Sadeghi et al, 2006
Silt Fence	52% turbidity	Sadeghi et al, 2006
Filtrexx® Sediment Control	90% total solids	Sadeghi et al, 2006
Filtrexx® Sediment Control	78% suspended solids	Sadeghi et al, 2006
Filtrexx® Sediment Control	63% turbidity	Sadeghi et al, 2006
Filtrexx® FilterMediatm w/ Flocullent Agent	97% suspended solids	Sadeghi et al, 2006
Filtrexx® FilterMediatm w/ Flocullent Agent	94% turbidity	Sadeghi et al, 2006
Filtrexx® FilterMediatm w/Silt Stop	97% suspended solids	Sadeghi et al, 2006
Filtrexx® FilterMediatm w/Silt Stop	98% turbidity	Sadeghi et al, 2006
Filter Berm vs Silt Fence	65% less total solids	Faucette et al, 2005
Filter Berm vs Silt Fence	91% less total solids	Demars & Long, 2000
Filter Berm vs Straw Bale	92% less total solids	Demars & Long, 2000
Filter Berm vs Silt Fence	72% less total solids	Ettlin & Stewart, 1993
Filter Berm vs Silt Fence	91% less suspended solids	Ettlin & Steart, 1993

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