Polyacrylamide Use for Sediment Reduction in Construction Site Stormwater Discharge

Problem
As part of a commitment to environmental protection, the Maryland State Highway Administration is exploring methods to increase the efficiency of sediment basins during roadway construction. Polymer coagulants have been occasionally used in other states as effective reducers of suspended sediment. However, the effectiveness of different polymers is dependent on the local conditions of the soil and water and methods of application are not well developed.

Objective
This project evaluates the performance of coagulants for enhanced sediment reduction in construction site runoff. The major objectives of this study were to assess the performance of polymers for enhanced sediment reduction, to develop a protocol to be used for future coagulant selection, and to evaluate methods of application.

Description
A test site was selected at the Rt. 43 expansion project in Baltimore County. The Rt. 43 site consisted of four sediment basins. Each basin possessed characteristics that identified it as unique to the others. Stormwater runoff from the site was collected on several occasions and subjected to laboratory tests. Several anionic and cationic polyacrylamides of various doses were added to the samples and tested for total suspended solids (TSS), total solids, and turbidity over time. Alum was also tested as a coagulant. The efficiency of the different polymers and alum was compared using TSS percent removal and turbidity ratios.
Comparison trials using the top performing coagulants for this site were conducted to accurately assess the best coagulant for use in future field trials.

**Results**

Twelve different coagulants were tested using stormwater from the Rt. 43 basins. Considering the turbidity and percent removal ratios, A-100, A-110, C-448, (Cytec Industries) and alum were chosen for further comparison trials.

In the comparison trials, all coagulants performed better in all tests than the samples without coagulant addition.

<table>
<thead>
<tr>
<th>Coagulant</th>
<th>Dose (mg/L)</th>
<th>Average % removal TSS</th>
<th>Average % removal TS</th>
<th>Average % reduction turbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>No coagulant</td>
<td>None</td>
<td>88</td>
<td>68</td>
<td>51</td>
</tr>
<tr>
<td>A-100</td>
<td>2</td>
<td>96</td>
<td>76</td>
<td>78</td>
</tr>
<tr>
<td>A-110</td>
<td>2</td>
<td>95</td>
<td>76</td>
<td>72</td>
</tr>
<tr>
<td>C-448</td>
<td>6</td>
<td>97</td>
<td>76</td>
<td>85</td>
</tr>
<tr>
<td>Alum</td>
<td>100</td>
<td>97</td>
<td>78</td>
<td>84</td>
</tr>
</tbody>
</table>

Alum and the cationic polyacrylamide C-448 provided the best performance in the comparison trials. Because cationic polyacrylamide is a known toxin to aquatic organisms, it is not recommended for field testing. Field testing is recommended for future studies as the proper coagulant can vary based on site characteristics. A detailed protocol has been developed that will be useful in determining the proper coagulants and dosages to be applied at each new site. Based on the first field test and literature review, the best method of application is likely directly to the runoff inflow. As the inflow travels through riprap, it will become well-mixed before it enters the basin. The inherent mixing of the basin appears to be too slow for ample coagulant-sediment interactions. This study demonstrates the potential for coagulant use in construction site sediment basins.

**Report Information**

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