ProTech InfoBrief IB05
Polymer Coagulant/Flocculant Treatment Costs

ProTech General Contracting Services has completed an initial series of tests to evaluate various polymers applied in flow-through stormwater treatment systems. The tests included a set of jar tests to determine the optimum dose for clarification efficiency (see ProTech InfoBrief IB04). Based on the optimum dose rates, a comparison chart has been developed to illustrate the range of direct polymer costs for stormwater treatment.

Method
The four polymers tested included two synthetic and two natural varieties that are currently in use by ProTech as well as other firms:

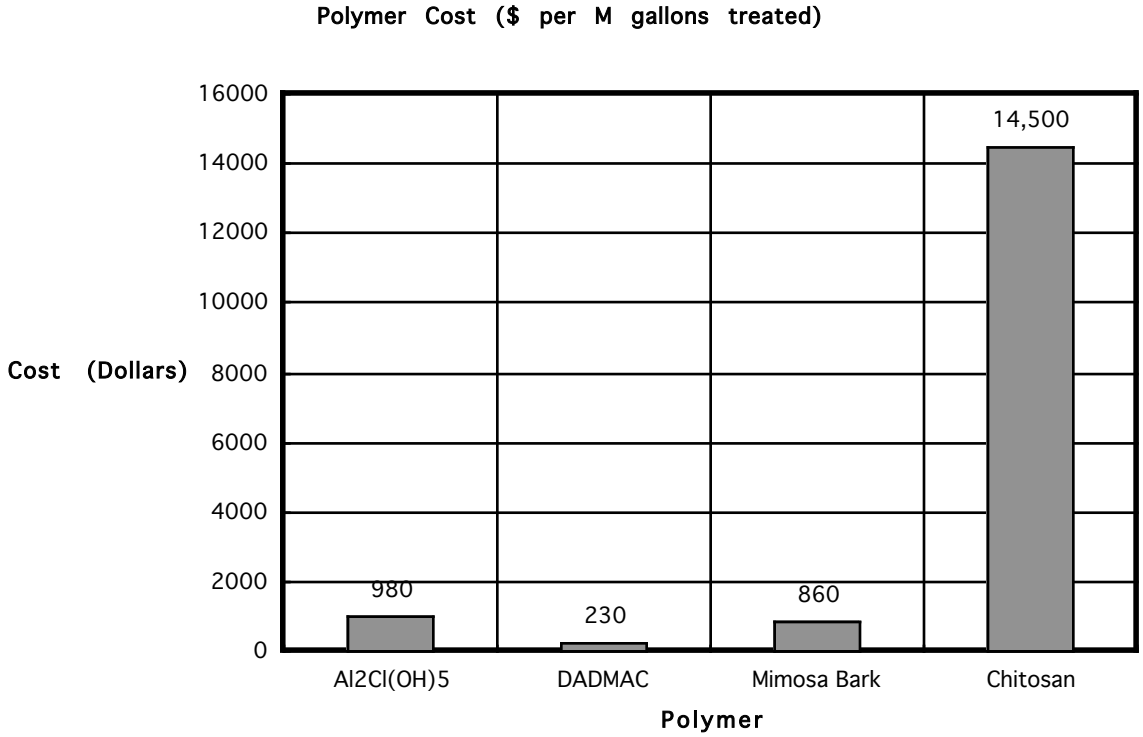
- Aluminum Chlorhydroxide ($Al_2Cl(OH)_5$
- Diallydimethyl Ammonium Chloride (DADMAC)
- Mimosa bark-based: derived from the bark of the Mimosa tree
- Chitosan (1% solution): derived from chitin, a component of shrimp and crab shells.

Water for the tests was collected from a ProTech project site in the Sacramento, California area. The water, collected from a stormwater holding basin, contained high levels of colloidal material and iron oxides which was essentially impossible to remove by gravitational settling. Turbidity was measured at >1000 NTU. Although this water was more difficult to treat than some stormwaters, it is typical of many construction projects, particularly in the central/northern California region. Polymer dosage was determined by a series of standardized jar tests conducted for each polymer (described in ProTech InfoBrief IB04). The optimum dose based on the jar test results is presented in the table below. Note that Chitosan is supplied in a 1% Chitosan solution, so for example, 1000 ppm of the 1% solution is equal to 10 ppm pure Chitosan.

Optimum Polymer Dose		
Polymer	Dosage (ppm)	Turbidity (NTU)
Control	0	>1000
$Al_2Cl(OH)_5$	75	38
DADMAC	25	2
Mimosa Bark	50	66
Chitosan (1%)	1000	30

Polymer Cost

The following chart presents a cost comparison based on polymer consumption rates from the clarification efficiency study presented above, for the >1000 NTU influent water of this study. In a flow-through treatment system, equipment and most operating costs are essentially the same for all polymers, since the system can utilize any polymer in liquid form. However, polymers with low clarification efficiency generally result in a greater volume of settled sediment, which incurs additional cost, as well as associated disposal considerations. These costs should be considered as examples only, because costs vary based on region, manufacturer, and quantity.



Summary

The DADMAC polymer is the most economical, not only in terms of direct polymer cost but also for settled sediment handling and disposal costs. The Aluminum Chlorhydroxide and the Mimosa Bark polymers are approximately equal in cost. Chitosan is the most expensive by a significant margin.