

Summary:

The above test results proved that the combination of NSP-3 coagulant and NSCF-2 flocculant produced the best results (based on bench scale tests) for treating the lake water / dirt mixture. This is the same finding as with our first testing on 6/5/08. Please see the pictures below. These chemistries reduced turbidity the best (to just slightly under 10 ntu) and had a rapid settling sludge at the cheapest usage cost of any of the coagulant / polymer combinations. The pH level after treatment was again near neutral. In addition, the sludge produced showed good dewatering characteristics which may be important for this project. This is in spite of increasing the turbidity from 2,100 ntu to 14,500 ntu, so the chemistry combination should work at whatever turbidity level is found in the wastewater created during the project. Coagulant usage increased by approx. 40% and the flocculant usage increased by approx. 600%.

Based on these findings, Northstar Chemical still recommends using NSP-3 coagulant and NSCF-2 flocculant. This will provide excellent results in turbidity removal at the least amount of cost. Please see the discussion on cost below.

Capital Cost Estimates:

Northstar would deliver the coagulant in 55-gallon drums and the flocculant in 5 gallon pails. In order to use the polymer a make-down system will be necessary. This can be as simple as an empty drum and a hand mixer up to a fully automated polymer make-down system. It will also be necessary to intimately mix the waste stream, the coagulant, and the flocculant. Northstar can provide recommendations for making down the polymer properly and what type of equipment will be needed for mixing.

Product Costs:

NSP-3 coagulant would be provided at \$0.93 / lb in 55-gallon drums, FOB Lake Oswego

NSCF-2 flocculant would be provided at \$2.84/lb in 5-gallon pails, FOB Lake Oswego.

These prices are valid for 30 days.

Usage Costs:

If 10,000 gallons of wastewater is created every day of the project, the estimated treatment would be 5.5 gallons of coagulant and 0.6 gallons of flocculant every day. This would amount to a treatment cost of \$73.20 / day.

