Appendix C

Flocculant Testing

Laboratory Testing of Polymer Flocculation of Seminole Lake Sediment

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INTRODUCTION

Fine solids, largely consisting of vegetative matter in lake sediments is capable of forming a network structure and locking up considerable amount of water. The particulate suspension thus formed, can potentially occupy large tracts of lands which cannot be put to productive use and is deleterious to aquatic life. The separation of the solids would amount to recycling of the held up water as well as potential use of the solids as compost. Flocculation of the solids is investigated as a technique to achieve viable methods of clarification of the waste water sludge.

MATERIALS AND METHODS

Two 500 ml jars containing samples from Seminole lake sediment were received for screening of flocculants that can be used to dewater such sediment after dredging it from the bottom of the lake. Sample (P31) is composed of fine particles of mostly organic matter, the solids content by weight is determined to be about 16%. The second sample (P42) contains coarser particles including sand. The solids content by weight is determined to be about 22%. Several solid grade polymers were tested as possible flocculants for these samples. Polymers included nonionic, anionic, and cationic chemicals were tested in this program. The charged polymers (anionic and cationic were tested as a function of charge density on the polymer chain ie high, medium, or low charge. These polymers included Percol (351, 156, 335, 371, 455) all are products of Allied Colloids Inc. In addition Polyethylene Oxide (PEO) of Union carbide was also tested. In addition, Mixtures of these flocculants were studied to obtain the best dewatering possible.

1000 ppm solution of each polymer was made and stored in a measuring flask. Flocculation was carried out in a 250 ml beaker using 100 ml (5% solids by weight) prepared of well stirred suspension of the lake sediment. Agitation was carried out using a Lightnin Labmaster mixer (L1U08) with a high shear impeller (3.5 cm diameter) at 100 rpm.

Dewatering was done using a nylon mesh (a6 Mesh size) and press filtration, whenever used, was achieved manually by squeezing the water from the sediment through the mesh.

RESULTS

All tested polymers were found to flocculate suspensions prepared from both received samples. However, flocs were small, fluffy and weak especially in the case of the fine sample (P31). Dewatering the flocculated material on the screen resulted in small amount of solids (about 5%) retained on the screen. In case of the double polymer treatment (156/371), flocs were larger and slightly stronger (about 40% retained) (see table I). Supernatant water was found to be clear in case of using 455, 371, and 156/371 polymers. Flocculation is found to start at a dosage of) 0.9 lb/dry ton of solids with no added benefit as the dosage increased.

In case of the second sample (P42), again all polymers are found to flocculate the suspension. In this case, the flocs were found to be slightly larger and slightly stronger (about 20% retainment of solids on the screen) than in the case of sample (P31). This is attributed to the coarser size distribution of the solids in the sample (P42) as compared to the first sample. In the case of using the dual treatment of 156/371 polymers, flocs were stronger and can be dewatered on the screen with

about 90% retained on the screen (see Table II). It should be remembered that addition of fiber may help in strengthening the flocs which can be dewatered further by pressing the solids on the screen.

Table I: Flocculation results of Sample (P31) using various flocculation schemes

S. No	Flocculant	Dosage (lb/ton)		% light* Transmitted in Filtrate	% solids retained on screen
		Anionic	Cationic		
1	Percol 156	0.9	-	15%, Turbid	5
2	Percol 336	0.9	-	81%, Turbid	5
3	Percol 371	-	0.9	92%, Clear	5
4	156 + 371	0.7	0.4	92%, Clear	40
5	336 + 371	0.7	0.4	92%, Clear	40
6	455	-	0.9	Clear	5

*% Light transmitted in lab water''100%

Table II: Flocculation results of Sample (P42) using various flocculation schemes

S. No	Flocculant	Dosage (lb/ton)		% light* Transmitted in Filtrate	% solids retained on screen
		Anionic	Cationic		
1	Percol 156	0.9	-	15%, Turbid	20
2	Percol 336	0.9	-	81%, Turbid	20
3	Percol 371	-	0.9	92%, Clear	15
4	156 + 371	0.7	0.4	92%, Clear	90
5	351 + 371	(Nonionic) 0.7	0.4	92%, Clear	90
6	455	-	0.9	Clear	20

*% Light transmitted in lab water''100%

As mentioned above, two nonionic polymers (Percol 351) and PEO were tested and the results are similar to the anionic polymers.

CONCLUSION

Even though it was easy to flocculate these samples by all types of polymers, the solids capture on the screen is not high. Also, the solid content in the dewatered solids are not high (increased from 5% to 7% after dewatering. Perhaps, the use of fiber may help in the dewatering as well as solids capture on the screen.