Flocculents

Source: Applied Polymer Systems, 2006

BENEFITS

	L	M	H
Flow Control			
Erosion Control			
Sediment Control	■	■	■
Runoff Reduction			
Flow Diversion			

Description: Flocculents are natural materials or a class of chemicals that cause colloidal particles (clay) to coagulate. The coagulated particles group together to form flocs that will settle out of detained stormwater.

Typical Uses: Used in conjunction with sediment basins and sediment traps to remove suspended clay and fine silt particles from stormwater runoff prior to discharge.

Advantages:
- Ability to remove fine particles that would not settle out otherwise.
- Increases the percentage of fines removed during the detention period.
- May be used to remove suspended particles during dewatering operations.

Limitations:
- Requires specific dosing of the appropriate flocculent to achieve proper sedimentation.
- Flocculent must be thoroughly mixed with the stormwater.
- Flocculated particles must still be allowed to settle which takes time.
- Some flocculents are considered chemical pollutants. When these are used, the discharge must be carefully monitored to ensure that flocculent is adequately removed by settling.
- Flocculated material must be removed upon completion of the project for basins that are to be converted into permanent structures.

Longevity: Only effective on the runoff volume they are applied to; no long-term benefits

SUDAS Specifications: Typically, flocculents are only used in special circumstances and therefore have not been included in SUDAS Specifications

A. Description/Uses

Even with the proper sediment controls in place, suspended clay and loess particles are difficult to remove. Water ponded for days, or even weeks, can remain murky due to the suspension of these fine particles. Flocculents aid in removing these fine particles and may be a desirable treatment method for locations with clay or loess soils that are upstream of lakes, ponds, or other sensitive waterways.

B. Design Considerations

Fine soil particles, such as loess and clay particles, are difficult to remove with conventional settling techniques (basins, traps, etc.). The colloidal particles contain a negative electrostatic surface. Particles with like charges repel each other, preventing them from sticking together and settling out. This allows these small particles to remain in suspension indefinitely.

Coagulants are a class of chemicals that may be added to turbid stormwater to aid in the removal of suspended colloidal particles. Negatively-charged soil particles are attracted to the positively-charged coagulant particles. These particles stick together and form a larger, neutrally-charged particle called a floc. Since the colloidal particle forms a neutrally-charged floc, it no longer repels other particles, and can combine with other floc particles. The process of combining flocs into larger flocs that can be settled out of suspension is called flocculation. While the class of chemicals that ultimately cause the process of flocculation are technically called coagulants, the term flocculents has been adopted and is more widely used within the industry.

One flocculent that has been commonly used for stormwater applications is Polyacrylamide (PAM). Two versions of PAM are available, cationic and anionic. Only anionic PAM should be used, as cationic PAM is considered highly toxic. Anionic PAM has been used for many years in the water and wastewater industry and is considered safe for humans and aquatic life when used at the recommended rates.

Chitosan is another flocculent that is derived from the exoskeletons of crustaceans. It is generally considered safe for use in stormwater and water bodies.

A variety of other flocculent materials are available. Since trace amounts of flocculent will undoubtedly be discharged, the product used should be non-toxic and safe for both human and aquatic life and should not create Biochemical Oxygen Demand (BOD) problems in the downstream discharge waters.

Selection of an appropriate flocculent is highly dependent on the soil particle type and concentration. Analysis of a sample of the contaminated water is usually required to select the proper product and application rate. Manufacturers of these products will normally assist in this process.

C. Application

Several different methods of delivery are available for the application of flocculents to stormwater runoff. The most basic involves a solid form of the flocculent, either in block or pellet form, that is placed in a wire basket or mesh screen within the runoff as it flows into the sediment basin. The flowing water slowly dissolves the material, releasing flocculent into the basin.

More advanced methods involve equipment that will inject a liquid form of the flocculent into the runoff stream or storm sewer pipe at the desired rate.

Portable equipment that treats and filters the runoff is also available. Contaminated runoff is pumped

from a sediment basin, treated with a flocculent, and then passed through sand filters to remove the suspended solids. The treated water may then be discharged.

Regardless of the flocculent material or method used, the material should never be added directly to the sediment basin or any standing water, unless adequate agitation is provided. The flocculent product should be introduced well in advance of the sediment control structure to allow for adequate mixing before the runoff arrives in the structure.

Adequate facilities need to be provided to allow for the settlement of the flocculated particles. Normally, a properly designed sediment basin is sufficient for this application. The accumulated material should be removed and disposed of properly.

D. Maintenance

Sediment should be removed on a routine basis to ensure a volume to receive the sediment. Timing will be based on having ample storage volume to accommodate anticipated runoff. Retention time and sediment storage volume are critical.

E. Time of Year

The effectiveness of the flocculent can be affected by temperature. The manufacturer should account for this when providing specific product and dosing rate recommendations.