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Hild & Associates, Inc.



# Areas of Applications for Flocculants

E F G Y L B

V A C M Z S

W Q J U X K

D T H C T U

I Y S L J R

- Adhesives, aluminum anodization and surface treatment, aluminum smelters, aluminum sulphate, asbestos plate, borax production, brewing industry, brine clarification, centrifugation aid, ceramic industry, chemical industry, effluent, clay, china clay, production, coagulant, coagulant aid, coal washing, copper mining, cyanidation, dairy and milk industry, dicalcium phosphate, dredging and land reclamation, electroplating industry, drying beds, filter aid, food processing industry, flotation aid, hydraulic back-fill, industrial raw water treatment, iron ore, iron and steel industry, latex and synthetic rubber effluent treatment, leaching, magnesia from seawater, meat processing, motor/automotive, municipal sewage, oil production, petroleum refineries, pharmaceutical industry, phosphate ore, phosphoric acid wet process, potato industry, potable water, potash mining, pulp and paper, sand and gravel, settling aid, sugar processing, tailing disposal, tannery, textile industry, titanium dioxide manufacture, zinc electrolysis, stormwater erosion and sediment

**CAUTION**

**THIS SIGN HAS  
SHARP EDGES**

**DO NOT TOUCH THE EDGES OF THIS SIGN**



**ALSO, THE BRIDGE IS OUT AHEAD**



# Sediment in our Water

Discharges from construction activity impact the biological, chemical, and physical integrity of receiving waters.

Estimates indicate that 80% of the phosphorus and 73% of the nitrogen in streams is associated with eroded sediment.



Sediment is the largest single nonpoint source pollutant and the primary factor in the deterioration of surface water quality.

# Basic Terminology

- Sediment – Material in suspension in water or recently deposited from suspension.
- Flocculation – The process by which suspended colloidal or very fine particles combine into larger masses.
- Turbidity – The degree to which light is scattered or absorbed by a fluid. Turbidity is usually associated with suspended sediment.

*Turbidity is measured with an NTU meter (Nephelometric Turbidity Units)*



Stormwater is full of suspended clays and particulates that *remain in suspension* due to small size and negative surface charge repulsion.

(Think of them as bumper cars with a negative electrical charge.)

## Untreated Particle Settling Time

1.0 mm coarse sand	10 seconds
0.1 mm fine sand	125 seconds
.01 silt	108 minutes
.0001 colloids	755 days



Larger particles are mainly influenced by gravitational forces while suspended particles, in particular the clay sized particles, are subject to coagulation and flocculation.



# Stormwater Characteristics and Environmental Conditions Influencing Performance

## ■ Temperature :

Settling velocity decreases as temperature decreases. Water viscosity more than doubles as water temperatures drop from 80 degrees F to near freezing.

## ■ Particle Size Distribution :

Generally larger are more easily removed than smaller particles.

## ■ Charge :

Clay particles generally have negative surface charges.

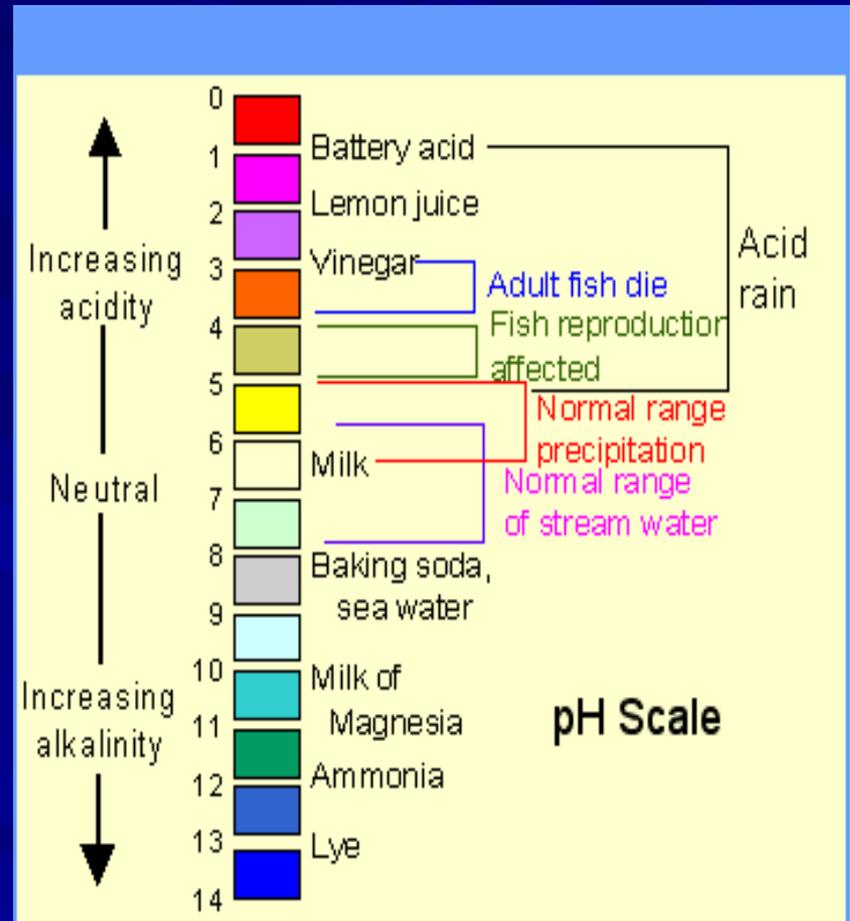
The negative charge and small mass cause the clay particles to repel each other in water and disperse, forming a colloid.

***Clay colloids must be destabilized by coagulation/flocculation before they can be easily removed via sedimentation or filtration.***



# pH

- Construction stormwater is usually very close to neutral.
- Construction stormwater that has come in contact with fresh concrete will typically have a high pH.
- Water with a high pH must be neutralized before it is treated.

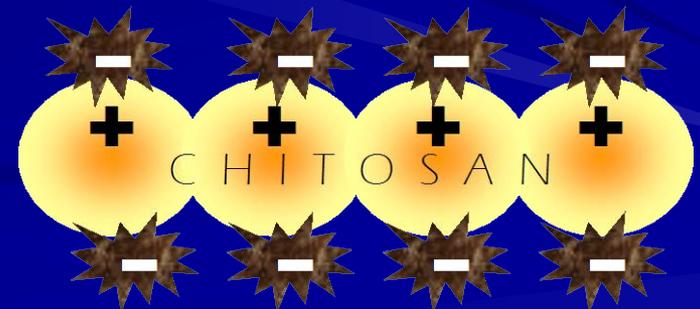




## Destabilizing Repulsion Between Particles

Flocculation is used to describe the action of polymeric materials which form bridges between individual particles.

Flocculants absorb on particles and cause destabilization either by bridging or charge neutralization.



## Counterbalance the Charge

- An anionic flocculant will usually react against a positively charged suspension (positive zeta potential)
- A cationic flocculant will usually react against a negatively charged suspension (negative zeta potential)

***However, the rule is not general. For example, anionic flocculants agglomerate clays which are electronegative.***

In this case, the destabilization mechanism is due to bridging.

## Biostar Chitosan

- Chitosan (poly-D-glucosamine)
- Natural sediment flocculant.
- Second most common polymer in nature.
- Structurally related to cellulose.
- Found in the shells of crustaceans and certain other organisms such as fungi, algae, and yeast.

## Biostar Chitosan

- Non-toxic, non-hazardous, commonly used by commercial aquariums to clean water.
- Binds sediment particles within 30 seconds by reducing the zeta potential (electrical charge resistance).
- Creates larger flocs enabling filtration or gravity settling to occur.
- Breaks down to carbon dioxide and water within approximately 19 days.
- No bio-accumulation concerns.

## Floc 500 Treatment Bag

- Treatment Capacity: 300 gpm maximum flow rate.

500,000 gallons @ .05 ppm (mg/l) dose rate

250,000                    1.0

125,000                    2.0

63,000                     4.0





PRIVATE  
SIGN  
Do Not  
READ

# Passive Application



# Housing Unit



## Floc Bag Housing Unit

- Pump through mixing system.
- Allow 40-50 feet of mixing time prior to discharge.
- Y feature allows for easy bag replacement.











YOU'LL NEVER  
GET TO WORK  
ON TIME  
HAHA!!



# Trash Pump



# Liquid Injection

- Metering pump for precise dosing based on flow rate and ppm required.
- Housing unit adaptable to liquid injection or Floc 500.





**KEEP**



**RIGHT**





# BIOSTAR™ CH

## Natural Sediment Flocculant

Non-Toxic / Non-Hazardous  
For Industrial Use Only Class 55 Water Clarifier

KEEP FROM FREEZING  
SEE INSTRUCTIONS FOR USE AND APPLICATIONS

# Liquid Injection Port



### 2% Biostar Injection Rate

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Flow Rate (gpm)	200 – 400 NTU 1 mg/L (1.0 ppm)	400 – 600 NTU 2 mg/L (2.0 ppm)	600 – 800 NTU 3 mg/L (3.0 ppm)	800 + NTU 4 mg/L (4.0 ppm)
100	19 mL/min .30 gph	38 mL/min .60 gph	57 mL/min .90 gph	76 mL/min 1.2 gph
200	37 mL/min .60 gph	75 mL/min 1.2 gph	112 mL/min 1.8 gph	150 mL/min 2.4 gph
300	55 mL/min .90 gph	110 mL/min 1.8 gph	165 mL/min 2.7 gph	220 mL/min 3.6 gph
400	75 mL/min 1.2 gph	150 mL/min 2.4 gph	225 mL/min 3.6 gph	300 mL/min 4.8 gph
500	95 mL/min 1.5 gph	190 mL/min 3.0 gph	285 mL/min 4.5 gph	380 mL/min 6.0 gph
600	115 mL/min 1.8 gph	230 mL/min 3.6 gph	345 mL/min 5.4 gph	460 mL/min 7.2 gph
700	130 mL/min 2.1 gph	260 mL/min 4.2 gph	390 mL/min 6.3 gph	520 mL/min 8.4 gph
800	150 mL/min 2.4 gph	300 mL/min 4.8 gph	450 mL/min 7.2 gph	600 mL/min 9.6 gph
900	170 mL/min 2.7 gph	340 mL/min 5.4 gph	510 mL/min 8.1 gph	680 mL/min 10.8 gph
1000	190 mL/min 3.0 gph	380 mL/min 6.0 gph	570 mL/min 9.0 gph	760 mL/min 12.0 gph

# Liquid Injection Port



# Liquid Injection Port









BargeCofferDewateringTubes.Ink

04.25.2013

# Mechanical Mixing

- Mixing essential for particle contact and floc formation.







## Biofiltration Discharge

Stormwater treated with Biostar, which cannot be treated with any methods due to insufficient capacity or for any other reason, can be discharged to the ground (overland flow) at a location which is at least 300 feet from the nearest surface water, in an area which is fully vegetated at the disposal location and over the entire pathway to a surface water.

- Allows for collection and bio-filtration of sediment flocs.
- Equipment: pump (2, 3, or 4")
  - suction hose (floating or skimmer)
  - Biostar floc 500's
  - 50' discharge hose
  - perforated dispersal pipe (1' of pipe for each gpm of output)

Note: Connect the treatment assembly to the pressurized side of the pump (limit treatment flow rate to less than 300 gpm for best results)

A photograph of a green rectangular sign with white text. The sign is placed on a dirt path. The text on the sign reads "PLEASE DO NOT WALK ON GRASS". The background shows a dirt path with some sparse grass and a concrete curb in the distance.

**PLEASE  
DO NOT  
WALK ON  
GRASS**

Thank You!

Hild & Associates, Inc.  
George Hild

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