

# Advanced Treatment Equipment

Michael R. Chase, CPESC



# Colloids

- Sub-micron particles that remain suspended in water for long periods of time due to a process known as Zeta Potential
- Create turbidity in water
- Problems to receiving water include
  - Increased temperature
  - Decreased visibility

# Zeta Potential

- The potential for particles to remain in suspension due to the relative size of the particle compared to the charge associated with the particle
- Particles with like charges repel each other
- The colloidal particles in storm water have a negative charge

# Detention Basin



# Batch Treatment

- Basin alone will not remove colloidal particles without flocculation
- Basin or tank required for treatment containment
- Requires liner to keep flocculent from reacting with sediment from basin walls and floor
- Requires circulation for mixing, usually centrifugal pumps, which could cause shearing, requiring additional flocculent
- Requires time for coagulated particles to settle
- Requires filtration after treatment

# Chitosan Enhanced Sand Filtration



# Chitosan Enhanced Sand Filtration





# Chitosan Enhanced Sand Filtration

- System Requirements
  - Pumps to move the water through the treatment process
  - Hoses and Piping to contain the water through the process and to aid in reaction time
  - Tanks either weir or tube settlers to reduce turbidity if levels exceed 800 Nephelometric Turbidity Units (NTU)
  - Injection pump to deliver chitosan at proper dosage
  - Sand media filters to capture coagulated particles

# Pumps



# Pumps

- Centrifugal
- Normally electric or diesel
- Self Priming
- Needs to meet system requirements for flow rate and pressure
- Run dry capability a plus
- Auto start/shut down a plus

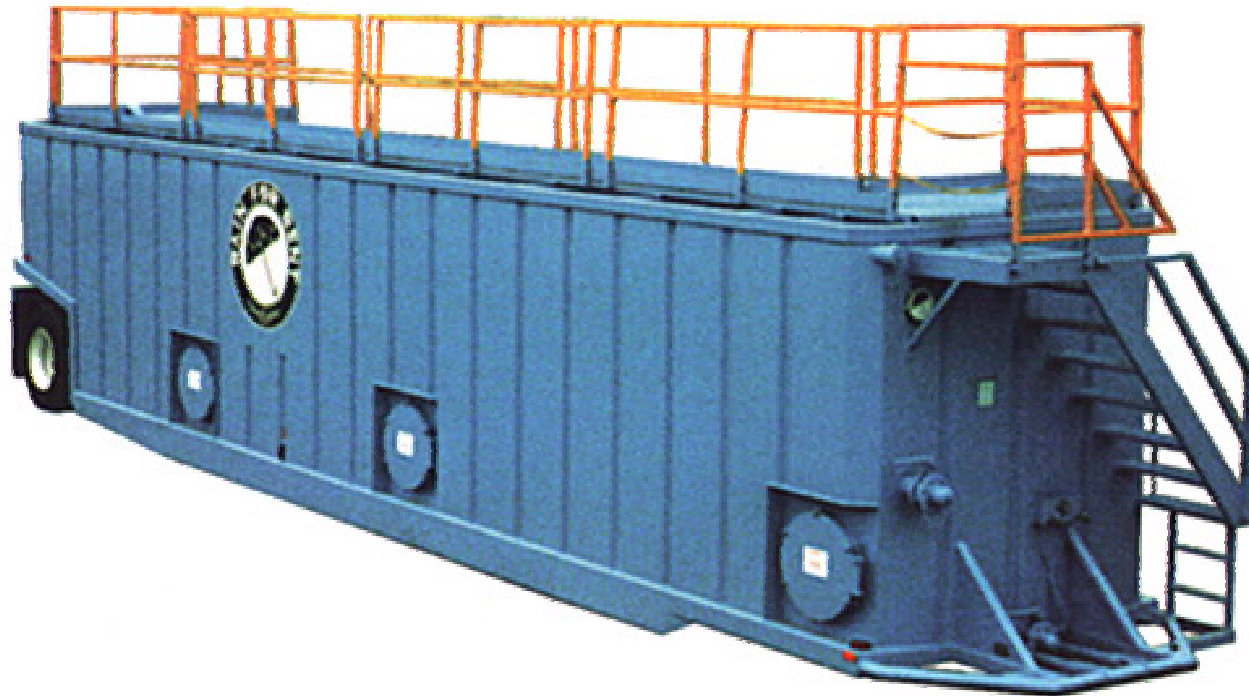
# Pipe and Hose



# Pipe and Hose

- Quick connect
- Non-leak
- Pressure rated
- Sized to reduce velocity after treatment injection
- Length of 80 to 100 feet between mixing point or injection point to sand media filter

# Weir Tank



# Weir Tank

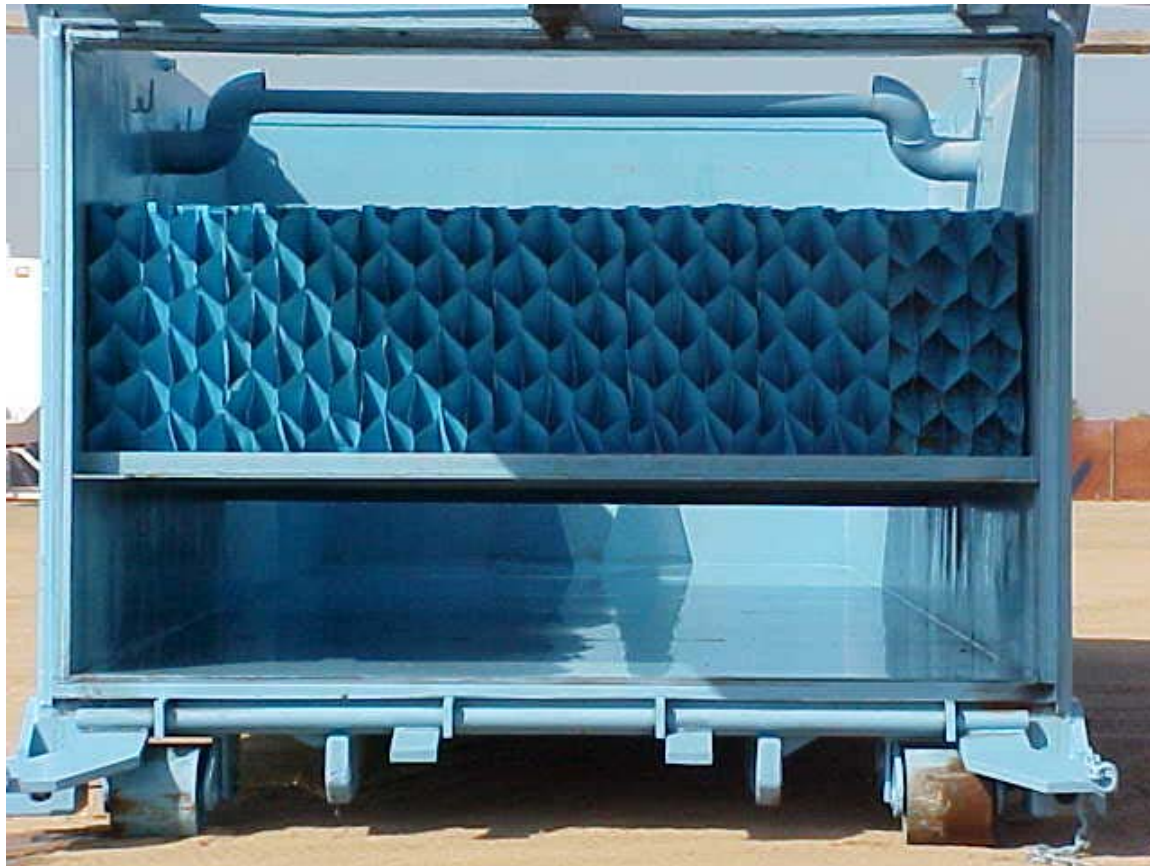
- Two weir over/under configuration best for treatment application
- Removal of large particles or pre-treatment reaction chamber using chitosan to reduce NTU levels
- 18,000 gallon capacity
- Flow rates up to 250 gpm
- Continuous flow

# Weir Tank





# Tube Settler Technology



# Tube Settler Technology

- Similar to slant plate clarifier
- 60° incline to aid in reducing the flow energy allowing sediment to drop out of suspension
- Flow rates up to 2.5 gpm per square foot of surface area
- Effective for NTU reduction with or without polymer treatment

# Tube Settler Technology



# Injection Pump



# Injection Pump

- Various models available
- Unit requires a high viscosity head
- Should be variable speed to adjust for dosage rates
- Positive displacement to insure accurate dosage
- High pressure to pump against line pressure
- Weather resistant
- Typical flow rate 0-10 gph

# Sand Media Filtration



# Sand Media Filtration

- Requires at least 3 vessels per unit to provide adequate backwash
- Flow rate at or below 15 gpm per square foot of surface area
- Requires #30 crushed silica for the media
  - Larger sand will allow migration of colloidal particles
- Automatic backwash capability for timed, or pressure differential backwash

# Sand Media Filter





# New Technology

- Injection Pump
  - Reads the charge associated with the water and adjusts the polymer dosage to match the charge
  - Prevents overdosing of polymer

# Injection Pump



# New Technology

- Monitoring system
  - Reads the NTU and pH
  - Determines if treated water meets discharge requirements
  - If not, unit re-circulates discharge in until it meets discharge requirements and then allows discharge to receiving water

# NTU and pH Probes



# NTU and pH Meters



# Discharge and Re-circulation Valves



# Results



# Results

