

## Corrugator Comparison

### Typical Corrugator Wastewater Treatment System:

- Equalization tank – used for flow and solids equalization
- Reaction tank – mixing and addition of chemicals to clarify the wastewater
- Dewatering Press – usually a plate and frame acts as a filter and captured the solids making a sludge cake. The drier, the less cost to haul off.



### Traditional Chemicals:

- Acid – sulfuric or hydrochloric – used to decrease the pH
- Coagulant – aluminum or ferric based – used to create a 'pin floc', drops the pH when added.
- Polymer – flocculant, usually anionic made by adding water and premixing prior to addition. Flocculant agglomerates the pin floc and increases the settling rate and shear strength of the solids.
- Lime or caustic – used to raise the pH after coagulation back to 8.5 +/- for copper insolubility and removal in the sludge
- Diatomaceous Earth – used as a dewatering press precoat so the sludge does not stick to the plates of the press

<b>Traditional Treatment Cycle:</b>	<b>Floccin Products Treatment Cycle:</b>
<ul style="list-style-type: none"> <li>• Fill the Reaction Tank</li> <li>• Turn the Mixer On</li> <li>• Add acid to a pH set point or coagulant to obtain a pin floc.</li> <li>• Add Flocculant</li> <li>• Add lime or caustic to raise the pH</li> <li>• Turn the Mixer Off and let settle</li> <li>• Wait several hours and decant clear water</li> <li>• Turn On the Sludge Pump and dewater sludge with Press</li> <li>• Open press and remove sludge and clean wet sludge from plates</li> </ul>	<ul style="list-style-type: none"> <li>• Fill the Reaction Tank</li> <li>• Turn the Mixer On</li> <li>• Add the Floccin product</li> <li>• Turn the Mixer Off and let settle</li> <li>• Wait 30 minutes and decant clear water</li> <li>• Turn On the Sludge Pump and dewater sludge with Press</li> <li>• Open press and remove sludge</li> </ul>

## **Benefits of the Floccin Products versus Traditional Treatment**

- 1 product versus 3-4 products
- Changes in solids or pH requires changes in dosages of the coagulant/acid/caustic, requires extensive operator experience and/or chemistry knowledge. Some facilities often have to 're-treat' the wastewater, doubling the cost. Floccin products treat each time and require no re-treating.
- Coagulant works in a narrow pH range. The Floccin products are capable of working over a wider pH range.
- Chemical cost is reduced by an average of 40% with the Floccin products
- Flock is shear sensitive and breaks down in the press resulting in solids 'carry through'. The Floccin products make a strong high shear sludge that does not break down in the press.
- Settling requires up to 6 hours prior to the decant step, Floccin solids settle in 30 minutes or less thereby decreasing system cycle time.
- Sludge cake is inconsistent (wet once, dry the next, then wet again). Floccin sludge is consistently dry.
- To make drier sludge from the traditional chemistry, the press is blown down with plant compressed air (often for hours), increases treatment costs in compressed air consumption for the plant. Floccin sludge does not need the lengthy air blow-down.
- The Floccin products generate 30% less sludge decreasing haul off volume costs.
- Using the Floccin products, the press takes an average of 30 minutes to clean. Using traditional chemistry, the press requires an average 3-4 hours to clean and is often pressure washed 2 times/month requiring 6 hours per pressure wash.
- Cycle time per batch require ½ the time of traditional chemistry. Some clients can complete a cycle in 6 hours where previous traditional chemistry required 14 hours (usually overnight).
- Increased labor with traditional chemistry based on the following:
  - Operator time to make down polymer and DE precoat with water (1/2 hour/batch)
  - Chemical handling (handling bags of DE, acid, lime, caustic, etc.)
  - Press cleaning each load due to wet cake (3-4 hours/batch)
  - Pressure washing the press (6 hours/week)
- Floccin sludge passes the TCLP test for leachable metals, traditional treatment usually fails the TCLP. The passing of the TCLP is important for long term environmental liability as the client is assured by this EPA test protocol that the sludge hauled off and placed in a landfill will not be the source for heavy metals leaching out over time.
- Traditional chemicals are hazardous and require specialized training (OSHA and insurance carrier requirements). Floccin products are non-hazardous.
- Operator insurance is needed to be able to handle these hazardous chemicals. Eliminating these chemicals and switching to the Floccin

products can qualify for a reduction in insurance premiums for operators assigned to this plant process.

- Operators can be assigned other duties as the labor requirement per batch is decreased. Clients that are using the Floccin products often operate the wastewater system, the baler, the boiler, the starch room, load/unload trucks or are assigned other duties.
- Zero discharge is easily achieved with the Floccin products as the treated water has a lower TDS/EC making a more stable starch with lower gel temperature.

\* Comparison data from many Corrugating Corporations that have switched to the Floccin products.