Successful clarification and wastewater treatment very frequently is dependent upon proper feed points and makedown procedures of polymeric coagulants and flocculants. The most commonly misapplied products are flocculants.

**Organic Coagulant Feed**

Polymeric coagulants are relatively low molecular weight materials. They are generally readily soluble in water at any concentration. They can be fed neat, directly into the point of application or diluted first with water. Some are more viscous than others, so high viscosity feed pumps may be needed if they are not first diluted in a mix tank with water. Coagulants perform by a process of charge neutralization, so good mixing with the water being treated and for an adequate length of time is required for effective coagulation.

**Flocculant Makedown and Feed**

Flocculants are high molecular weight chemicals and they generally should not be fed neat. Effectiveness and efficiency of flocculants depends upon the makedown equipment, carrier water, mixing, and point of application. The main forms of flocculants used in industry are dry products and emulsions:

- **Dry Flocculants:** The solution concentration that can be made with a dry polymer depends upon its charge, its charge density, and its molecular weight. You can be safe with most if the solution is made at < 0.25% by weight. Some can go as high as 1.0%. I usually target 0.1% when I can. If you make the solution at more than the allowable percent, you end up with a slimy, unpumpable mess.

  For best results, the dry polymer should be wetted as it is poured into the mix tank. This can be accomplished with a polymer eductor such as a Hootonanny. It should be directed into the vortex of a low speed mixer running at 350 rpm. (High-speed mixers should not be used since they will shear the polymer). Mixing should continue for 60 – 90 minutes, then the mixer should be turned off. (A 90-minute shut
The resulting solution should be clear, viscous, and without any “fisheyes.”

The solution will now be of high viscosity of perhaps 2000 cps and should be fed with a high viscosity diaphragm pump, gear pump, or progressive cavity pump. It can be fed into the point of slow mixing directly, or for higher efficiency it can be pumped into carrier water to further uncoil the polymer before it enters the slow mix zone or point of application.

**Emulsion Flocculants:** Emulsion polymers are liquid products that are approximately 65% polymer, 30% oil, and 5% surfactant. The oil allows a high concentration to be provided in a liquid form for the convenience of liquid feed, but must be inverted from the oil phase into the water phase. To accomplish the inversion it is essential that the product be fed into a high shear condition of mixing at a 0.2 – 1% concentration. If the concentration is too low or too high, the surfactant will not effectively invert the polymer into the water phase and the flocculant will not be effectively activated. With proper inversion the solution will be an opaque white and without polymer strings.

There are many emulsion polymer makedown systems on the market where the emulsion polymer is pumped into a high shear mix zone. The resultant solution can then go directly to application, or for greater efficiency, it can first go to a retention tank to allow more time for the polymer to uncoil. It is then pumped directly to the application point or into carrier water.

Emulsion polymers can also be made down into a mix tank by pouring or pumping it into a tank with a low speed mixer at the 0.2 – 1% depending upon the molecular weight, charge, and charge density and allowing 60 – 90 minute mixing time.