

How are dry flocculants manufactured, and their mixing implications

Water soluble polymers called flocculants, and their chemistry makeup have been the topic of discussion the last few weeks. In this blog, we will shift our focus and discuss the two main flocculant forms. Understanding the manufacturing process for these products and describing their form will set the basis for future discussions related to proper mix and feed system design.

As previously explained, flocculants are long chain polymers that aggregate particles together which as an aggregate either settle faster or allow improved water/solution drainage depending on the solids/liquid (S/L) separation process used. Water soluble polymer building blocks called monomers are reacted together basically end to end to make the chained polymer. There are three basic flocculant forms produced and sold:

- > Dry powder (crushed and bead forms)
- > Emulsion liquid
- > Solution liquid

Dry flocculant and primarily crushed product will be topic of discussion this week. Essentially, and admittedly simplistically, the process for producing dry flocculants involves the following steps:

- Blend the different monomers with the chemistry type and charge level desired.
- In a reactor controlling temperature and pressure along addition of reaction initiation and termination chemicals, the monomers are polymerized into long chains to the chain length targeted including degree of branching. What is produced is a flocculant gel that is, for rough perspective, on the order of 20% poly-

- mer solids with the balance essentially water.
- The gel is extruded into strands, much the same as a hamburger grinder.
- The extruded flocculant is dried to moistures $\leq 5\%$ water. Different manufactures use different proprietary drying processes since this is a key step.
 - Dried flocculants are subjected to size reduction in closed circuit with a screening classification step to size the flocculant particles into a specific size range typically -10 mesh (2000 μ , microns) to + 100 mesh (149 μ).
 - After sizing the products are bagged and are ready to be shipped.

Some relevant points related to how the process impacts final product selection and use include:

- Since dry flocculant particles dissolve slowly from the particle surfaces, dissolution time and rate is directly related to the amount of particle surface area. Particles sized below - 10 mesh will dissolve faster than larger particles.
- Slipping on dissolved flocculant on floors and platforms is a significant safety hazard and to prevent dust drift in handling and feeding. The best control is to minimize very fine particles from dusting out of the system. The primary control measure is to remove the very fine particles in manufacturing which is the reason the - 100 mesh flocculant fines are removed.
- The drying step can break the polymer chains, reducing their length which reduces their ability to aggregate particles. But this is controllable by the manufacturers; however, typically the highest molecular weight flocculants are obtained with emulsion polymers that are manufactured without a drying step.



Next week will discuss the proper methods for mixing and feeding dry flocculants.