

Ecotoxicity of Cationic Polymers

Polymers come in three different categories which are based upon their electrical charge. These three are:

Anionic – negatively charged polymer flocculants

Cationic – positively charged polymer flocculants

Non-ionic – Has neither a positive or negative charge associated with the polymer.

Since the ground, soil, clay, silt, sediment, colloids, water and associated biologicals are in a normally negative charged state you generally need to use Cationic polymers to effectively clarify the water or flocculate the particles.

Polymers are used to clarify drinking water and many other waste water scenarios and are considered harmless to humans and mammals. This includes using low doses of cationic polymer solution to clarify fish ponds.

There are little to NO adverse ecotoxicity effects when using the Anionic or Non-ionic polymers to fish or aquatic life. Cationic polymers are recognized to be potentially hazardous to aquatic life, particularly fish when laboratory tested in pure water. It is likely that sublethal effects and mortality of fish is the result of mechanical suffocation, reduction in oxygen transfer and mucous production on gill surfaces.¹ When running lab tests with pure water an excess of Cationic polymers has shown a 50% lethal effect on fish with excess cationic concentrations of .04 to 4,000 mg/l.

However, the reality of any residual Cationic polymer discharge is highly unlikely, to be highly infrequent, and of a very small volume relative to the dilution potential of the receiving water. The dosing volume of Cationic polymers is closely monitored to make sure there is no over or under dosing. Polymers are expensive; there is a strong economic incentive to ONLY use the minimum amount of Cationic polymer to accomplish the job.

The conclusion of the report, *Overview of the Effects of Residual Flocculants on Aquatic Receiving Environments* states, “The potential toxicity of cationic polymers is well recognized but is seldom realized in the field. There is a large body of evidence indicating that these polymers are inactivated by sorption to naturally occurring dissolved and suspended organic matter and clays and their potential toxicity thereby greatly diminished, effectively to non-significant levels.”²

IF there is any excess cationic polymer released it will quickly be attracted to the turbidity of the water, suspended clay colloids, surrounding silt and soil and be quickly settled out onto the lake bottom where it is considered captured and innocuous.

If there still is a concern, minnows can be placed in the returning water to monitor the waters effect on them. Smaller zooplankton, immature fish fry and minnows are more susceptible since their gills are smaller in size and a small amount of excess Cationic polymer could coat too much of their gill surfaces and create fish mortality.

¹ Overview of the Effects of Residual Flocculants on Aquatic Receiving Environments - p.6

² Overview of the Effects of Residual Flocculants on Aquatic Receiving Environments - Executive Summary
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