

**PARTICULATE AND DISSOLVED PHOSPHORUS CHEMICAL SEPARATION AND
PHOSPHORUS RELEASE FROM DAIRY WASTEWATER.**

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Phosphorus is most often the element limiting eutrophication or algal blooms in surface water bodies and estuaries. There is increasing interest on post-excretion treatments to chemically bind or remove soluble phosphorus and retain nitrogen in manure before it is applied to fields as many soils in the United States contain excessive levels of nutrients due to repeated heavy applications of animal manure. A promising technology to sequester manure phosphorus and other organic nutrients is the separation of liquid manure into particulate and liquid fractions to correct the inefficiency of mechanical liquid-solid separators used in dairy or swine production. The low separation efficiency has led to the costly loss of capacity in waste storage facilities. Particulates fill up retention ponds or lagoons rapidly, requiring frequent maintenance and cleaning.

Improving the solid-liquid phase separation process by chemical coagulants used in the drinking water treatment industry helps the removal of organic and mineral matter and nutrients from the suspension and disposal of a relatively small volume of solids. As chemical amendments and methods of applications largely depend upon manure characteristics such as particle size, total suspended solid (TSS) content, or pH, concentrations of polymers or mineral amendments must be optimized to benefit from synergistic action that may exist in their individual modes of action. Suspension TSS had a clear effect on aggregation and rates of polymer and amendment. Organic polymers and aluminum and iron metal salts individually increased the aggregation of particulates in high-solid dairy manure suspensions. A synergistic aggregating reaction occurred at low concentrations of aluminum sulfate and iron chloride with cationic polyacrylamide and polyamine polymers. Co-applications of polymers and mineral amendments also reduced excessive amounts of soluble phosphorus in manure-amended soils to reduce offsite transport risks. Reductions in soluble phosphorus were achieved consistently with fly ash and Al and Fe salts in the 68 lb/1000 gal of suspension in the presence of organic water treatment polymers. The polymer-amendment treated particulates maintained their stability in soil. Release of soluble phosphorus from soil amended with treated manure was reduced. Therefore, the synergism that exists between coagulant types can be optimized to reduce chemical use and maximize manure solids and phosphorus removal from liquid manure suspensions containing high TSS between 3 and 10%.