

Liquid Sodium Aluminate Replaces Alum in Phosphorus Removal Application and Solves Long Term Problem at Ohio Wastewater Plant

The Challenge

The Lakewood Ohio Wastewater Treatment Plant for many years experienced phosphorus compliance issues and increased chemical costs during the dry summer months. Aluminum Sulfate was effective 9 to 10 months of the year, however performance diminished drastically and dosages increased when plant influent flow dropped and caused corresponding changes in water quality. Theories were examined to determine why the facility struggled with meeting its 1.0 mg/l permit limit under these conditions. The only course of action was to continually increase alum dosage to which the phosphorus concentrations became unresponsive. The plant's alum supplier confirmed that the chemical can be subject to limited performance outside of a certain pH range, but provided no solution to remedy the problem. Facility personnel were frustrated and concerned about the impact of phosphorous violations and chemical cost.

The Solution

USALCO worked with plant personnel to analyze data taken over a three year period from 2005 to 2007, specifically examining phosphorus removal efficacy, alum administration, flow, and concentrations of various wastewater constituents. During the majority of each year the average aluminum to phosphorus (Al: P) ratio was calculated at 0.7 to 1.0, which demonstrated very efficient phosphorus removal with alum. The data showed that during the troublesome months the Al to P ratio dramatically increased to levels over 2 to 1, with a significant increase in alum consumption as facility personnel struggled to control effluent phosphorus. Of particular note, a trend was identified where diminished

performance was usually seen when average influent wastewater alkalinity exceeded 190 mg/l. USALCO recommended investigating sodium aluminate as a solution because its range of effectiveness had no defined limitations like alum. Additionally, sodium aluminate has greater aluminum content when compared to alum. Lakewood WWTP personnel agreed to allow USALCO to conduct bench testing, where sodium aluminate was subsequently demonstrated to effectively remove phosphorus in their wastewater.

The Results

A three week plant trial was commenced in August 2008 under ideal conditions (low flow, higher alkalinity) that truly tested the capabilities of sodium aluminate. The trial results showed consistent phosphorus removal below 1.0 mg/l (with no violations) at a dosage 58% less than alum. Lakewood WWTP converted to sodium aluminate in April of 2009. After a full year of utilization the following results and benefits were confirmed:

- Consistent phosphorus removal which averaged below 0.7 mg/l independent of influent conditions. Greater flexibility in phosphorus control and immediate response to any influent P change.
- Improved water quality - less algae growth and perceived improvement in UV operation.
- Sodium aluminate consumption is 67% less than alum on a gallon per day basis.