

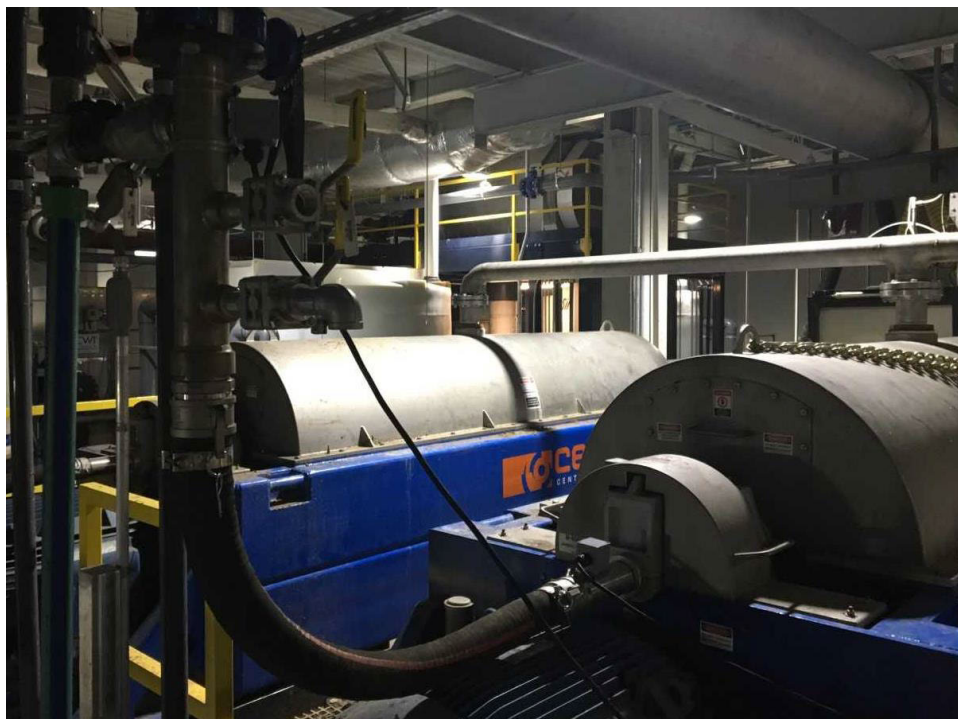
Struvite Scale Control in Anaerobic Digestion

Flow-Tech eliminates the build-up of struvite scale within the wetted surfaces of wastewater lines transporting anaerobically digested sludge through a centrifuge dewatering process.

Background

Flow-Tech was installed at a location in the Midwest that converts meat packing waste and wastewater into natural gas as a renewable source of energy. In addition to methane production, the digestion process also converts organic nitrogen to ammonia (NH_3), and organic phosphorus to soluble orthophosphate (PO_4^{3-}).

The anaerobic sludge dewatering process utilizes two centrifuges in parallel. Due to the naturally high levels of hardness ions (Ca^{2+} and Mg^{2+}) and alkalinity in the influent digested sludge, the conditions were optimal for rapid growth of struvite (Magnesium Ammonium Phosphate, $\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$) mineral scale. Struvite is well known to form a tenacious scale on anaerobic dewatering equipment and transport lines, and the scale is very resistant to standard chemical cleaning products—resulting in exorbitant costs of operation.



Due to rapid struvite scale formation, the centrifuges needed to be taken out-of-service numerous times each week to remove crystalline struvite deposits that were causing increased resistance to the high-speed rotation of the centrifuge. Deposit removal typically involved mechanical scraping and use of a high-pressure hose. In some instances, a proprietary chemical cleaning product was used. The constant need to remove struvite scale was time-consuming and expensive.

Solution

Flow-Tech's chemical-free water treatment system was installed on the two-inch influent pipe that delivers anaerobically digested sludge to centrifuge #2. This way, the struvite scale control performance could be directly compared to that of untreated centrifuge #1. The goal was to determine if the Flow-Tech signal could provide scale removal and scale inhibition benefits for anaerobic digestion systems suffering from the growth of struvite scale.



After Flow-Tech was installed, the side-by-side centrifuges were fed an identical sludge for 90 days and evaluated for performance. As expected, the rate of scale formation in centrifuge #1 was unchanged—requiring multiple cleanings each week. ***Centrifuge #2, treated with Flow-Tech, no longer required any downtime due to increased rotational resistance. Centrifuge #2 was examined at least once each week and found to contain a small, soft gelatinous paste that was easy to rinse away. During the entire 90-day evaluation, there was no formation of the tenacious crystalline scale that is commonly associated with struvite.***

The customer purchased the unit for centrifuge #2, along with additional Flow-Tech units for centrifuge #1 and the two centrate pumps associated with each centrifuge. At the time of this writing, these Flow-Tech units have been operating for approximately one year with no development of struvite crystal formation in neither the centrifuges nor centrate pumps.