IOWA FERTILIZER COMPANY

WEVER

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COMPANY PROFILE
Iowa Fertilizer Company (IFCo) is a nitrogen fertilizer manufacturing facility that produces anhydrous ammonia, urea (liquid and granulated), urea ammonium nitrate (UAN), and diesel exhaust fluid (DEF). It is the first greenfield nitrogen fertilizer facility built in the United States in more than 30 years. Located in Wever, Iowa, and producing two million metric tons of nitrogen fertilizer annually, Iowa Fertilizer Company produces domestic fertilizer for the highest corn-producing region in the country. More than 230 people are employed full-time at the Wever plant.

PROJECT BACKGROUND

Iowa Fertilizer Company treats approximately 2,000 gallons of sanitary waste per day. A permitted on-site sanitary wastewater treatment plant (WWTP) provides Iowa Fertilizer Company with the ability to treat and discharge its own sanitary waste. The sanitary WWTP uses bacterial nitrification, the conversion of ammonia into nitrate by bacteria, for efficient treatment. Before the sanitary WWTP can discharge treated effluent, proper nitrification must occur. Adam Weis, who served as an intern throughout the summer of 2018, was tasked with optimizing and automating chemical treatment of the current system to ensure sufficient ammonia removal from the sanitary waste stream.

INCENTIVES TO CHANGE

Alkaline chemicals are dosed to the sanitary WWTP to help control pH for proper nitrification. Determining the proper type and amount of alkaline chemical to dose and automating this process would ensure sufficient nitrification occurs. This automation would also improve chemical treatment consistency and reduce the manual labor required by operators to physically add the chemical to the system.

RESULTS

Improved Sanitary Wastewater Treatment: The nitrification process that takes place at the sanitary WWTP produces acidity as a byproduct. These acidic conditions affect the ability of bacteria to continue removing ammonia. The addition of alkaline chemicals is used to counteract the acidity and stabilize pH, ensuring ideal conditions for the bacteria. Iowa Fertilizer Company had been using a combination of sodium bicarbonate and sodium hydroxide to add alkalinity and adjust pH. Daily testing showed that additional dosing was needed and that the previous chemical combination may not be the optimum treatment.

Additional lab tests were subsequently conducted to investigate which chemical best treats the system, and how much should be dosed. Based on the testing, it was concluded that a different alkaline chemical, sodium carbonate, should be used and the quantity should be increased. After implementing these changes, the system saw almost an immediate improvement. Ammonia levels in the sanitary WWTP were reduced. Additionally, sodium carbonate is a considerably safer chemical to use in place of sodium hydroxide, which is a strong base.

Additional monitoring of the sanitary WWTP revealed how Iowa Fertilizer Company can observe the early signs of an increase in ammonia levels or fluctuations in pH and use these observations to make the necessary chemical treatment changes for optimization. These chemical and dosing changes improved the performance of the sanitary WWTP and could save Iowa Fertilizer Company $286,500 per year in supplemental sanitary waste removal costs, along with eliminating the use of 1.2 tons of sodium hydroxide and more than 2,000 gallons of diesel fuel.

Creating a More Efficient Chemical Treatment Process: The next phase of the project consisted of designing an automated chemical injection system to pump sodium carbonate solution into the sanitary WWTP. Currently, operators manually prepare and dose the chemical treatment, which requires extra labor and delivers the chemical in two large doses per day. An automated system helps reduce operator labor and improve dosing consistency. The intern worked with engineering, operations, and other personnel to design an automatic chemical injection system and identify which components to obtain from vendors. The final design includes a mixed tank to prepare the sodium carbonate solution and a pump and piping system to inject sodium carbonate into the sanitary WWTP. This would allow a slow, continuous dose to the system and would deliver the sodium carbonate more consistently, while further reducing potential chemical exposure for the operators.

Additionally, pH sensors will be installed both near the point of injection and towards the end of the sanitary WWTP process. Monitoring the pH towards the end of the system provides a checkpoint for Iowa Fertilizer Company to ensure the sanitary WWTP is working properly, while the sensors near the injection point would be used to automate the pump speed based on the pH of the system. This efficient process provides a more reliable and hands-free method of controlling alkalinity dosing.

While the primary cost savings from the automation project come from reduced operator labor, it would also provide increased reliability for the system and eliminate the need for employees to constantly oversee its operation. The next step for Iowa Fertilizer Company is approval of the automated chemical treatment design and budget proposal, and then funding can be secured for procurement and installation.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
IMPROVED SANITARY WASTEWATER TREATMENT	$286,500	0.09 tons NH_3 2,044 gallons diesel 1.2 tons NaOH	IMPLEMENTED
CREATING A MORE EFFICIENT CHEMICAL TREATMENT PROCESS	$22,000	–	RECOMMENDED