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
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 considerably safer chemical to use in place of sodium hydroxide.

PROJECT OUTCOMES
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.

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>ANNUAL COST SAVINGS</th>
<th>ENVIRONMENTAL RESULTS</th>
<th>STATUS</th>
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</thead>
<tbody>
<tr>
<td>Improved Sanitary Wastewater Treatment</td>
<td>$286,500</td>
<td>0.09 tons NH, 2,044 gallons diesel, 1.2 tons NaOH</td>
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<td>Creating a More Efficient Chemical Treatment Process</td>
<td>$22,000</td>
<td>–</td>
<td>RECOMMENDED</td>
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