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KEMIN INDUSTRIES

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 DES MOINES

COMPANY PROFILE:

Kemin Industries is a global ingredient manufacturer headquartered in Des Moines, Iowa, serving the human and animal nutrition, food technologies, crop technologies, and textile industries. Founded in 1961, the company has grown into a bioscience powerhouse with more than 15 manufacturing facilities and a presence in more than 90 countries. Kemin produces more than 500 specialty ingredients and impacts an estimated four billion people daily. Known for its scientific innovation and commitment to sustainability, Kemin is investing heavily in research and environmental initiatives, with a goal to sustainably improve the quality of life for 80 percent of the world's population by 2042.

PROJECT BACKGROUND

Kemin's Des Moines campus, specifically Building #3, was the focus of this internship due to its high-water consumption and wastewater generation. The project aimed to identify opportunities for reducing water use, improving wastewater treatment efficiency, and repurposing water streams. Primary systems studied included the Clean-In-Place (CIP) system used in Slendesta production, the reverse osmosis water purification system, and the wastewater stream generated during Lutein and Zeaxanthin extraction. The intern was responsible for mapping utility baselines, identifying inefficiencies, conducting cost and environmental impact analyses, and developing recommendations that aligned with Kemin's operational and sustainability goals.

INCENTIVES TO CHANGE

Kemin's primary incentives for environmental improvement

stem from both internal and external drivers. Internally, the company has pledged to reach net-zero greenhouse gas emissions by 2050. Operational inefficiencies, particularly in water use and off-site wastewater treatment, presented opportunities for cost savings and sustainability alignment. Externally, regulatory compliance and evolving customer expectations around environmental responsibility are compelling action. Rising utility costs, transportation-related emissions, and increased scrutiny from clients in the nutrition and health industries made this project a high priority. These factors combined to support investment in practical and scalable pollution prevention strategies across Building #3.

RESULTS

Clean-In-Place (CIP) Optimization

The first recommendation focuses on optimizing the CIP system used to clean equipment in the production of Slendesta. This automated system runs multi-step sequences—



including rinses, caustic and acid washes, and sanitizing stages—to ensure proper sanitation between production batches. Each sequence contains 40 to 70 steps and uses large volumes of city water, especially during rinse stages. Because the system was recently installed and initially programmed under tight time constraints, it is likely the needed duration and flow rate of many steps was overestimated.

To reduce water usage, each step was documented then particular steps were identified that could be shortened or modified. For example, in one of the sequences, unnecessary flow was occurring during drain steps. Fixing this error saved 240 gallons per cleaning cycle. Since Slendesta is produced multiple times per week, this single correction yields an annual water savings of approximately 28,800 gallons. Because the changes required no capital investment, Kemin immediately benefitted from not purchasing the excess water. Additional rinse time reductions are under evaluation using a simple operator log which tracks whether each modified sequence passes post-cleaning swab tests. This low-cost, iterative approach allows the CIP system to maintain cleaning effectiveness while reducing water usage over time.

Treating Wastewater with a Dissolved Air Flotation (DAF) System

The second recommendation is the installation of a DAF system to treat wastewater from Lutein (Lu) and Zeaxanthin (Ze) production on-site. Currently, all wastewater from these processes is adjusted for temperature and pH, then hauled off-site to the Des Moines Wastewater Reclamation Authority (DMWRA) for treatment. This method costs Kemin a considerable amount of money, considering treatment fees, fuel costs, and monthly service charges. A DAF system would allow Kemin to process this wastewater on-site by removing suspended solids and plant pigments that prevent the water from being discharged to the sanitary sewer. DAF systems use coagulation, flocculation, and air bubbles to float contaminants to the surface for removal as sludge. The clarified water can then be safely discharged to a sanitary drain.

This solution is well suited to the Lu/Ze wastewater, which contains organic residues and pigments from marigold



extracts. While Kemin previously used a Bubble Accelerated Flotation (BAF) system, it was decommissioned due to chemical-related maintenance issues. Today's DAF systems use more stable chemistries and improved automation, making them a more reliable option. Preliminary estimates suggest that the DAF system would reduce off-site treatment needs by 80 percent, and reduce the cost of annual treatment by nearly two-thirds. Accounting for electricity use and chemical costs, the system would still yield substantial annual savings. To reduce risk, Kemin plans to rent the unit for two months with a portion of the rental cost being applied toward purchase. The DAF system will still generate sludge requiring off-site treatment, but this volume is significantly smaller, enabling monthly rather than daily hauls. The result is a major reduction in transportation-related fuel consumption, carbon emissions, and disposal costs.

Together, these two recommendations provide a powerful combination of cost savings and environmental impact reduction. The CIP optimization is a no-cost solution that immediately reduces city water consumption, while the DAF system offers a long-term strategy to minimize wastewater treatment costs and emissions. Both projects directly support Kemin's environmental goals and long-term sustainability commitments.

ENVIRONMENTAL AND ECONOMIC SAVINGS TABLE

PROJECT	ANNUAL COST SAVINGS	ANNUAL ENVIRONMENTAL RESULTS	STATUS
CLEAN-IN-PLACE OPTIMIZATION	\$422	468,000 gallons	IN PROGRESS
TREATING WASTEWATER WITH A DISSOLVED AIR FLOTATION (DAF) SYSTEM	\$290,435	16,000 tons CO2	RECOMMENDED