MINNESOTA TECHNICAL ASSISTANCE PROGRAM

Case Study

UNIVERSITY OF MINNESOTA

Ver-tech Labs reduces phosphorus in wastewater discharge

By engaging employees and working with the City of Rockford, Ver-tech has implemented changes to reduce the amount of phosphorus and organic loading leaving the facility.

Ver-tech Labs in Rockford, Minnesota, manufactures a wide variety of heavy duty cleaners, degreasers, and brighteners for car and truck wash operations, restaurants, printing plants, and other businesses needing cleaning products. Additionally, Ver-tech provides custom and contract blending services to a wide variety of customers and packages both liquid and powder products in various container shapes and sizes.

Prior to the Project

In 2007, the City of Rockford asked Ver-tech to reduce phosphorus and biological oxygen demand (BOD) in the facility's wastewater discharge. This request was made based on the City's monitoring of Ver-tech's discharge, which indicated high phosphorus and BOD levels. Ver-tech investigated their processes and discovered three reasons for the loading issues: product formulation, rinse water, and the neutralization process.

Product Formulation

Until recently, most of the liquid and dry cleaning products that Ver-tech blended contained phosphorus, a nutrient that enhances algae growth in natural water systems. This accelerated algae growth results in rapid decomposition, using up oxygen in the water and increasing the potential to kill fish. As a result of the cleaning product formulation, the facility was discharging significant levels of phosphorus and wastewater with high BOD to the local treatment facility.

Rinse Water

After blending liquid products, Ver-tech used a hose to clean the mixing tanks to remove any residual cleaner. The residual cleaner and rinse water, containing high levels of phosphorus, were discharged as wastewater. This process wasted water and raw materials and increased the loading to the wastewater treatment facility.

On the dry formulation line, the company was experiencing caking problems with the mixers. The humidity in the mixing room caused the dry components to harden in the screw mixers and along the tank walls, making it impossible to remove the product from the mixing tank. The mixers needed to be completely cleaned to prevent cross-contamination of other products. To restart the mixing, Ver-tech used a hose to loosen the material and clean the tanks. The formulation and rinse water were then discharged as wastewater, thereby wasting valuable raw materials and money.

Neutralization Process

The wastewater from the two cleaning methods is diverted to a pH neutralization tank prior to being discharged to the wastewater treatment facility. This step is necessary as Ver-tech's formulated cleaners are alkaline in nature, thus requiring that the company adjust the pH with an acid to a neutral range for discharge to the wastewater treatment facility. The company used phosphoric acid in the pH neutralization tank to lower the pH, which increased the amount of phosphorus in the wastewater discharged from Ver-tech's facility.

Identifying Opportunities

To reduce the phosphorus and BOD loading Ver-tech evaluated three options.

- Reusing rinse water from the mixing lines
- Moving away from phosphoric acid in the pH neutralization tanks
- Reformulating cleaners to no/low phosphorus

Reusing Rinse Water

To reduce the phosphorus loading from the liquid formulation line, Ver-tech began reusing the rinse water containing residual product in future formulations. To overcome the problems associated with the dry formulation line, Ver-tech first experimented with dehumidifiers. This, however, did not reduce the amount of product that clung to the tank walls and mixers.

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Therefore, two steps were taken. First, the facility installed new mixing equipment which reduced the caking in the tanks. Product remaining in the tanks is now vacuumed and used in future dry formulations. Second, production scheduling and batch sizes were reviewed, resulting in reduced clean-up between similar products and optimized batch production volumes. Overall, residual from 80% of the company's products are used in future formulations, thereby eliminating raw material waste on approximately 100 products.

Neutralization Tanks

To address the phosphorus loading issues from the pH neutralization tank, the company switched from using phosphoric acid to hydrochloric acid.

Moving to Green Cleaners

In addition to improving the production process, Ver-tech has begun actively reformulating their products to replace phosphorus-containing cleaners with green cleaners. Additionally, Ver-tech has begun using a green cleaner in another process at the facility: filter bag cleaning. Ver-tech cleans filter bags for a variety of clients and was previously using a phosphorus-based cleaner in the process.

Results

The implementation of phosphorus-reducing practices at Ver-tech has resulted in a reduction of 8,650 lbs per year of phosphorus discharge to the City. Through the reformulation of two products, the company has reduced the use of over 100,000 lbs of phosphates in their formulations. Additionally, the company has reduced the BOD and total suspended solids (TSS) loading by over 15,000 lbs per year. Overall, Ver-tech has saved $100,000 in costs associated with the avoided purchase of chemicals and discharge to the treatment facility. Ver-tech is currently meeting all discharge standards and is not required to pay surcharges to the City.

Looking Towards the Future

While the City of Rockford does not currently have a phosphorus limit, they are anticipating a limit of 1 mg/L when their permit is renewed. Currently, the City is using enhanced biological phosphorus removal at the treatment facility, which is helping keep the phosphorus levels down. However, should a limit be imposed on the facility, additional chemicals will be needed to meet that limit. The City worked with Ver-tech in anticipation of the future limit. If Ver-tech had not reduced its phosphorus loading, the City would have needed to incur additional treatment costs to meet the future phosphorus limit. Anticipated savings from the avoided treatment costs in the future are approximately $86,500.

For More Information

MnTAP has a variety of technical assistance services available to help Minnesota businesses implement industry-tailored solutions that maximize resource efficiency, prevent pollution, increase energy efficiency, and reduce costs. Our information resources are available online at <mntap.umn.edu>. Please call MnTAP at 612.624.1300 or 800.247.0015 for personal assistance or more information about MnTAP's services.