



WHEY DIVERSION AND REUSE

Overview

Hazardous chemicals are widely used at food processing facilities through clean-in-place (CIP) systems, which discharge to facility wastewater streams.

Facility Background

MnTAP was contacted by a dairy processor with a typical daily throughput of 100,000 pounds of liquid whey and an average daily wastewater effluent of 12,000 gallons. The processor sought to reduce the strength charges it was paying to the local wastewater utility for excess pollutant loading.

In particular, the facility had been assessed additional charges for carbonaceous biological oxygen demand (CBOD) loading, which in dairies is often caused by milk, whey, or other product loss to wastewater drains.

Clean-in-place systems eliminate the need to dismantle equipment for cleaning and can help control water and chemical use when standard operating procedures (SOPs) are followed closely.

Process

MnTAP reviewed existing information on facility permitting and compliance prior to the facility visit using the EPA's Enforcement and Compliance History Online (ECHO) database, which allowed MnTAP to understand regulatory challenges facing the facility and to be better prepared during the facility visit.

While onsite at the facility, MnTAP analyzed recent wastewater sampling results and correspondence between the facility and the wastewater utility; observed on-site CIP and sanitation processes that generate wastewater; and discussed facility operations with plant leadership, operators, and maintenance staff. The project team used Safety Data Sheets (SDS) and chemical usage records provided by the facility to understand the inorganic pollutant load to wastewater.



NAICS Code: 3115**
Industry Sector: Dairy
Product Manufacturing
EPA Region 5

About MnTAP

The Minnesota Technical Assistance Program (MnTAP) is a confidential, no-cost, and non-regulatory program at the University of Minnesota that provides technical assistance focused on pollution prevention to organizations in Minnesota.

For Assistance, Please Contact:

Kevin Philpy, Senior Engineer
philp029@umn.edu



Minnesota Technical Assistance Program

www.mntap.umn.edu

200 Oak St SE | Suite 350-1 | Minneapolis, MN | 55455

Key Recommendation

Divert First Rinse of Whey for Beneficial Reuse

Pollutant Reduction:
38,000 pounds of CBOD

Cost Savings:
\$24,000

Status:
Implemented

At this facility, tank rinsate from the facility's dairy processes was being hauled off site for disposal as high-strength waste. Whey has numerous beneficial uses and could be upcycled or reprocessed off site into another commercial project, even in diluted form.

Reprocessing captured whey could represent a potential revenue stream for the facility and would also lower the CBOD in the facility's wastewater stream. MnTAP determined that whey was the source of CBOD in wastewater because:

- Whey is the only dairy product used at the facility.
- The facility's processes are consistent throughout the year
- A review of SDS forms and chemical use showed no other significant contributors of organic material to wastewater.

The facility's wastewater discharge permit stipulates that the municipal authority will collect a minimum of one sample per week for CBOD. Strength charges for CBOD were assessed at a fixed rate until a daily maximum load in pounds, and then at a higher rate for any load above the daily threshold. Using the daily wastewater data provided by the facility, MnTAP calculated the total CBOD load as follows:

$$CBOD \text{ Load } \left(\frac{\text{lbs.}}{\text{day}} \right) = \text{Average Daily Flow } \left(\frac{\text{gal}}{\text{day}} \right) * \text{Average Daily CBOD concentration } \left(\frac{\text{mg}}{\text{l}} \right) * 8.34 / 10^6$$

Savings were generated based on the percentage of whey that the project team determined could be diverted and the total annual CBOD load to the facility as stated in the wastewater sampling results.

For confidentiality reasons, the exact reuse chosen by the facility is not disclosed here. However, the box on the right provides examples of how whey can be reused.

Potential uses of off-specification or dilute whey include:

- Dewatered to form whey protein concentrate that can be reprocessed by another food manufacturer for lactose or lactic acid
- Reprocessed into biofuels
- Applied as a low-cost or no-cost soil amendment or fertilizer
- Used to feed animals directly or be reprocessed into feed

Conclusion

Following MnTAP's investigation and reporting, the facility gained a clearer picture of the opportunities for wastewater load reduction and energy conservation. Processes were enacted to capture and repurpose whey, leading to lower costs for the facility and decreased pollutant loads on the municipal wastewater treatment system. MnTAP's work and follow-up led to technical assistance being provided at another similar facility, enabling findings from this study to be applied elsewhere in Minnesota.