



# CARTON FILLING MINIMIZATION STUDY



## Overview

Fluid beverage manufacturers package and distribute products in a wide variety of sizes and shapes, such as cans, bottles, cartons, and bags. To accommodate for these differences, packaging equipment may need frequent reconfiguration or adjustments unless they are designed for a specific size and shape. As equipment tailored for one type of packaging is frequently operated at near full capacity to maximize profitability, focusing on specialized packaging equipment could present an opportunity for continuous improvement in enhancing operational efficiency.

## Facility Background

MnTAP collaborated with a beverage processor to study possibilities for pollution prevention around the processor’s carton filling operation. The carton filler is a critical part of their facility that operates all year round and fills several different products, each of which requires the line to be flushed before the next product can be packaged.

During the site assessment, MnTAP staff observed the assembly of four different products at the carton filler, which can be described in the following steps:

- The equipment operator continually adds cartons to the filler feeder, and the bulk tank gravity feeds empty cartons with liquids.
- After being filled, the cartons are sealed and conveyed to an automated crater and stacker.
- Throughout the production run, the operator can determine when the end of the run is approaching based on the planned production quantities and the running counter on the carton filler.
- Once the required carton production is completed, the supply from the product tank to the filler is stopped. The remaining product in the filler bowl and supply lines is then flushed out of the filler to the floor drains leading to the facility’s wastewater equalization tank.

**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.

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# Key Recommendation

## Minimize product loss to drain during changeover

**Pollutant Reduction:**  
10,500 gallons of product

**Cost Savings:**  
\$10,000

**Status:**  
Proposed

Facility personnel stated that the filler bowl holds 12 gallons of liquid and is approximately 65% full during production. MnTAP staff estimated that the 2-inch diameter supply lines that lead from the supply tank to the filler, which is largely gravity fed, are approximately 60 feet long. Due to access limitations, the exact volume that is released to the floor during each changeover could not be measured in the course of the site assessment. Three changeovers were observed during the site assessment.

Assuming that only the volume of product from the filler and supply lines is being discharged to the drain, approximately 14 gallons of product is released to the drain during each changeover. Factoring in the facility's standard manufacturing schedule, the total annual volume of product released to the drain would total approximately 10,500 gallons.

To accommodate the company's need to ensure that there is sufficient product in the bowls and lines to complete orders, the filler operator should shut off the flow from the supply tank to the filler as there should be enough product in the bowl and filling lines to fill the remaining cartons. Similar to the marking on the carton loading chute that prompts the operator on when cartons need to be loaded, a mark could be made to give operators an indication on when they should cease product flow from the supply tank.

Based on the facility's estimated costs of raw materials, each gallon of product costs approximately \$0.95 in raw materials. If the facility follows MnTAP's recommendation to package all product from the bowl and lines after the operator cuts off flow from the product tank, this could lead to a total potential savings of 10,500 gallons of product and up to \$10,000 per year. Alternatively, if 50% of the product in the lines and bowl can be recovered during this stage, the facility could still save 5,250 gallons of product per year that would otherwise be flushed to wastewater and achieve a cost savings of \$5,000.

Product that is flushed to drain at the facility from the carton filler contributes to strength charges for chemical oxygen demand (COD) and total suspended solids (TSS) as assessed by the local wastewater authority. Therefore, this recommendation could achieve additional savings associated with lowered COD and TSS.

## Conclusion

A thorough inspection of all elements that occurs when performing a focused review of a specific process can reveal multiple opportunities for cost and resource savings. The proposed solutions are still awaiting implementation as of the preparation of this study due to competing priorities and other opportunities for improving process efficiency at this facility. However, the information gained from this assessment has helped the manufacturer better understand the benefits and pollution prevention opportunities associated with the carton filler operation.