



# JUICE REPROCESSING

## Overview

Minnesota is home to numerous beverage producers, including dairy processors, breweries, distilleries, and plant-based beverage processors. As consumer tastes change, new beverage products are introduced, and new companies organize and expand. Due to intense competition among processors and rising costs of raw materials, especially imports, many facilities are seeking solutions that can minimize ingredient loss to drains during routine operations and equipment sanitization.

## Facility Background

A fruit processor contacted MnTAP after learning about MnTAP's internships on food waste reduction and wanting to apply MnTAP's insights to their operations. Since the facility's wastewater discharge volume was below the local threshold for requiring a permit, no strength charges were assessed during the site visit. However, the processor was preparing to scale up their operations and wanted to identify potential loss points in their juice manufacturing process before moving forward with the planned expansion. The facility was also interested in exploring opportunities for energy savings associated with compressed air use.

## Process

While on site, MnTAP staff observed the mixing and filling processes, including the changeovers between flavors, and compared the capacities at various stages in the process to the total volume in the finished units. Facility leadership, operators, and maintenance staff provided insights into the regular production, flushing, and sanitization processes.

The primary pollutants to the wastewater drains were chemical oxygen demand (COD) and total suspended solids (TSS). MnTAP staff used a 2021 study (1), which reported 500,000 milligrams per liter (mg/L) of COD and 3,600 mg/L of TSS in mixed fruit juice wastewater, to evaluate the potential impacts of fruit juice loss to the drains.



NAICS Code: 3114\*\*

Industry Sector: Specialty Food  
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:

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1. Zerrouki, S., Rihani, R., Lekikot, K., & Ramdhane, I. (2021). Enhanced biogas production from anaerobic digestion of wastewater from the fruit juice industry by sonolysis: experiments and modelling. *Water Science and Technology*, 84(3), 644-655.

# Key Recommendation

## Capture and Reprocess Juice from Production Pipes

At the site visit, MnTAP staff observed the following fruit processing and sanitation stages during a routine production run:

**Pollutant Reduction:**  
21,000 pounds of CBOD  
150 pounds of TSS

**Cost Savings:**  
\$72,000

**Status:**  
Planned

1. Upon arrival, steel drums holding frozen juice concentrate were allowed to partially thaw before being emptied into a grinder.
2. Fruit juice was blended with other flavors and ingredients before being pumped to a tank for temporary storage.
3. The finished fruit juice was transferred to a filler for bottling, after which the final product can be shipped off site for pasteurization.
4. Mixing tanks were emptied, lines leading from the mixing tank to the day tank and filler were flushed to the floor drains, and the mixing tank was refilled with raw juice.
5. The tanks, filler, and lines were flushed in preparation for the next product.

MnTAP staff measured the size and length of the 1.5-inch stainless steel pipes that connect the grinder to the filler through the tanks. MnTAP staff then observed the tee fittings, which were opened to drain product out of the lines, at the lowest elevation of each section of horizontal pipe. These tee fittings could drain the following sections of pipes:

- 252 inches between the mixing tank and the day tank
- 124 inches between the day tank and the filler

Assuming the recipe (stock keeping unit or SKU) remains consistent, the juice from pipes during mid-production flushes can be drained gravitationally from the tee fitting into a sanitized vessel and returned to the mixing vat instead of being discharged to the floor. We approximate that 90% of this juice can be captured in this way.



Based on the production schedule reported to MnTAP by facility personnel, we estimated that around 5,000 gallons of juice could be recaptured, reclaimed, and reprocessed in the mixing tank. Using the local rates and available costs for raw juice by the barrel, reclaiming and reprocessing juice from the mid-production flushes could save 21,000 pounds of COD, 150 pounds of TSS, and approximately \$72,000 in juice costs annually.

## Conclusion

The current equipment configuration did not allow for further vertical expansion, so the processor is evaluating options for facility expansion or relocation as part of the scale-up plan. The information gained from this assessment has helped the manufacturer better understand the pollution prevention opportunities associated with juice reprocessing. These learnings will also help to minimize any future wastewater strength charges, in the event their daily wastewater volumes grow enough to require the processor to acquire a municipal discharge permit.