Strategies for Source and Load Reduction in Industrial Effluent

Kevin Philpy
Senior Engineer
Minnesota Technical Assistance Program (MnTAP)

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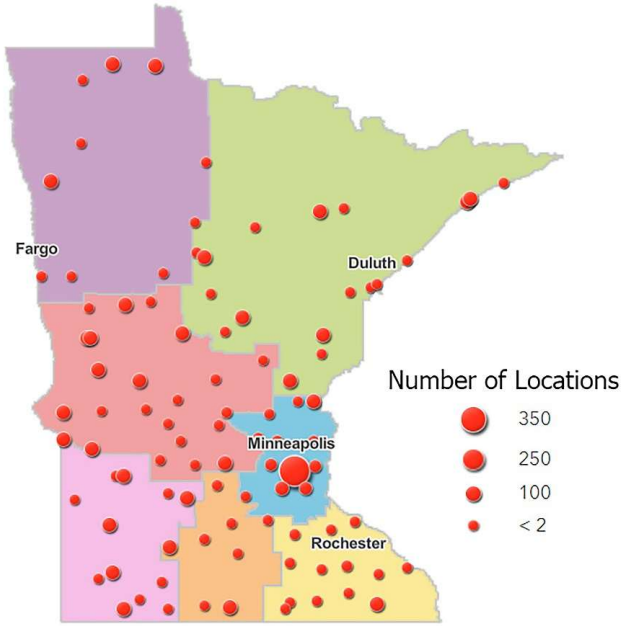
How did I get here?

- **Civil/Environmental background**
  - 10+ years in consulting – due diligence, compliance, ELV
  - 6 years in corporate EHS at DFA
  - Joined MnTAP in 2022
- **Food systems – water, waste, energy, chemical reduction**
- **TA/assessments in the field**
- **Reporting/industry outreach**

Minnesota Technical Assistance Program

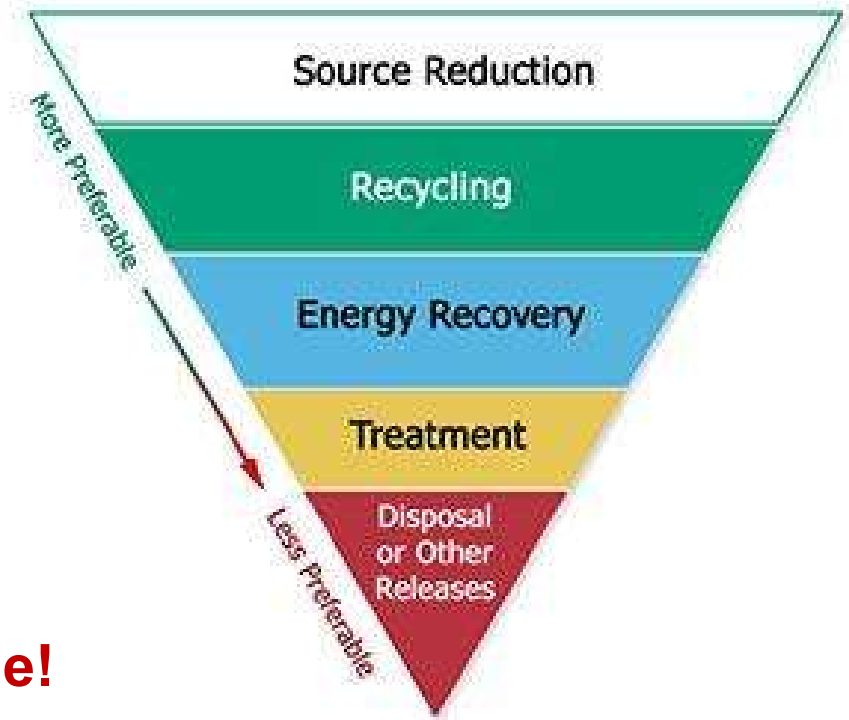
- **Confidential, grant-funded environmental support for MN businesses**
  - Prevent pollution at the source
  - Optimize resource consumption
  - Reduce waste and energy use
- **11 engineers and professionals**
- **Based in School of Public Health at University of Minnesota**



Supported Facilities 2017-2021

Pollution Prevention (P2)

- Divert or limit high-strength waste from wastewater
- Minimize or reuse water
- Minimize the need for chemicals (which can be expensive!)



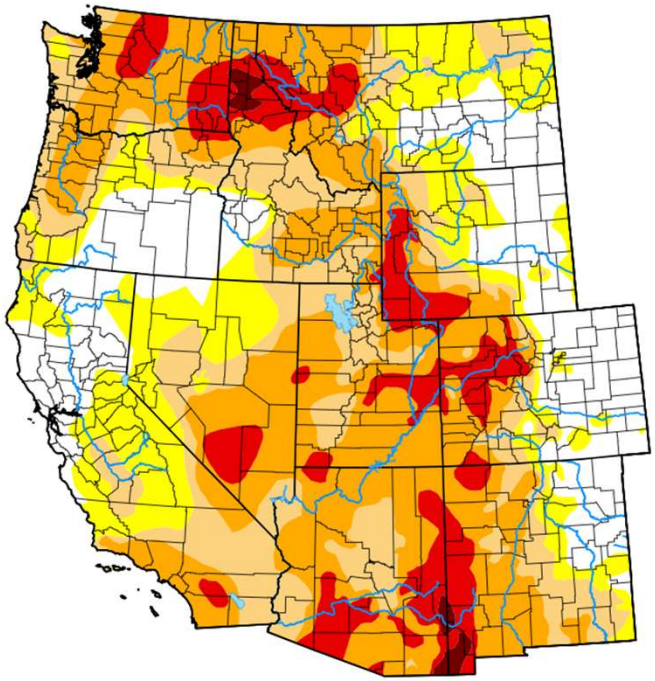
Source reduction benefits everyone!

https://www.epa.gov/toxics-release-inventory-tri-program/pollution-prevention-p2-and-tri

High-Strength Waste Sources

- **Facility-Specific**
  - Equipment sanitization – Most facilities
  - Building heating/cooling – Any facility
  - Floor cleaning/janitorial – Any facility
- **Industry-Specific**
  - Food/beverage – COD/BOD, TSS
  - Metal finishers – high pH, inorganics
  - Wood/paper treatment – COD, TSS, inorganics
  - All facilities – High water and chemical use

Water Conservation



Map released: Thurs. October 9, 2025

Data valid: October 7, 2025 at 8 a.m. EDT

Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

Authors

United States and Puerto Rico Author(s):

Curtis Riganti, National Drought Mitigation Center

Pacific Islands and Virgin Islands Author(s):

Tsegaye Tadesse, National Drought Mitigation Center

U.S. Drought Monitor – Nebraska-Lincoln

Common Wastewater Challenges

- **Irregularity in discharge**
  - Daily production/cleaning variability
  - Seasonal production
- **New contaminants/products/processes**
  - Changing reagent/sanitizer costs
  - Generator/SIU employee turnover

Keep slug plans and product lists updated!

Common Wastewater Goals

- Obey relevant ordinances and permits
- Minimize costs of treatment
- Be a good neighbor
- Protect surrounding resources

Leveraging the regulations (POTW) or SOPs (SIUs) you have is the best way to ensure compliance.

MnTAP Intern Program

- **15-20 P2 Intern Projects**
  - Process efficiency/lean manufacturing
  - Waste prevention
  - Water & energy conservation
- **Full-time paid position**
  - ~13 weeks - end of May to mid-August
  - $19/hr + $1,500 stipend upon completion
- **Primary project team**
  - MnTAP Intern – project lead
  - 1 supervisor on-site at the company
  - 1 supervisor with MnTAP

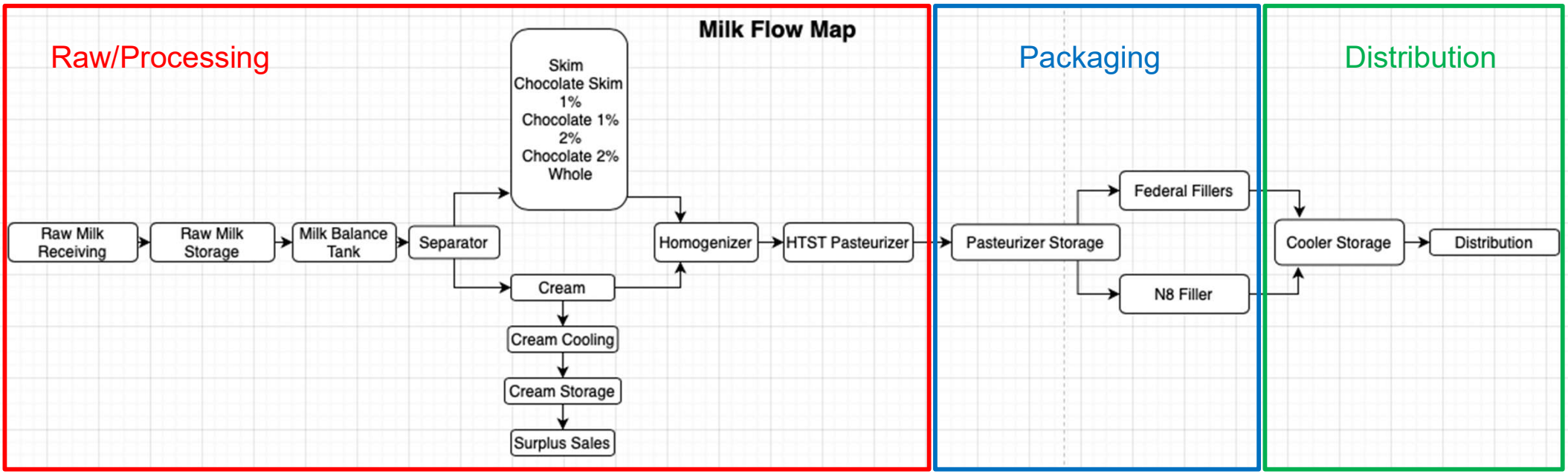
The 2025 MnTAP Intern Cohort

Site Assessment Guidance

- **Watch the process. Make observations and non-invasive measurements.**
  - Load = Flow x strength
  - Load may come from multiple sources
- **Establish and maintain positive relationships**
  - Governmental – Local → State → Federal regulations
  - Industrial - with and between WW generators
- **Ensure replicable data/information**
  - Systematic – the same way, every time
  - Defensible – consistent with industry or legal standards

2023 Dairy Internships

Dairy Processing



Dairy Product Conservation

- **Reduce product lost to wastewater**
  - Average Shrink of 2%
  - Shrink: 100 jugs made, 98 jugs make it to distribution
- **Evaluate key processes for milk loss**
- **Decrease strength charges resulting from milk loss to drain**

Federal Fillers

Rotary filler for half and full gallon jugs

- **Start Up:**
  - Milk is run through to rinse out sanitizer
  - Milk flow is shut off manually once sanitizer is removed
- **Shut Down:**
  - At end of run, remaining milk is discharged to floor drain
  - Bowl and lines are rinsed before cleaning

Recommendations for Federal Fillers

Proposed Solution for Start Up

- Implement an inline conductivity sensor before bowl of filler
- Eliminates operator variability in shutoff time
- Cost: TBD

Potential Annual Savings

- 94,000 gallons of milk
- $114,000 in revenue
- $38,000 in strength charges

Recommendations for Federal Fillers

Proposed Solution for Shut Down

- Best practice sharing between operators
- Reduce milk left in bowl before filler is shut down
- Cost: $1,000

Potential Annual Savings

- 29,000 gallons of milk
- $35,000 in revenue
- $11,700 in strength charges

CIP (Clean-in-Place) Systems

- CIP systems clean tanks/product lines
- May include:
  - Pre-rinse
  - Intermediate-rinse
  - Post-rinse
  - Caustic/acid wash
  - Sanitize
- Remove product, scale and biofouling
- Each system is responsible for multiple tanks/lines called circuits
- Trended system data

Decrease Post/Intermediate-Rinse Time

Water Savings

- Utilized trended data
- Monitored the conductivity to find when it reached a low point for each circuit
- Added a safety net of 20 seconds to the new rinse time

Fuel Savings

- Due to lower water usage, fuel was also saved
- Only applied to some circuits

Decrease Pre-Rinse Time

Water Savings

- Trended data was utilized
- There was no turbidity sensor present
- Used post/intermediate-rinse time for new pre-rinse time
- Safety net of 20 seconds utilized

Fuel Savings

- Same as post/intermediate-rinse

Natural gas boiler

10 Ton Natural Gas Fired Steam Boiler (aac-autoclave.com)

Condensate Recovery

- Food production is a wet process
- Not all water comes into contact with product
- Condensate can be recovered

Solutions

- Save final rinsate for pre-rinse
- Close the loop on cooling water

2025 Internship

- Gaylord, MN
- 600 employees
- 320,000 square feet
- Produces liquid and cooked egg for foodservice and food manufacturing

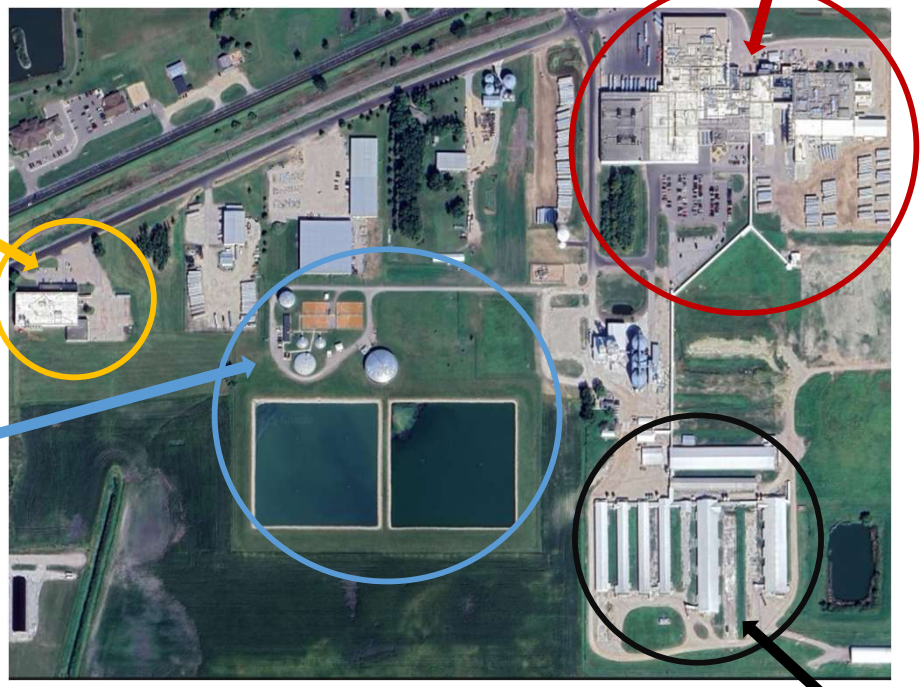
Slide 21

MMD1 Provide background information on your company/facility on this slide, such as:
City, Size (sq footage or # of employees). Also touch on what their products and services are and include the company logo.
Matthew M Domski, 2023-07-27T23:16:42.900

Incentives to Change MMD1

Wastewater Loading Reduction

- Prepare for 2nd processing plant
- Reduce phosphorus load, CBOD, TSS, and pH
- Prevent egg, chemical, and water loss



Slide 22

MMD1 List why the company is interested in the focus of your project (why they sought to partner with MnTAP). Examples of this could be: corporate/local facility goals and targets, high utility, wastewater and/or hauling costs, process efficiency and safety improvements.
Matthew M Domski, 2023-07-27T23:19:21.152

Overview of Departments

Breaking

- Receives eggs from chicken barns
- Cleans, cracks, filters, and presses eggs
- Eggs used in processing & packaging

Precook

- Cooks, freezes, and packages egg patties

Aseptic

- Processes liquid egg
  - Pasteurization
  - Homogenization
- Products: Egg cartons & bags

System C

- Processes liquid egg
  - Pasteurization
  - Homogenization
- Product: Egg cartons

Sources of Egg Loss

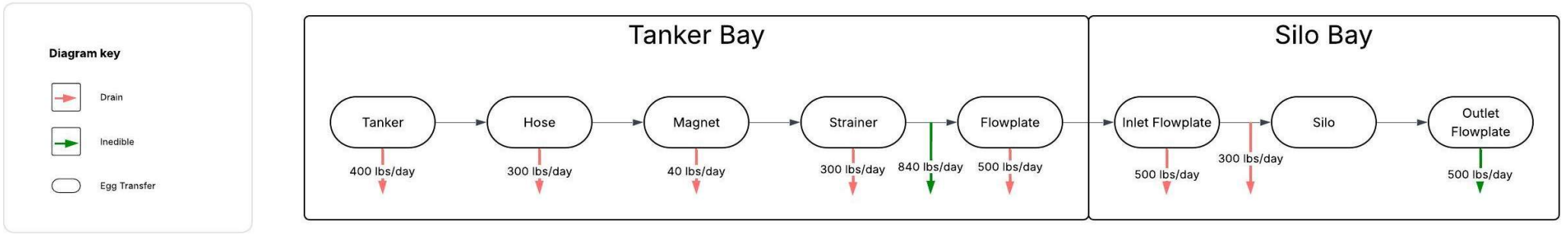
MMD1

Tanker Bay

- 24-32 tankers daily
- 1,100,000 lbs of liquid daily

Silo Bay

- Hold whole egg, egg yolk, egg whites, mixes, and cage-free versions



Slide 24

MMD1 Replace the title with one of your primary recommendations that you want to showcase at the Symposium. You can use more than 1 slide to describe this recommendation and how you investigated solutions, but remember our time limit of 10 minutes.

Matthew M Domski, 2023-07-27T21:30:43.958

Raw Receiving Recommendations

Install Troughs & Train Operators

- Cost
  - Troughs & Hoses: $3,300
  - Training: $130
- Annual Waste Reduction
  - 98,000 lbs of egg
  - 1,030 lbs of phosphorus
  - 5,400 lbs of ferric chloride
- Annual Savings
  - Pretreatment savings: $70,000
  - Inedible revenue: $23,000

Chemical Use at Facility

COP Tanks

- Cleans removable parts
- Circulation & Soaking:
  - Sodium hydroxide
- For scrubbing:
  - Trisodium phosphate

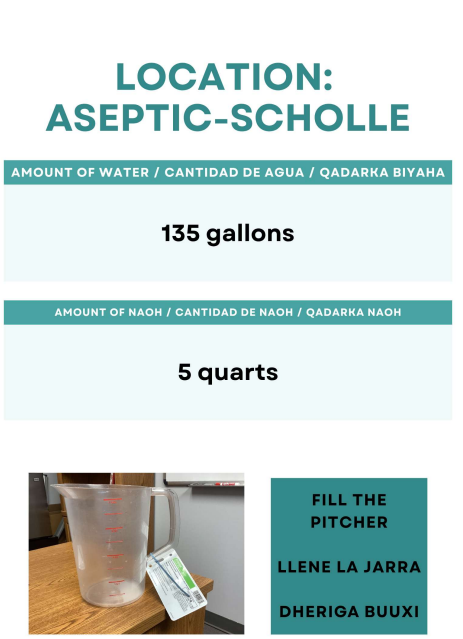
Egg Disinfection

- Sprays shelled eggs
- For fecal matter removal:
  - Sodium hypochlorite

Chemical Use Reduction Recommendations

Add Infographics and Pitchers for Accurate Chemical Addition

- Cost
  - Pitchers: $400
  - Jugs: $1,000
  - Retraining: $260
- Annual Waste Reduction
  - 3,400 lbs of sodium hydroxide
- Annual Savings
  - $4,100



Chemical Use Reduction Recommendations

Plug Excess Spray Nozzles

- Cost
  - Plugs: $14
- Annual Waste Reduction
  - 330,000 gallons of water
  - 2,200 lbs of sodium hypochlorite
- Annual Savings
  - $8,600

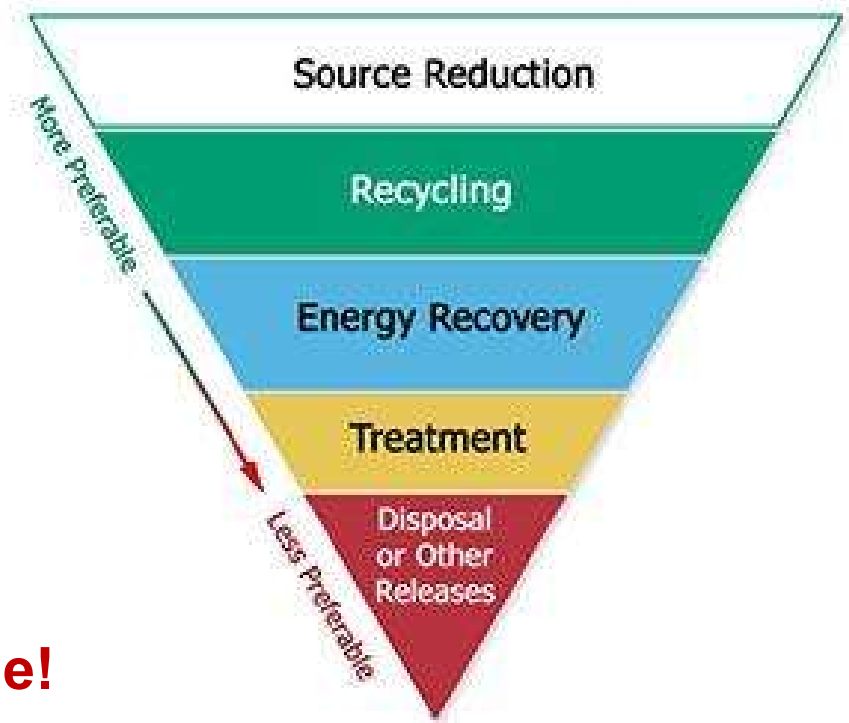
Recommendation	Annual reduction	Total cost	Annual savings	Payback period	Status
Install Troughs and Train Operators	98,000 lbs of liquid egg 1,030 lbs of phosphorus 5,400 lbs of ferric chloride	$3,400	$93,000	13 days	Implementing
Reduce CIP Prerinse Time	1.4 million gallons of water	$25	$3,500	3 days	Recommended
Re-Install Solenoid and Flow Controls for Pumps	440,000 gal of water	$500	$1,100	5 months	Implementing
Install Automated Flow Control for Pumps	450,000 gal of water	$570	$1,100	6 months	Implementing
Reduce Number of Spray Nozzles in Breaking	330,000 gal of water 2,200 lbs of sodium hypochlorite	$14	$8,600	Immediate	Implementing
Reduce COP Tanks Chemical Usage	3,400 lbs of sodium hydroxide	$3,600	$4,100	10 months	Implementing

Slide 29

MMD1 List all of your recommendations in this table, keeping it in this color scheme/format. Depending on how much time you have left, you can briefly go over additional recommendations in this table (for each, target 2-3 sentence description or maybe 15-20 seconds).
Matthew M Domski, 2023-07-27T20:27:35.096

Source Reduction is the Goal!

- Divert or limit high-strength waste from wastewater
- Minimize or reuse water
- Minimize the need for chemicals (which can be expensive!)



Source reduction benefits everyone!

https://www.epa.gov/toxics-release-inventory-tri-program/pollution-prevention-p2-and-tri

Thank You!

Strengthening Minnesota businesses by improving efficiency while saving money through energy, water, and waste prevention

www.mntap.umn.edu

Kevin Philpy

philp029@umn.edu