Saving Water with WaterSense

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U.S EPA WaterSense

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Introducing WaterSense

WaterSense is a voluntary program launched by EPA in 2006 that provides a simple way to identify water-efficient:

- Products
- Programs
- Practices
- Homes

Products are independently certified for water efficiency **and** performance

WaterSense Labeled Products

More than **37,000** product models have earned the label. Water factors are included in many **ENERGY STAR** certified products.

Flushing Urinals

Showerheads

Lavatory Faucets

Homes

Flushometer Valve Toilets

Tank-Type Toilets

Irrigation Controllers

Spray Sprinkler Bodies

Just Add Water

- O&M procedures & procurement policies
- Water-efficiency in all subcontracts and service contracts
  - Make vendors aware of goals
  - Add best practices to all O&M contracts
  - Conduct regular system audits with leak detection and repair
- Track water in Portfolio Manager
- Find rebates - Contact your water, energy, and gas utilities

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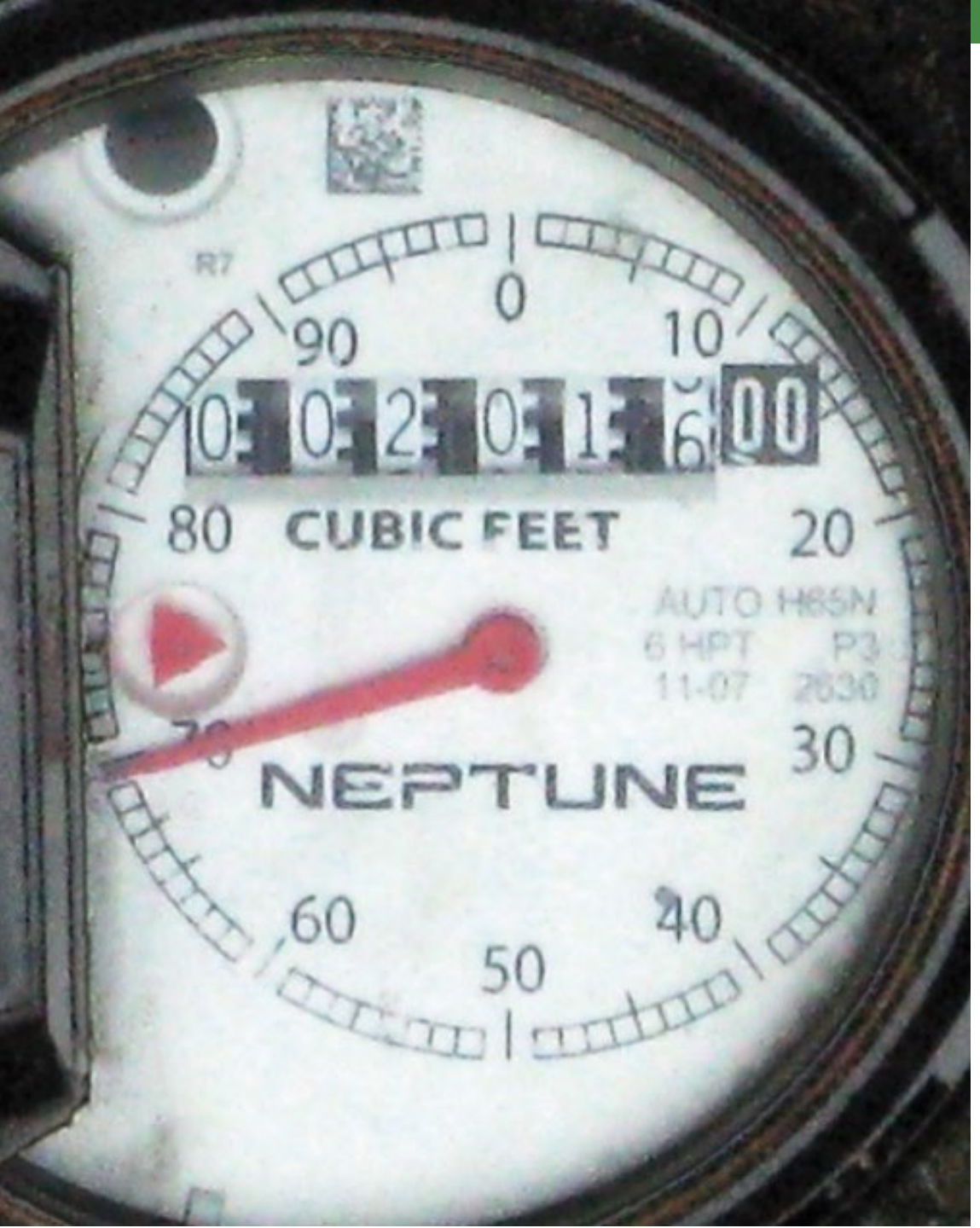


Submetering

Don't wait for the bill to see problems

Submeter specific end uses for data on-demand

- Submeters **do not** need separate utility accounts – can be internal use only
- Consider temporary flowmeters or other water monitoring devices like acoustic leak detection
- Set up alerts to quickly identify leaks and equipment inefficiencies or malfunctions

Submeter any system using more than 1,000 gal/day or 100,000 gal/year – tenant spaces, irrigation systems, cooling towers, single-pass cooling systems, rainwater systems

Leak and Waste Indicators

- Spikes in water usage - found with monthly bill tracking or meter reading
- Problems and malfunctions found during a water assessment or equipment inventory
- Alerts from leak detection or failure abatement devices
- Walk-through of facility identifies leak – puddles, drips, running fixtures, discharge to floor drains
- Reports from employees, visitors, or tenants

Leaks Add Up Fast!

Leak Water Loss Guide (Water Loss in Gallons at 50 PSI)

Leak this Size	Loss per Day	Loss per Month	Loss per Year
	120	3,600	43,200
	360	10,800	129,600
	693	20,790	249,480
	1,200	36,000	432,000
	1,920	57,600	691,200
	3,096	92,880	1,114,560
	4,296	128,880	1,546,560
	6,640	199,200	2,390,400
	6,984	209,520	2,514,240

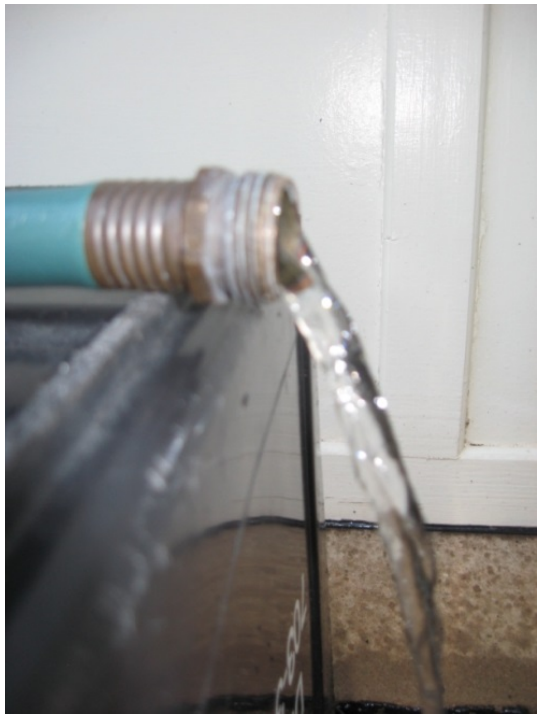
$ 34 per month,
$ 403 per year

$1,957 per month
$23,483 per year

Source: Washington State Department of Health Office of Drinking Water, costs estimated based on national average rate of $9.34 per 1,000 gallons

Stop Sending Money Down the Drain

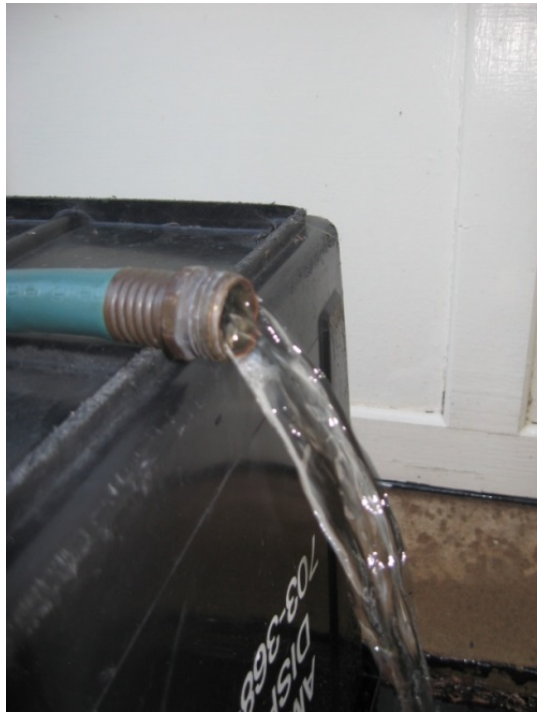
look for WaterSense Meets EPA Criteria



1 gpm

500,000 gal/year

$4,670/year*



2 gpm

1,000,000 gal/year

$9,340/year*

6 gpm

3,000,000 gal/year

$28,020/year*

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*at national average commercial cost of $9.34 per 1,000 gallons

Involve Employees

Train custodial staff to identify and fix leaking or malfunctioning fixtures and equipment

Post signage in restrooms and kitchen areas with:

- water saving factoid or call to action
- contact info for repairs
- instructions for using new technologies
- reminders to shut off equipment between uses

Involve Employees

Add specific tasks to existing routines:

- Property or Facility Manager
  - Check the meter during off-hours – movement can be a leak
  - Look for water running to floor drains near equipment (ex. water heater, boiler, etc.) running water may be a leak
- Cleaning Staff
  - Report dripping or clogged faucets and showerheads
  - Tank-type toilets – small ripples at the edge of the water in the bowl can be a leaky flapper

Involve Employees

Add specific tasks to existing routines:

- Landscaping staff/contractors
  - Puddles and watering hardscape = waste
  - Look for broken sprinkler heads, dead plants, and other strange looking things
- Kitchen staff
  - Shut-off equipment between uses, especially food disposals
  - Steam leaking from equipment – wasted water and energy

Water Savings in Restrooms

Restrooms can be a significant water use

Older fixtures installed before 1994 use 3-5 times more water than newer efficient models

- Water savings depend on user behavior just like energy
- Regular maintenance is vital –
  - Annually inspect valves and replace worn parts
  - Adjust automatic sensors on fixtures to avoid double or phantom flushes and faucets running too long
  - Regularly remove scale build-up and biofilm on all fixtures especially faucets and showerheads

Verifying Water Use in Restrooms

Tank-type toilets – Dye Tablets or food coloring

- Drop tablets into the tank and wait 10 minutes
- Dye color in the bowl = leaky toilet flapper

Flushometer Valve Toilets and Flushing Urinals – Timed Flush Test

- Count the number of seconds that elapse during flush cycle time
- Multiply seconds by 0.42 for toilets and 0.25 for urinals to get gallons per flush

Faucets and Showerheads – Timed Flow Test

- Use a flow-gauge bag or a measuring cup or pitcher of a known volume to measure volume of flow per unit of time
  - Faucets – use one marked in cups or pints
  - Showerheads – use one in quarts or gallons

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* South Florida Water Management District *Water Efficiency and Self-Conducted Water Audits at Commercial and Institutional Facilities Guide* https://www.sfwmd.gov/documents-by-tag/waterefficiency

Water Efficient Restroom Fixtures

look for WaterSense Meets EPA Criteria

	Private Restrooms or Patient Rooms	Public Restrooms
Toilets	Tank-type ≤ 1.28 gpf	Flushometer Valve ≤ 1.28 gpf
Faucets/Laminar Flow Devices	Lavatory ≤ 1.5 gpm	0.5 gpm OR 0.25 gpc
Showerheads	≤ 2.0 gpm	
Urinals	Flushing Urinals ≤ 0.5 gpf	

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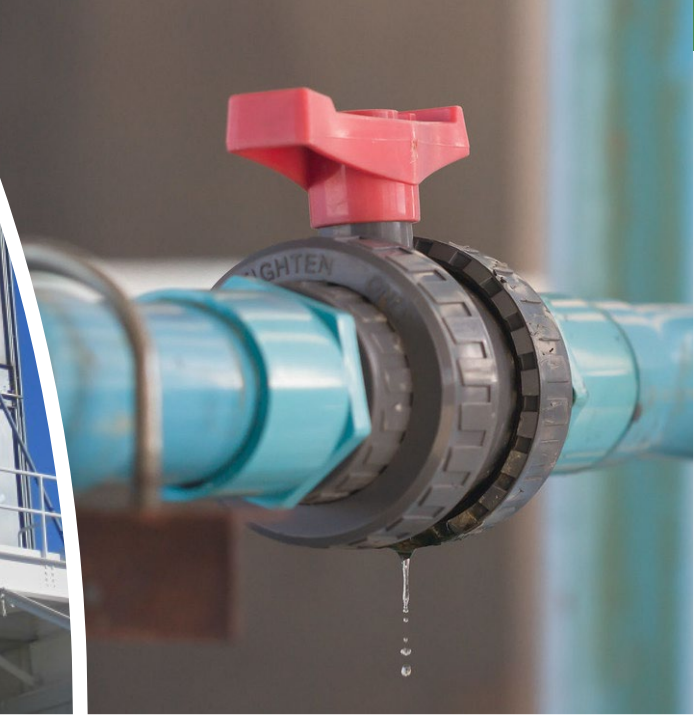
Target Mechanical Systems

- Mechanical systems can account for up to 30 - 60% of water use
- Submeter systems and check for leaks and inefficiencies – especially hot water and steam
- Minimize water use in single-pass cooling systems
- Maximize cooling tower cycles of concentration



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Single-Pass Cooling

Single-pass or once-through cooling systems use water to remove heat and cool equipment

– Uses **40 times** more water than a cooling tower

Types of equipment that could use single-pass cooling include:

- Ice machines
- Refrigeration systems
- Vacuum systems

- Air conditioners
- Air compressors

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Single-Pass Cooling Efficiencies

Maximize efficiency of existing systems

- Use minimum flow rate required for cooling set by manufacturer
- Install a control valve to turn off cooling water when there is no heat load – standby mode
- Regularly check operation of the water control valve
- Recirculate water by connecting cooling lines to existing chilled water loops

In the long-run eliminate single-pass cooling systems

- Replace with air-cooled equipment
- Reuse water in a closed-loop recirculation system

Cooling Towers

Cooling towers can be **30-60%** of total facility water use

- High energy use to pump water continuously
- Evaporation is not the target for water efficiency
- Monitor water chemistry and flow
- Maximize cycles of concentration

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Cooling Tower BMPs

Main goal: maximize cycles of concentration

Cycles of concentration is an indicator of the number of times water can be recirculated in the system before it's discharged to the sewer

- Limited by the concentration of minerals in the water often measured by a conductivity meter - can lead to scaling and mineral build-up
- Increasing cycles from 3 to 6 reduces make-up water by 20% and blowdown water by 50%

- Install submeters on the make-up and blowdown lines to monitor flow
- Ensure cooling tower fill valves cut off cleanly
- Choose a water treatment vendor that specializes in water efficiency
- Read water chemistry reports to verify progress toward goals
- Use make-up water submeter to measure evaporation losses to request a sewer credit from your utility

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Outdoor Water Use

- Community benefits
- Minimize amount of water need to supplement rainwater to meet plant watering needs
- Landscape and irrigation service agreements should include:
  - Water efficiency goals
  - Requirements for local water restrictions
- Existing staff can attend courses or seminars to learn water-efficient techniques

Irrigation

Water losses from wind, evaporation, and over-watering caused by:

- Poor irrigation system design
- Improper system installation and management
- Lack of maintenance
- Improper scheduling

https://www.epa.gov/watersense/outdoors

Find Outdoor Water Waste

- Check the system for broken or clogged sprinkler heads
- Make sure sprinkler heads do not tilt too high or too low
- Move or adjust sprinkler components to avoid watering pavement
- Look for pooling and puddling
- Audit your irrigation system using an irrigation professional certified by a WaterSense labeled program every 3 years

https://www.epa.gov/watersense/irrigation-pro

WaterSense Resources

- Water use information by facility type
- Best management practices
- Water-saving tips
- Assessment tools
- Worksheets and checklists
- Live and recorded training webinars
- Case studies and more!

www.epa.gov/watersense/tools-ci-facilities

Tools for Getting Started

WaterSense Simple Water Assessment Checklist

Writable PDF to help quickly identify and target potential projects and best management practices

WaterSense Operations and Maintenance Checklist

Checklist of low- or no-cost changes to operation and maintenance procedures can start saving water, energy, and costs quickly.

Sample Worksheets in Appendix B of *WaterSense at Work*

Building Water Survey, List of Water Meters, Water Consumption History; Equipment and Water Use Inventory

WaterSense Commercial Facility Leaks Checklist

PDF checklist to help quickly identify leaks and potential water waste

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www.epa.gov/watersense/tools-ci-facilities

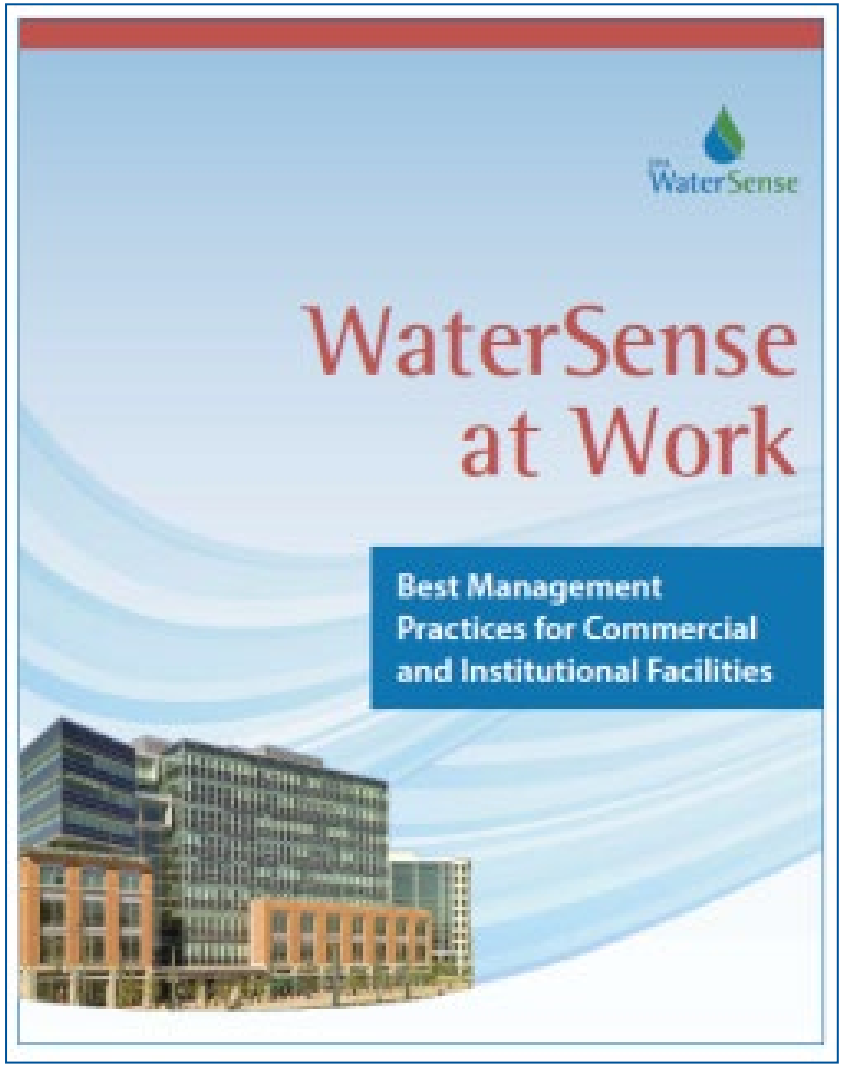
O&M Checklist

Tips to Identify and Address Potential Water Waste	Section of *WaterSense at Work*[1]	Done ✓	Notes
SANITARY FIXTURES			
10. Post signs in restrooms to instruct users to report leaks and continuously flushing fixtures.	3.2 – 3.4		
11. **Tank-type toilets:** Check tank-type toilets regularly for leaks, broken flappers, and other parts failures. Annually test toilets using a dye test to ensure the flappers are not worn or allowing water to seep from the tank into the bowl and down the sewer. Drop a dye tablet or several drops of food coloring in the tank. After 10 minutes, see if the dye has leaked into the bowl, which indicates a leak. Flush immediately.	3.2		
12. Check the toilet fill valves for water overflow to make sure fill valves are not running constantly.	3.2		
13. **Flushometer-valve toilets and urinals:** Inspect diaphragm or piston valves annually and replace any worn parts. To determine if the valve needs replacement, time the complete flush cycle. A properly functioning flushometer valve toilet should not have a flush cycle longer than four seconds for a 1.6 gallon per flush (gpf) valve and three seconds for a 1.28 gpf valve. A urinal flush cycle should be completed in three seconds for a 1.0 gpf valve and two seconds for a 0.5 gpf valve. If longer, check the flush volume adjustment screw or consider replacing the valve or valve insert.	3.2 – 3.3		
14. Periodically check to ensure the control stop (which regulates the flow of water from the inlet pipe to the flushometer valve) is set to fully open during normal operation.	3.2 – 3.3		
15. Periodically inspect the flush volume adjustment screw to ensure the flush volume setting has not been modified from the original settings to use more water per flush than needed.	3.2 – 3.3		
16. If replacing valves or valve inserts, make sure the new ones are consistent with the manufacturer's specifications. Ensure the rated flush volume matches the acceptable range for the fixture.	3.2 – 3.3		

Best Management Practices

WaterSense at Work: best practices for all buildings

- Water management planning
- Water use monitoring and user education
- Sanitary fixtures, kitchen equipment
- Outdoor water use, Mechanical systems
- Lab & medical equipment
- Onsite alternative sources of water



https://www.epa.gov/watersense/best-management-practices

Water Wednesdays

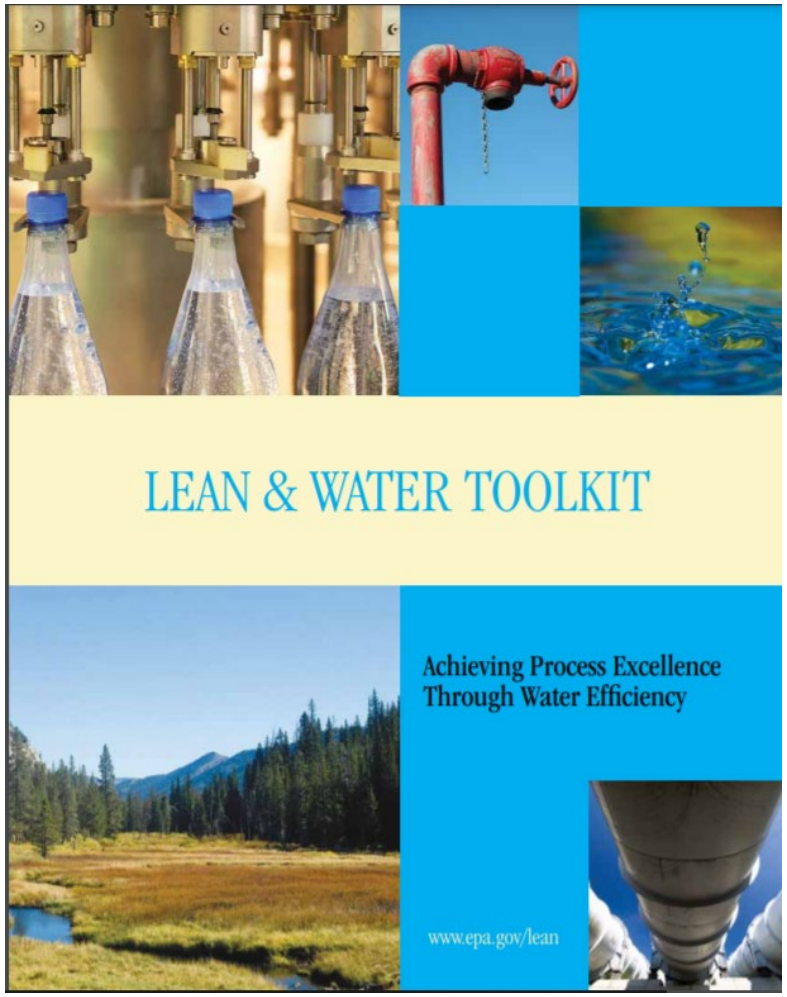
Register at: www.energystar.gov/buildings/training

Controlling Water Waste Across Commercial and Institutional Properties Everywhere	*April 20th*
Beat the Peak – Using Water Wisely for Commercial Outdoor Spaces	*June 30th*
EPA's 1-100 Water Score for Multifamily Buildings	*July 14th*
Saving Water in Restrooms	*August 25th*
Minimizing Water Use in Mechanical Systems	*Sept 15th*
Conducting Water Assessments	*October 20th*
Quick Water Wins - Operation and Maintenance Projects	*November 2nd*
Evaluating Water Use in Capital Improvement Projects	December 8th

Recordings of past webinars available

EPA's Lean and Water Toolkit

- Created to help with any industrial facility type
- Covers
  - value stream mapping
  - gemba walks
  - developing a water balance
  - kaizen events
  - root cause analysis
  - case studies and more



https://www.epa.gov/sustainability/lean-water-toolkit-contents-and-acknowledgements

COVID-19 Resources

Buildings may need to flush their water system before reopening

- CDC Guidance for Reopening Buildings after Prolonged Shutdown or Reduced Operation

  www.cdc.gov/coronavirus/2019-ncov/php/building-water-system.html

- CDC Prevention through Water Management – includes toolkit

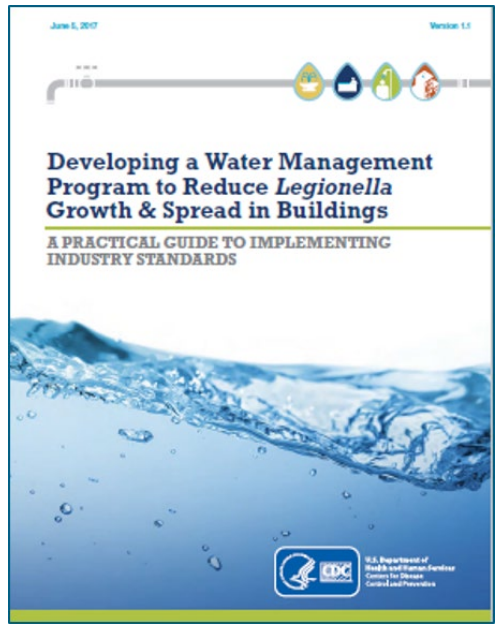
  www.cdc.gov/legionella/wmp/index.html

- EPA Guidance on Information on Maintaining or Restoring Water Quality in Buildings with Low or No Use – includes checklist

  www.epa.gov/coronavirus/information-maintaining-or-restoring-water-quality-buildings-low-or-no-use

- AWWA and IAPMO. Responding to Water Stagnation in Buildings with Reduced or No Water Use

  www.awwa.org/AWWA-Articles/new-guide-addresses-stagnant-water-in-buildings-with-low-occupancy



Water Savings Network

- Free program where participants are encouraged to set water use intensity goals for all or a part of their portfolio (e.g., in water-stressed regions), and contribute by:
  - Track and share water savings progress
  - Publish a case study
  - Share best practices and lessons learned through peer exchanges, or
  - Document the ways water efficiency impacts other priority areas such as energy reduction, resilience, equity, and workforce development

https://betterbuildingssolutioncenter.energy.gov/better-plants/industrial-water-savings-network

Examples of Technical Assistance: Water INPLT Training

Water INPLT training leveraged by PWP Tool aims to help manufacturing plants:

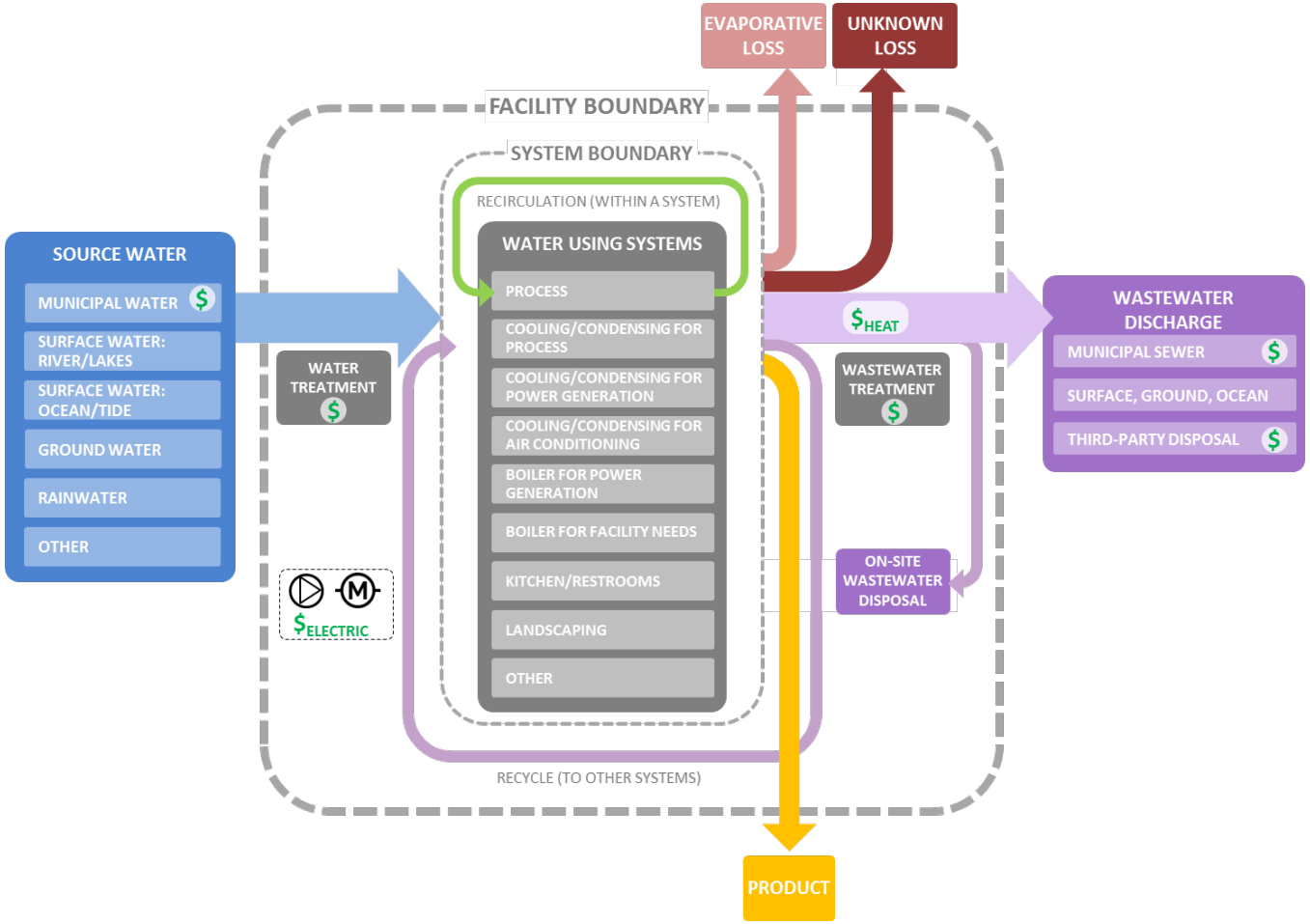
- Perform a water balance and establish a water baseline
- Identify the true cost of water at the facility
- Identify water efficiency opportunity at the facility through a water treasure hunt process

A 2.5 day event (classroom *plus* field training)

Recordings from the virtual water INPLT training is available online: https://bptraining.ornl.gov

Plant Water Profiler (PWP) Tool

- Free, Excel- based tool for facility level water assessment
- Helps systematically determine baseline water use and true cost
- Streamlines data collection
- Provides summary report containing high level recommendations



https://www.energy.gov/eere/amo/plant-water-profiler-tool-excel-version-10-pwpex-v10

Part 1.1 - Industry and Contact Information

Please provide details about the plant and contact information. Enter relevant information in yellow cells. Select industry subsector from the first drop-down list, and then industry type from the next drop-down list.

Corporation Name:	ABC Dairy Products Manufacturing Company	**Primary Contact for Assessment:**	
Plant Name:	XYZ Plant	Name:	John Doe
Location:	Cleveland, Ohio	Address:	123 Street Mailstop 2345 Cleveland, Ohio 44101
Primary Product:	Cultured Dairy Products		
Industry Subsector and NAICS 3-Digit Code:	311. Food Manufacturing	Phone:	xxx-xxx-xxxx
Industry Type and NAICS 5-Digit Code:	31151. Dairy Product (except Frozen) Manufacturing	Fax-No:	xxx-xxx-xxxx
		E-mail:	abc@email.com
Specify if other:			
Plant's Safety Protocol:			
Specific Problems or Ideas of Interest related to Plant's Water Use:			

The **North American Industry Classification System (NAICS)** is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the US business economy.

Search Industry by NAICS Code

Part 1.2 - Plant's Annual Hours of Operation

Please provide plant's annual hours of operation. You may list different departments of the plant (e.g., administration office) separately, if their hours of operation are different.

Department	Normal Hours of Operation per Year	Downtime Hours per Year	Actual Hours of Operation per Year	Comments
Plant	8,760	72	8,688	2 12-hr shifts; 6 hr/mo. downtime
Administration Office	2,000		2,000	8 hr/day, 5 day/wk, 50 wk/yr
			-	

Part 1.3 - Annual Production Information

Product	Annual Production		Comments
	1,000	lb	
Cottage Cheese	400.0		
Sour Cream	300.0		
TOTAL	700.0		

Part 1.4 - Water-Using Systems Utilized in the Plant

Please indicate which water-using systems are present in your plant. Select systems that are present; this will activate corresponding rows in this table and throughout the tool. Enter the name of the system in yellow cells where highlighted.

Water-Using System			Comments
Process:	☑	Process 1	
	☐		
	☐		
Cooling Tower for:	☑	Process 1	
	☑	Air Conditioning	
	☐		
Boiler for:	☑	Facility Needs	
	☐		
Kitchen and Restrooms	☑		
Landscaping and Irrigation	☑		
Other System:	☐		
Onsite Water Treatment	☑		
Onsite Wastewater Treatment	☑		

You may specify up to:
- 3 **processes** (e.g., based on product type or subprocess), if you wish to analyze them separately;
- 3 **cooling tower systems** (e.g., for separate cooling/condensing loads, such as process, power generation, and air conditioning);
- 2 **boiler systems** (e.g., for separate heating loads, such as power generation, and facility needs).

Specify cooling tower and boiler systems separate from processes and water-using systems they serve.

Part 3.1 - Process Water Use

This table calculates process water use in the plant. You may describe multiple applications for a process (e.g., product type or subprocess). Please select the process and enter required data in the highlighted cells.

Process Application	Water Required for Processing	Process Water Consumed in Product	Process Water Losses (Evaporation/ Other)	Production Units per Year	Hours Water Used per Year	Fraction of Gross Water Use Recirculated	Total (Million Gallon per Year)					
							Gross Water Use	Source Water + Water from Other Systems	Wastewater Discharge + Recycled to Other Systems	Process Water Consumed in Product	Process Water Losses (Evaporation/ Other)	Recirculated Water
	Gallon per Production Unit	Fraction of Incoming Water						Incoming	Outgoing (Leaving the System)			
Process: Process 1	3.2			1,500,000.0		0.2	4.8	3.84	3.84	-	-	0.96
Process: Process 1	2.0	0.25		1,500,000.0			3.0	3.0	2.25	0.75	-	-
							-	-	-	-	-	-
							-	-	-	-	-	-
							-	-	-	-	-	-
							-	-	-	-	-	-
Aggregated Results												
Process: Process 1							7.8	6.84	6.09	0.75	-	0.96
-							-	-	-	-	-	-
-							-	-	-	-	-	-

Part 3.2 - Cooling Tower Water Use

This table calculates cooling tower water use in the plant. Please select the applicable cooling/condensing system and enter required data in the highlighted cells.
For "Load (Fraction of Chiller Tonnage)," the typical range is 0.5-0.8. For "Evaporation Rate per 10°F Temp. Drop," 0.85% is a typical value, and the typical range is 0.65% for moist climate to 1.0-1.2% for dry climate. For "Temp. Drop Across Cooling Tower," typical range is 10-15°F. For conductivity, first select "Conductivity Unit" from the drop-down list on the right and then enter data below.

Cooling Tower	Hours of Operation per Year	Cooling Tower Tonnage	Load Factor (Fraction of Tonnage)	Evaporation Rate per 10°F Temp. Drop (%)	Temp. Drop Across Cooling Tower (°F)	Makeup Water Conductivity	Blowdown Conductivity	Million Gallon per Year (% of Gross Wat			
								Gross Water Use	Incoming	Outgoing	
						µS/cm	µS/cm		Makeup Water	Blowdown	Eva
Cooling Tower for: Process 1	2,912	250	0.8	0.85%	10	600	1,800	105 (100%)	1.34 (1.28%)	0.446 (0.425%)	0.89
Cooling Tower for: Air Conditioning	2,000	75	0.78	0.85%	10	600	1,800	21.1 (100%)	0.269 (1.28%)	0.0895 (0.425%)	0.17
								-	-	-	
								-	-	-	
								-	-	-	
								-	-	-	
Aggregated Results											
Cooling Tower for: Process 1								105 (100%)	1.34 (1.28%)	0.446 (0.425%)	0.89
Cooling Tower for: Air Conditioning								21.1 (100%)	0.269 (1.28%)	0.0895 (0.425%)	0.17
-								-	-	-	

Part 3.3 - Boiler Water Use

This table calculates boiler water use in the plant. Please select applicable water systems and enter required data in the highlighted cells.
"Steam Generation Rate per Horsepower" is 34.5 lb/h at 212°F. For conductivity, first select "Conductivity Unit" from the drop-down list on the right and then enter data below.

Boiler	Hours of Operation per Year	Boiler Horsepower (BHP)	Load Factor (Fraction of BHP)	Steam Generation Rate (lb/h) per BHP	Feedwater Conductivity	Makeup Water Conductivity	Blowdown Conductivity	Million Gallon per Year (% of Gross Wat			
								Feedwater	Makeup Water	Blowdown	Ste
					µS/cm	µS/cm	µS/cm		Incoming	Outgoing	
Boiler for: Facility Needs	2,912	500.0	0.78	34.5	450	600	5,500	5.12 (100%)	3.84 (75%)	0.419 (8.18%)	3.4
								-	-	-	
								-	-	-	
								-	-	-	
								-	-	-	

Part 3.4 - Kitchen and Restrooms Water Use

This table calculates sanitary water use in the plant. You may describe multiple employee groups based on work hours. Please select the rows and enter required data. **For "Water Use per Employee," a typical range is 10-35 gallon per shift. The lower value is used when there are just toilets. A higher value is used where there are toilets, showers, and full kitchen services (e.g., food preparation and dishwashing).**

Description	Number of Employees	Workdays per Year	Daily Water Use per Employee (Gallon)	Gross Water Use (Million Gallon per Year)
Plant	150	250	30.0	1.125
Core Operations Building	25	365	30.0	0.274
				-
				-
				-
				-
TOTAL				1.399

Part 3.5 - Landscaping and Irrigation Water Use

This table calculates irrigation water use in the facility. You may describe multiple irrigated land areas or combine them as one area. Please select the rows and enter required data. **Please provide an estimate based on incoming water from (a) sources identified under Part 2.1 and (b) water-using systems in the plant.**

Description	Area of Land Irrigated (sq ft)	Inches of Irrigation Water per Year	Gross Water Use (Million Gallon per Year)
Lot A	68,000	36.0	1.525
Lot B	10,000	52.0	0.324
			-
			-
			-
			-
TOTAL			1.849

Part 4.1 - System Gross Water Use

For EACH water-using system, please provide an estimate of water use originating from different paths. ***Note:*** *You may use values in the purple cells, which were calculated in previous tabs, as a guide for your estimates in yellow cells, as shown below:*

** Use calculated Incoming Water (Source Water + Water From Other Systems) for user estimate for Source Water and Water From Other Systems.*

** Use calculated Recirculated Water for user estimate for Recirculated Water.*

** Use calculated Gross Water Use to cross-check TOTAL of User Estimate of Water Use.*

Water-Using System	Water Flows Calculated on Tab 3 (Million Gallon per Year)			Water Use (Measured or Estimated) (Million Gallon per Year)			
	Incoming Water (Source Water + Recycled From Other Systems)	Recirculated Water	Gross Water Use	Incoming Water		Recirculated Water	**Total (Gross Water Use)**
				Source Water	Recycled Water From Other Systems		
Process: Process 1	6.84	0.96	**7.8**	6.8		0.96	**7.76**
-	-	-	**-**				**-**
-	-	-	**-**				**-**
Cooling Tower for: Process 1	1.337	103.495	**104.832**	1.3		100.0	**101.3**
Cooling Tower for: Air Conditioning	0.269	20.791	**21.06**	0.3		20.79	**21.09**
-	-	-	**-**				**-**
Boiler for: Facility Needs	3.841	1.28	**5.121**	3.85		1.28	**5.13**
-	-	-	**-**				**-**
Kitchen and Restrooms	1.399	-	**1.399**	1.4			**1.4**
Landscaping and Irrigation	1.849	-	**1.849**		1.85		**1.85**
-							**-**
TOTAL	**15.533**	**126.527**	**142.06**	**13.65**	**1.85**	**123.03**	**138.53**

Note: *System-level TOTAL for Source Water should closely match with plant-level ANNUAL TOTAL calculated in Part 2.1, also shown here in the purple cell.* 13.2

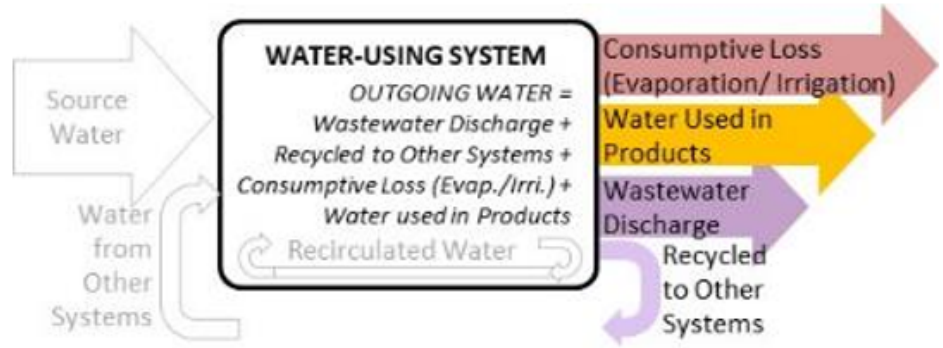
Part 4.2 - System Water Outflow

For EACH water-using system, please provide an estimate of water outflow to different paths.

Note: *You may use values in the purple cells, which were calculated in previous tabs, as a guide for your estimates in yellow cells, as shown below:*

** Use calculated Wastewater Discharge + Recycled To Other Systems for Estimated Wastewater Discharge and Recycled To Other Systems.*

** Use calculated Known Losses (Evaporation/ Other) for Estimated Known Losses (Evaporation/ Other).*



Water-Using System	Water Flows Calculated on Tab 3 (Million Gallon per Year)			Outgoing Water (Measured or Estimated) (Million Gallon per Year)			
	Wastewater Discharge + Recycled To Other Systems	Known Losses (Evaporation/ Other)	Water Consumed in Product	Wastewater Discharge	Recycled To Other System	Known Losses (Evaporation/ Other)	Water Consumed in Product
Process: Process 1	6.09	-	0.75	4.7	1.33		0.375
-	-	-	-				
-	-	-	-				
Cooling Tower for: Process 1	0.446	0.891			0.43	0.87	
Cooling Tower for: Air Conditioning	0.09	0.179			0.09	0.18	
-	-	-					
Boiler for: Facility Needs	0.419	3.422		0.4		3.422	
-	-	-					
Kitchen and Restrooms	1.399			1.4			
Landscaping and Irrigation		1.849				1.85	
-							
TOTAL	**8.443**	**6.341**	**0.75**	**6.5**	**1.85**	**6.322**	**0.375**

Note: *System-level TOTAL for Wastewater Discharge should closely match with plant-level ANNUAL TOTAL calculated in Part 2.2, also shown here in the left purple cell.*

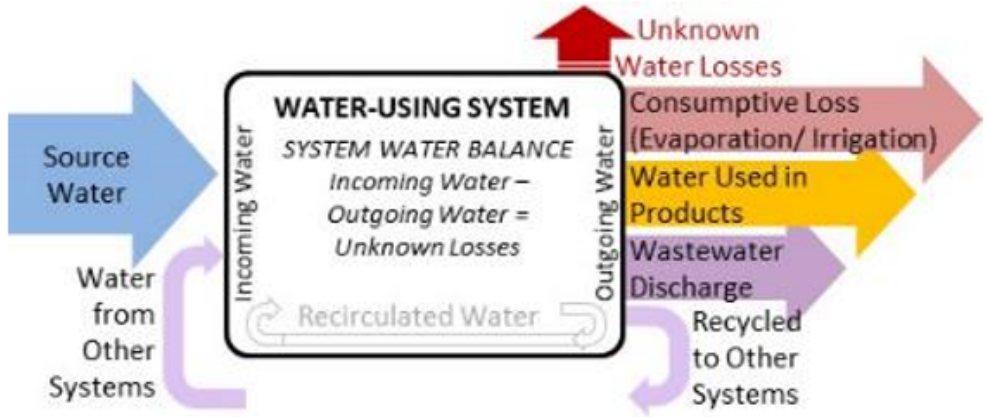
6.36	1.85

Note: *System-level TOTAL for Recycled Systems calculated in Part 4.1, also sho*

Part 4 Results - System Water Balance

This table shows the water balance for each system in your plant. Based on the data you have provided, it compares total incoming water with total outgoing water to estimate unknown water losses for each system.

***Note** : A positive water imbalance may mean overestimated incoming water, underestimated outgoing water, and/or unknown water loss in the system. A* negative water imbalance *may mean underestimated incoming water, overestimated outgoing water, and/or unaccounted incoming water to the system. You may refine your estimates in Tab 3, Part 4.1 and Part 4.2 and revisit system water imbalance, especially, if the water flows are unmetered.*



Water-Using System	Total System Water (Million Gallon per Year)			Water Imbalance (%)	
	Incoming Water	Outgoing Water	Water Imbalance	(% of Incoming Water)	(% of Total)
Process: Process 1	6.8	6.405	0.395	5.8%	87.2%
-	-	-	-	-	-
-	-	-	-	-	-
Cooling Tower for: Process 1	1.3	1.3	-	-	-
Cooling Tower for: Air Conditioning	0.3	0.27	0.03	10.0%	6.6%
-	-	-	-	-	-
Boiler for: Facility Needs	3.85	3.822	0.028	0.7%	6.2%
-	-	-	-	-	-
Kitchen and Restrooms	1.4	1.4	-	-	-
Landscaping and Irrigation	1.85	1.85	-	-	-
-	-	-	-	-	-
ANNUAL TOTAL	**15.5**	**15.047**	**0.453**		**100.0%**

Plot Area

Part 8.1 - Heat Energy in Wastewater Leaving the Plant

This table calculates the heat energy in wastewater leaving the plant. For each water-using system, please provide the average temperature of incoming source water and outgoing wastewater.

Heating Efficiency:	0.78

Water-Using System	Water Temperature (°F)		Temperature Rise (°F)	Quantity of Wastewater Discharge (Million Gallon)	Heat Energy in Wastewater (MMBtu)
	Incoming Source Water	Outgoing Wastewater			
Process: Process 1	75.0	95.0	20.0	4.7	1,006
-			-	-	-
-			-	-	-
Cooling Tower for: Process 1			-	-	-
Cooling Tower for: Air Conditioning			-	-	-
-			-	-	-
Boiler for: Facility Needs	75.0	110.0	35.0	0.4	150
-			-	-	-
Kitchen and Restrooms			-	1.4	-
Landscaping and Irrigation			-	-	-
-			-	-	-
TOTAL					1,156

Part 8.2 - Pump, Fan and Motor Energy

This table calculates the electricity use associated with pump, fan and other motor-driven equipment to use water in your plant. Please select the water-using system from the drop-down lists and enter data in the highlighted cells.

Water-Using System	Description	Number	Hours of Operation per Year	Load Factor	Horsepower	Efficiency (%)	Energy Use (kWh)
Process: Process 1	Service Water Pum	1	8,760	0.7	25.0	91.0%	125,672
Cooling Tower for: Process 1	Hot Well Pumps	2	8,760	0.7	100.0	91.0%	1,005,378
Cooling Tower for: Process 1	Cold Well Pumps	2	8,760	0.7	50.0	91.0%	502,689
Cooling Tower for: Process 1	Fans	2	4,800	0.7	25.0	91.0%	127,722

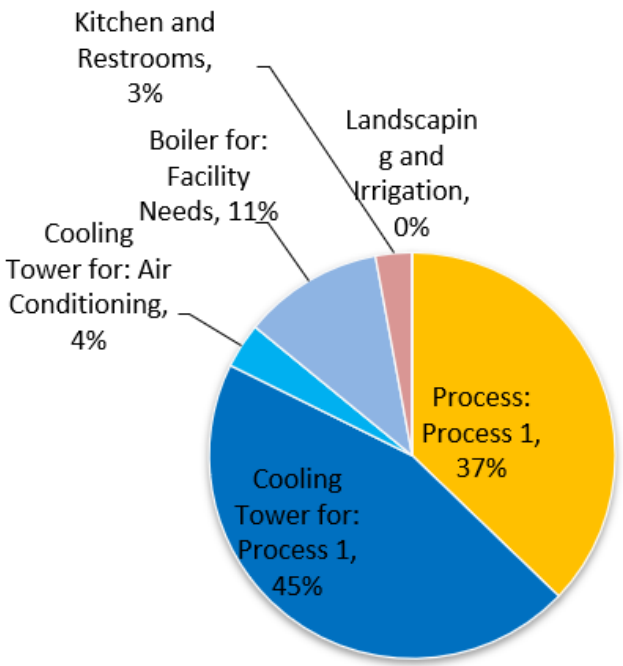
Part 10.2 - System-Specific Water Efficiency Measures Implemented in Your Plant

Please indicate if the following system-specific water efficiency measures are implemented in your plant. Select NA if a measure is not applicable to your plant or its water-using systems.

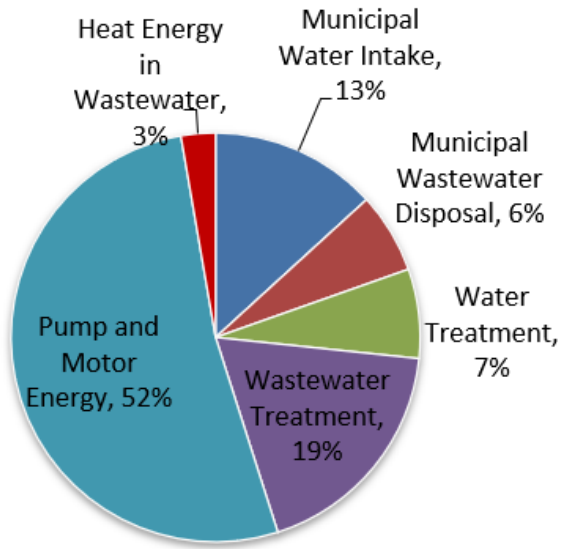
Process: Process 1

Have you installed equipment (e.g., timers, solenoids, level/pressure switches) to automatically shut off water flow when water is not required, such as at the end of a production cycle?	No
Are solenoids and automatic shutoff mechanisms checked regularly to ensure that they are working properly?	No
Is equipment set to the minimum flow rates recommended by the manufacturer?	No
Have pressure-reducing devices been installed on equipment that does not require high pressure?	No
Does process equipment reuse water (i.e., closed loop) or use reclaimed water from other parts of the facility?	No
Have you replaced water-based transportation with either waterless techniques or recycled water?	No
Are signs posted near equipment encouraging employee awareness of water use and discouraging tampering with equipment flow rate?	No
Are all hoses equipped with an automatic shutoff nozzle?	No
Has process cleaning or facility cleaning been replaced with or supplemented by waterless techniques (e.g., burnout ovens, ultrasonic cleaning) where	No
Are improved rinsing techniques used and optimized: counter-current systems?	No
Are improved rinsing techniques used and optimized: sequential use from high to lower quality needs?	No
Are improved rinsing techniques used and optimized: conductivity flow controls?	No
Are improved rinsing techniques used and optimized: improved spray nozzles/pressure rinsing?	No
Are improved rinsing techniques used and optimized: fog rinsing?	No
Is spent rinse water reclaimed and reused for lower grade processes or for other facility applications?	No
Have steps been taken to reduce the water used by open steam sterilizers (e.g., utilizing jacket and chamber)?	No
Are you using detergents that can easily be removed with little water?	No
Is water used for cleaning submetered?	No
Are the flow parameters for cleaning systems monitored periodically?	No
Are employees aware of deionized/reverse osmosis (or other specially treated) water use?	No
Are conductivity controllers used in rinses?	No
At wash station, are booster pumps used with low-pressure water instead of high-pressure water?	No

True Cost of Water by System



True Cost of Water by Cost Component



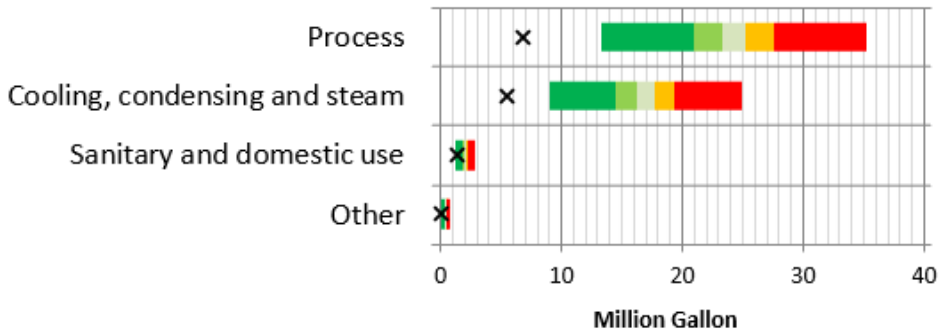
These charts present the percent distribution of **true cost of water** by different water-using systems in your plant (left) and by cost components (right).

By identifying systems and cost components that are contributing the most towards true cost of water, you may **prioritize measures to focus on them.**

Part 5: Water Savings Opportunity

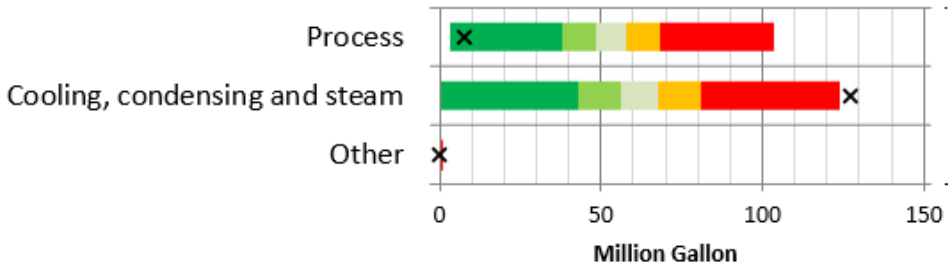
5.1 Comparison with Industry Average

Source Water Intake



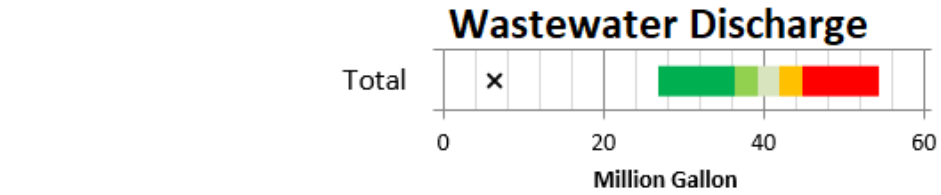
	Percentile	Comments
Process	100%	
Cooling, condensing and steam	100%	
Sanitary and domestic use	98%	
Other	98%	Industry has high variance in data

Gross Water Use



	Percentile	Comments
Process	99%	
Cooling, condensing and steam	0%	Industry has high variance in data
Other	97%	Industry has high variance in data

Wastewater Discharge



	Percentile	Comments
Total	100%	

X : Plant

> 80%	60-80 %	40-60%	20-40%	< 20%	**: Percentile Ranges***

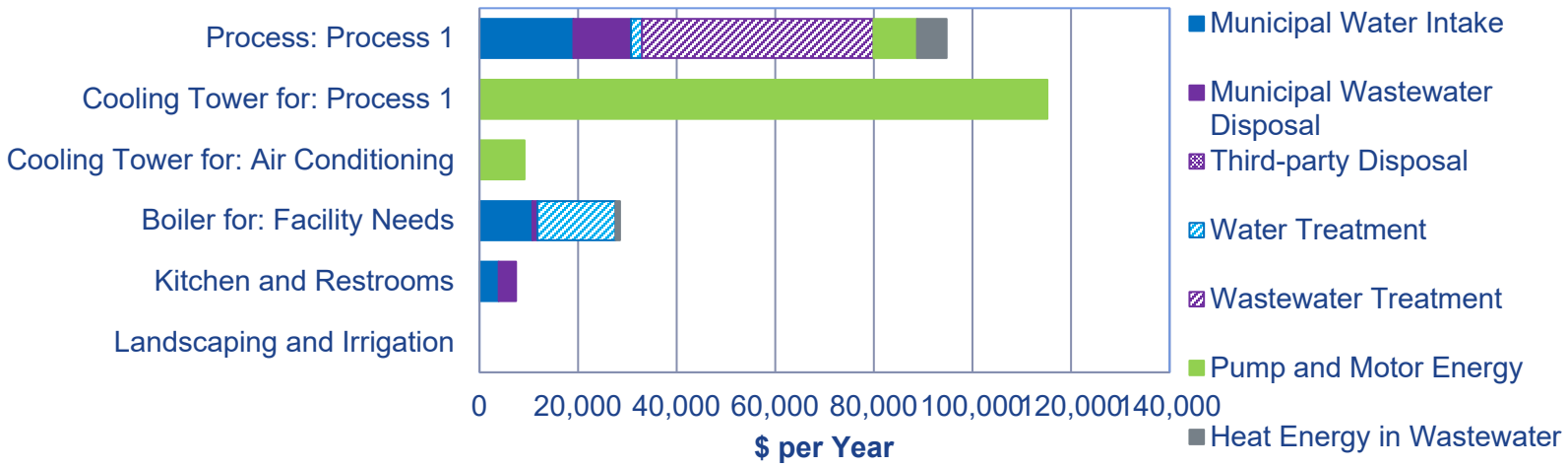
These charts compare water flows in your plant (marked as X) with those in the same industry subsector.

*** Percentile represents the percentage of similar facilities with a higher water usage.**

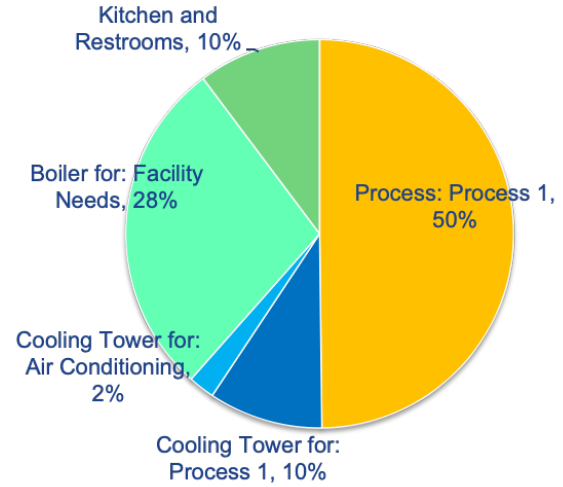
The percentiles are determined using data from STATCAN, Canada's statistics agency. Average water use for each industry was determined using total water use data and number of facilities for each 3-digit NAICS code. The standard deviation was derived using the reported coefficient of variance "grade" for each reported value.

PWP provides comprehensive results

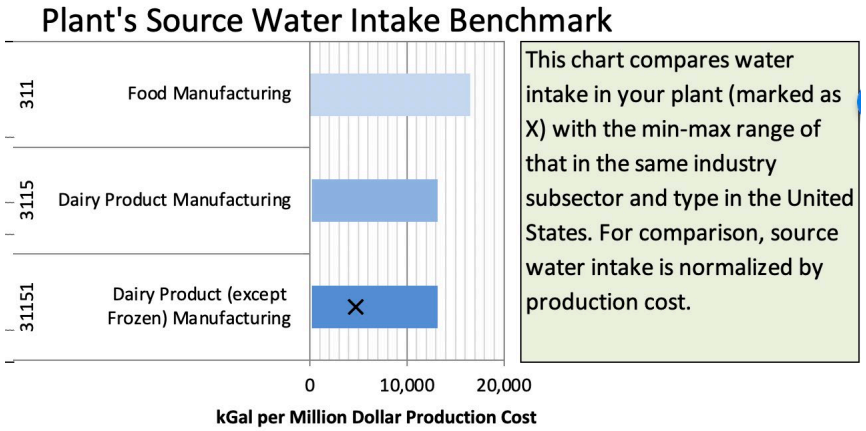
True Cost of Water



Water Intake by System



Comparison with Industry Average



Water Imbalance by System

Water-Using System	Incoming Water	Outgoing Water	Water Imbalance		
	Million Gallon per Year		Million Gallon Per Year	% of Incoming Water	% of Total Loss
Process: Process 1	6.8	6.405	0.395	5.8%	87.2%
Cooling Tower for: Process 1	1.3	1.3	-	-	-
Cooling Tower for: Air Conditioning	0.3	0.27	0.03	10.0%	6.6%
....					
PLANT TOTAL	**15.5**	**15.047**	**0.453**	**16.5%**	**100.0%**

Other Resources

South Florida Water Management District *Water Efficiency and Self-Conducted Water Audits at Commercial and Institutional Facilities Guide*

https://www.sfwmd.gov/documents-by-tag/waterefficiency

Environmental Defense Fund, AT&T, & GEMI – Cooling Tower Trainings

Water Efficiency Toolkit with Scorecard and WaterMAPP Tool
http://gemi.org/EDFGEMIwaterMAPP/

City of Boulder Commercial, Industrial, and Institutional (CII) Water Assessment Tool and User's Guide – based on WaterSense at Work

https://www.brendlegroup.com/actions-insights/resources/

Conclusion

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