



The beverage producer's guide to optimizing water use ratio

Best practices for reducing water consumption —
without sacrificing plant efficiency.

ECOLAB[®]



A new era for water accountability

Today's leading beverage manufacturers face mounting pressure to improve their water use ratio (WUR) — and boards and executive teams are watching closely.

The focus is justified. Achieving a meaningfully lower ratio can reduce operating costs and drive greater supply security in water-scarce markets.

This eBook will share best practices for eliminating your hidden water waste from core processes — Clean-in-Place (CIP), reverse osmosis, and utilities — and delivering the water efficiency metrics your organization demands.

What's inside:

- 1 Trends Shaping Modern Water Management Initiatives
- 2 Benchmarking Your Plant's WUR
- 3 CIP: A Crucial Opportunity for Lowering Water Consumption
- 4 Reverse Osmosis: Maximize Yield Without Sacrificing Water Quality
- 5 Utilities: The Silent Contributor
- 6 A Total-Plant Partner for a Stronger WUR
- 7 Take Control of Your Plant's Water Use Ratio

Trends shaping modern water management initiatives

78%

of food, beverage, and agriculture (FBA) companies report board-level oversight of water issues¹

59%

of FBA companies have a formal water-related target metric¹

\$87.5B

aggregate financial risk exposure from water issues in the FBA sector¹

Sustainability goals are tied to the bottom line

Because the cost of inaction is moving toward outweighing the cost of mitigation, executive teams are transitioning from merely disclosing water data to demanding aggressive operational changes on the plant floor. In addition to larger regulations, local water stress can trigger permit reductions and limit facility expansions at any time, threatening daily output.

Water scarcity is a reality that's here to stay

Global freshwater demand is projected to outstrip supply by 40% before 2030.² Between regulatory scrutiny and rising withdrawal costs, driving down a plant's water use ratio is the most direct way to protect operations. By one analysis, it is estimated that up to 51% of studied beverage facilities will be operating in a medium to high water stress area in 2030.³

Energy consumption multiplies the cost of every liter

The financial and regulatory pressure is clear, but the cost of inaction goes beyond water itself. With up to 75% of a plant's energy spent on heating, pumping, and treating water, every liter wasted automatically drives up total utility costs and emissions.

1. CDP and Ecolab, "Driving Business Value through Water Disclosure and Innovation" (Water Use Efficiency Index Insights Brief), 2026.

2. Global Commission on the Economics of Water, "Turning the Tide: A Call to Collective Action," 2023.

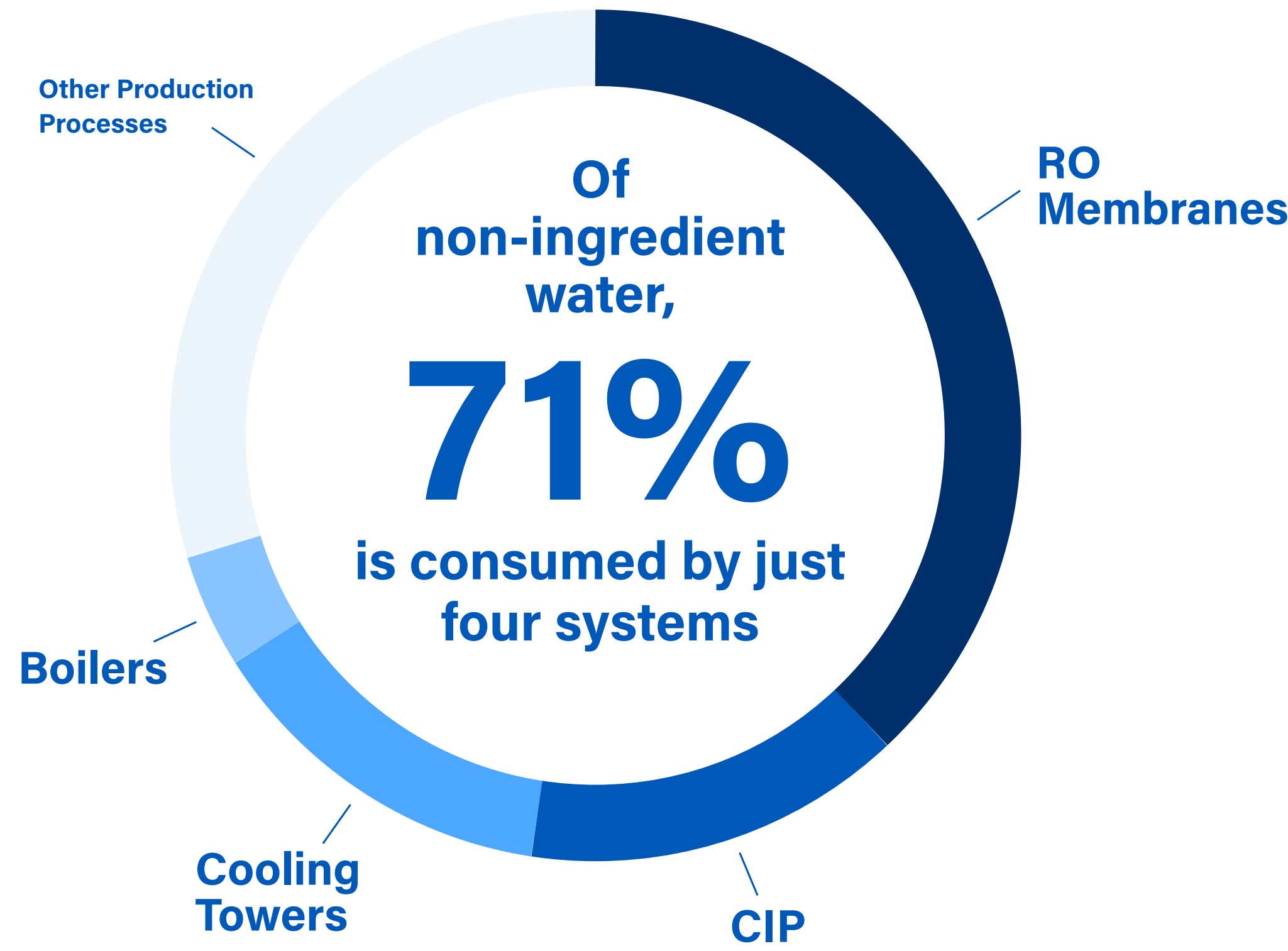
3. Beverage Industry Environmental Roundtable (BIER), "Beverage Industry Continues to Drive Improvement in Water, Energy, and Emissions Efficiency: 2023 Benchmarking Study Trends & Observations."

Benchmarking your plant's WUR

Water Use Ratio (WUR) measures the total liters of water required to produce one liter of finished beverage — expressed as l/l (liters per liter) or hl/hl for brewing (a single hectoliter equals 100 liters). It is the primary metric for tracking facility-level water efficiency. Many facilities have already addressed the easier efficiency opportunities to optimize their WUR, but achieving meaningful, sustained improvement depends more on plant-wide optimization.

Ecolab's operational data indicates that facilities typically hit a natural ceiling for WUR reduction — approximately 1.75 l/l for beverage facilities and 2.5 hl/hl for breweries. Breaking through this barrier requires moving beyond status quo adjustments and viewing the plant through the lens of water circularity.

A significant portion of water used by beverage manufacturers and breweries is used as ingredient water, but at the industry average WUR of 1.8, 44% of all water withdrawn never reaches the bottle and 71% of that non-ingredient water is consumed by just four systems: RO membranes, CIP, cooling towers, and boilers.⁴



This eBook will focus on optimizing the three areas with the greatest potential

4. Ecolab Internal Analysis: Water balance data from Total Plant Assessments conducted across 100+ global beverage facilities.

CIP:

A crucial opportunity for lowering water consumption

In production, CIP can consume 8-12% of a beverage site's total plant water.¹ Because this water never makes it into the final product, it can become one of the heavier anchors on your plant's WUR. Optimizing wash cycles is the most impactful path to lowering the ratio and hitting your targets.

Best practices for CIP water reduction

Stop over-washing as risk prevention

Most CIP systems are programmed for worst-case scenarios, resulting in over-rinsing out of an abundance of caution. Transitioning from static, time-based flushes outlined in an SSOP to real time, soil-based rinsing eliminates this unnecessary volume. Every liter saved is a direct reduction in your WUR.

Conquer flavor carryover

The boogeyman of large beverage portfolios with high intensity tastes? Flavor carryover from pungent beverages. Removing pungent flavors often requires hotter, longer CIPs, which require additional time, energy, and water. Using advanced chemistries targeting flavor soils helps ensure product quality, while reducing water usage.

Know what you don't know yet

All facilities have CIP performance data, but not all facilities are using it to constantly improve their programs. That's because it's often scattered, maybe even in physical file storage. Centralized digital monitoring allows operators to pinpoint exactly where water is being over-allocated and dial it back without compromising product quality or food safety.

INNOVATION SPOTLIGHT

CIP IQ™ Precise Wash Module

Ecolab's CIP™ IQ Precise Wash module uses real-time soil data from advanced impedance sensors to help you fine-tune every CIP rinse – per line, per cycle. Precise Wash's AI-enhanced algorithms use data from 3D TRASAR™ for Precise Wash to monitor the rinse step and detect when soil is no longer actively being removed. This allows you to advance to the next step at the right time, with the confidence that the rinse is complete, enabling up to a 20% reduction in rinse time.¹

Synergex™ Sanitizer & Disinfectant

Advanced chemistries, such as Synergex™, enable complete flavor removal with a short, ambient-temperature CIP. It allows for the removal of pungent flavors without requiring longer, hotter CIPs that use excess water and energy. By doing so, Synergex helps protect the quality of your beverages while driving optimization in your CIP and contributing towards a lower WUR.



REVERSE OSMOSIS:

Maximize yield without sacrificing water quality

Membrane systems for ingredient water inherently consume water in order to purify water. If an RO system is running at a 75% recovery rate, 25% of the incoming water is being sent down the drain as reject concentrate. Every gallon of rejected water inflates your total withdrawal, driving your WUR in the wrong direction.

The goal is to safely push recovery rates higher—targeting optimized benchmarks of 80–85%—so that significantly less incoming water is required to produce the same volume of RO-filtered water.

Best practices for RO water reduction

DATA:

Stop guessing about membrane health

Raw RO data is often misleading because it doesn't account for daily fluctuations in temperature, pressure, or conductivity. By tracking normalized data instead, operators can isolate the true indicators of system health. With these insights, plants can intervene before performance declines, maintaining steady output and reducing downtime.

CHEMISTRY:

Protect against feedwater variability

Since the quality of incoming city or well water is never static, rigid pretreatment programs inevitably fail. When incoming water spikes in hardness or organics, membranes foul faster, forcing the plant to drop its recovery rate to compensate. Deploying adaptable, targeted chemistries neutralizes these incoming threats and extends the time between heavy wash cycles.

EXPERTISE:

Break the fixed-cleaning cycle

Many facilities clean their membranes on a rigid calendar schedule, while others wait until performance has already crashed. Both approaches waste enormous amounts of water. A truly optimized RO program relies on the expertise to interpret normalized data and execute condition-based cleaning—ensuring the plant only consumes water for CIP when the membranes actually need cleaning.

INNOVATION SPOTLIGHT

3D TRASAR™ Technology for RO

Ecolab's 3D TRASAR™ for RO provides continuous, real-time visibility into system health through automated reporting and actionable insights. By eliminating reliance on manual data collection and specialized labor, it gives operators the intelligence they need to identify the earliest signs of fouling or performance drift.

Because the system constantly monitors key performance indicators—including antiscalant concentrations—plants can intervene based on real-time performance data. This proactive visibility allows producers to safely maximize their RO recovery rates, extracting the maximum amount of usable ingredient water from every liter withdrawn while protecting their membranes and avoiding unplanned downtime.



UTILITIES:

The silent contributor

For facilities that manage their own on-site utilities, systems like cooling towers, boilers, and pasteurizers are often the hidden anchors dragging down water efficiency. Because they operate 24/7, even minor inefficiencies compound rapidly. For example, a cooling tower operating below optimal cycles of concentration will endlessly demand fresh makeup water, inflating your WUR every hour the plant runs.

Best practices for utility water reduction

Maximize Cycles of Concentration

In cooling and boiler systems, the goal is to safely reuse the same water as many times as possible before blowing it down. By safely pushing cycles of concentration higher, facilities can reduce their fresh makeup water demand and pull their total WUR down.

Optimize Pasteurizer and Warmer Treatment

Tunnel pasteurizers are highly susceptible to biological growth and scale. Proper chemical treatment prevents the need for massive, water-wasting dump-and-fill cleanings while protecting package integrity.

Deploy Continuous Performance Monitoring

Manual water testing leaves facilities vulnerable to rapid shifts in water chemistry. Continuous monitoring allows for instant correction, preventing the scale and corrosion that negatively impact heat transfer efficiency and cause unnecessary water usage.

INNOVATION SPOTLIGHT

Manual water testing leaves 24/7 utility operations vulnerable to rapid, unseen shifts in chemistry. Ecolab's 3D TRASAR™ technology acts as the central nervous system for your utility water, replacing manual checks with continuous, real-time control.

3D TRASAR™ for Cooling Towers

3D TRASAR™ continuously measures conductivity, pH, and turbidity—automatically adjusting chemistry to safely maximize cycles of concentration.

3D TRASAR™ for Boilers

3D TRASAR™ detects pre-boiler corrosion the exact moment it starts. This automated oversight prevents the scale and corrosion that destroy heat transfer efficiency and force massive, water-wasting blowdowns.

Managing the Effluent Paradox

As facilities reduce their WUR, less dilution can increase the concentration of salts and organics in wastewater streams. Addressing it properly requires a more circular approach to water management. By applying the R3 framework—reduce, reuse, and recycle—facilities can cut water demand and find opportunities to repurpose water where appropriate. This helps lower WUR while maintaining control of effluent quality.

A total-plant partner for a stronger WUR

The modern beverage plant is a highly interdependent ecosystem. Lowering your WUR requires a strategy that accounts for the entire facility's footprint. If a plant successfully reduces water usage during CIP, the resulting concentrated effluent can trigger a failure in a wastewater compliance audit. Even a well-intentioned reduction in utility blowdown can easily compromise heat exchange efficiency if the water chemistry isn't perfectly balanced.

With Ecolab, you stop trading one operational risk for another.

Driving real, sustainable change to your WUR requires a partner capable of managing these exact interdependencies. Ecolab combines advanced chemistry with real-time, data-driven visibility to ensure that an efficiency gain in one area never creates a costly bottleneck downstream.

It's a holistic alignment that allows beverage producers to finally break through their efficiency ceilings and gain the operational control needed to meet aggressive sustainability targets without risking production continuity.



Take control of your plant's water use ratio

Schedule a health assessment with Ecolab and discover how a total-plant approach can lower your WUR and prepare your facility for a water-scarce future.

Visit ecolab.com/sustainablebeveragebook for more information

