



E-BOOK

Balancing the Challenges of Sustainable Brewing

Essential Considerations & Strategies to
Protect Performance, Quality & Sustainability





Table of Contents

INTRODUCTION:

Sustainability Adds New Layers to Brewers' Balancing Acts

KEY GOALS:

- Reduce Energy Consumption
- Minimize Water Usage
- Maintain Wastewater Compliance
- Beer Production
- Minimize Food Safety Risks
- Protect Assets

CONCLUSION:

Sustainable Brewing Is Future-Proof Brewing

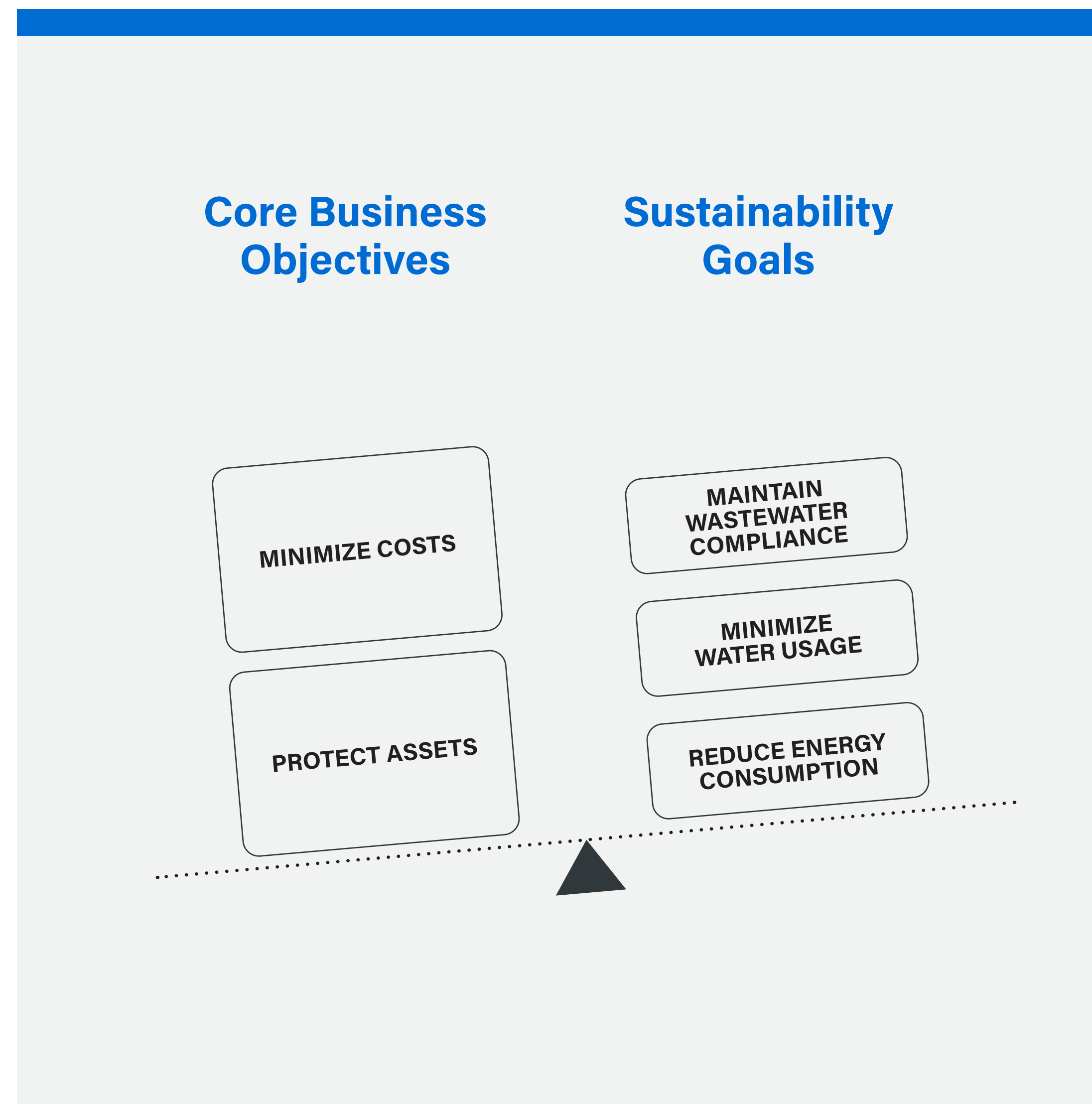


Sustainability Adds New Layers to Brewers' Balancing Acts

It's never been easy to run a brewery. You're tasked with creating a great product and producing it at a consistently high level of quality – all while balancing the bottom line to drive profitable business growth.

But today, leading brewers of all sizes increasingly elevate environmental, sustainability and governance (ESG) initiatives as core tenets of future-ready growth strategies. Sustainable brewing practices play a critical role not just in meeting consumer and investor demands. More sustainable brewing practices will be vital in adapting to increasing resource scarcity – water, wastewater treatment capacity, energy, labor – to ensure operational resiliency and reduce impediments to growth.

The goals and requirements of sustainable brewing introduce new and heightened challenges in the balancing act of running a modern, sustainable brewing operation. This ebook will outline the intersection of emerging sustainability goals with the five interdependent objectives of all brewing operations.



KEY GOAL:

Reduce Energy Consumption

KEY STAKEHOLDER: Sustainability Manager

The brewing process is inherently resource-intensive, making it both a prime target and difficult candidate for sustainability initiatives. Over the last decade, the brewing industry, on average, has reduced the amount of energy used per liter of beer produced by nearly 20%¹. However, many brewers are approaching a hard limit. A certain level of energy consumption is unavoidable: You can't make beer without the heat required, and you can't have cold beer without refrigeration.

But one of the biggest sources of energy use outside of the brewing process itself is a brewery's cleaning, sanitizing and facility hygiene program. Cleaning and sanitization protocols typically involve huge volumes of hot water – at a high energy cost to heat. Brewers need to look for strategies to balance the need for reliably effective cleaning and sanitization with opportunities to reduce energy costs of these processes.

1. https://www.brewersassociation.org/attachments/0001/1530/Sustainability_Energy_Manual.pdf





Sustainability Considerations

How can we reduce the amount of hot water utilized in cleaning and sanitizing protocols?

How can we improve the energy efficiency of brewing equipment?



Sustainability Strategies to Protect Food Safety & Quality

Streamlining daily cleaning regimens

Modernizing cleaning and sanitization protocols to take advantage of state-of-the-art products and technologies can drive significant reduction in resources consumed in cleaning, while delivering meaningful efficiencies to reduce downtime.

Ambient-temperature cleaning & sanitization

Certain advanced chemistries are designed to be highly effective without requiring hot water, significantly reducing energy costs associated with the cleaning program.

Improved cleaning efficacy

Better cleaning products deliver more reliable and efficacious cleaning outcomes, removing scale and other mineral and microbiological buildups that can lead brewing equipment to operate with less energy efficiency.

KEY GOAL:

Minimize Water Usage

KEY STAKEHOLDER: Sustainability Manager

Beer is roughly 95% water – but brewing a barrel of beer requires substantially more than a barrel of water. While the industry average across all sizes of breweries is often cited as 7:1, many breweries have made significant headway in reducing water usage, with many currently achieving a 3:1 ratio.² Now, leading brewers are establishing plans to reach an average of 2 liters of water per liter of beer by 2030 or sooner.

As with energy consumption, the brewing process itself is just one source of water use. In fact, research suggests more than half (51%) of water usage in the typical brewery goes to cleaning, sanitization and facility hygiene processes.³ These processes provide prime targets for sustainable strategies to reduce water usage. The challenge is to find water-use reduction strategies that don't come at the expense of cleaning efficiency or cleaning effectiveness. Breweries don't want to add production-sapping downtime, and they can't afford to risk product quality or food safety.

2. https://www.brewersassociation.org/attachments/0001/1517/Sustainability_-_Water_Wastewater.pdf
3. <https://www.brewer-world.com/water-usage-in-breweries/>





Sustainability Considerations

How can we decrease the overall water usage of cleaning and sanitizing protocols?



Sustainability Strategies to Protect Food Safety & Quality:

Streamlining cleaning and sanitizing protocols

Modern cleaning and sanitizing chemistries enable daily regimens to be completed in less time. Higher cleaning and sanitizing efficacy means less time (and thus less resources) required to achieve quality and food safety standards – with the added benefit of reducing production time lost to these daily tasks.

Minimizing rinsing requirements

Advanced cleaning and sanitizing products deliver no-rinse efficacy that eliminates the need for time- and water-intensive rinse steps. This simultaneously reduces water usage and production downtime.

Reducing deep-clean frequency

More effective cleaning products and protocols can reduce the need for deep-clean protocols that require substantial amounts of water and typically include significant rinsing requirements. Reducing deep-clean frequency cuts water usage, while minimizing these disruptive events.

KEY GOAL:

Maintain Wastewater Compliance

KEY STAKEHOLDER: Environmental Manager

The majority of water utilization in the brewing process does not end up in the barrel; it goes down the drain. Breweries must manage their wastewater carefully to protect their brand reputation and minimize costs. They must also avoid the worst case: when the wastewater system gets backed up to the point that production must be shut down.

To compound matters, as a brewery reduces the amount of water it uses, the percentage of contaminants remaining in the wastewater automatically increases. For example, a wastewater stream with 100 ppm of contaminants suddenly will have 200 ppm of contaminants if the brewery cuts that water stream by 50%. Since discharge permits are generally based on ppm ranges of contaminants, saving water makes wastewater compliance more difficult.

Breweries that choose to treat wastewater minimally are typically constrained by the capacity limits of municipal plants. This leads others to choose to process their wastewater themselves and discharge the “polished” effluent back into a nearby lake or river. While this strategy gives a brewery greater control and scalability, it obviously comes with much higher costs.





Sustainability Considerations

How can we improve the quality of effluent?

How can we reduce the volume of effluent?



Sustainability Strategies to Protect Food Safety & Quality

Concentrated cleaning chemistries

Modern cleaning and sanitizing products utilize concentrated formulations to deliver more reliable and higher-efficacy results while significantly reducing the total amount of chemistry in a brewery's wastewater. This often produces additional benefits in protecting assets from chemical wear and potentially reduces chemistry costs.

Reducing deep-clean frequency

Deep-clean and sanitization protocols often entail the use of harsher chemistries that have a more significant burden on wastewater. Enhancing daily cleaning and sanitization protocols reduces the frequency of these deep cleans, supporting wastewater quality while reducing downtime.

Recycle wastewater

Many breweries have begun investigating or implementing "zero liquid discharge" strategies to recycle most or all wastewater from brewing production.

KEY GOAL:

Beer Production

KEY STAKEHOLDERS: Brewing Manager / Packaging Manager / Quality Manager

A brewery's simplest goal, of course, is to produce as much beer as possible, given its production assets. But to stay in business, that beer needs to stay at a consistent, high level of quality from a taste perspective. A strong quality program – ensuring critical equipment is thoroughly cleaned and sanitized before each production run to prevent off-flavors and pathogens – has always required production tradeoffs: A thorough cleaning regimen requires production lines to be shut down, eating into beer production capacity. Cleaning activities also incur high costs in terms of water, energy and chemistry – costs that do not directly translate to higher production and business revenue.

Now, sustainability introduces a third consideration into this balance: Brewers need to build modernized quality programs that protect product quality – while maximizing production uptime and minimizing resource consumption.





Sustainability Considerations

How can we reduce energy consumption without reducing production capacity?

How can we minimize water usage without impacting capacity or quality?

How can we increase production while managing/reducing wastewater burden?



Sustainability Strategies to Protect Food Safety & Quality

Reducing deep-clean frequency

Advanced cleaning and sanitizing chemistries can more effectively remove residues to reduce the frequency of more intensive deep-clean protocols – cutting downtime while reducing water, chemistry and energy usage.

Minimizing quality-related production disruptions

These same advanced cleaning chemistries can reduce the risk of a quality control issue causing more serious production disruption.

Streamlining daily cleaning regimens

Modernizing cleaning and sanitization protocols to take advantage of state-of-the-art products and technologies can drive significant reduction in resources consumed in cleaning, while delivering meaningful efficiencies to reduce downtime.

KEY GOAL:

Minimize Food Safety Risks

KEY STAKEHOLDERS: Quality Manager / Sanitarian

Food safety is inextricably linked with product quality in brewing operations. In between batches, brewers must clean and sanitize critical equipment like fermenters, bright beer tanks and fillers to eliminate soils and pathogens and minimize any risk to consumers. Food safety and quality programs can differ, depending on the type of beverage produced, the toughness and character of the soils, and the quality of the water in use at the brewery. Quality and food safety leaders also must make tradeoffs in their cleaning protocols: Some cleaning regimens require more steps and therefore take more time. Some are run at hotter temperatures and therefore use more energy and may impair asset life. Others have longer rinse requirements and hence use more water. The type and frequency of cleaning can impact wastewater discharge.

As you can see, quality and food safety programs impact nearly every other key outcome in a brewing operation. Brewers must manage these many trade-offs when determining the optimal cleaning and sanitizing program.





Sustainability Considerations

How can we reduce energy costs associated with cleaning and sanitization?

How can we clean and sanitize with less water?

How can we improve effluent/wastewater quality?



Sustainability Strategies to Protect Food Safety & Quality

Ambient-temperature cleaning & sanitization

Certain advanced chemistries are designed to be highly effective without requiring hot water, significantly reducing energy costs associated with the cleaning program.

Faster, low-/no-rinse cleaning protocols

Modern cleaning and sanitizing products use concentrated formulations that allow protocols to be completed faster and with less water. Some also eliminate or significantly reduce the need for rinse steps, further reducing water usage while delivering meaningful time savings.

Reducing chemistry usage to improve effluent quality

Better chemistry that enables reduced water usage directly lowers the wastewater burden of the brewing operation. In addition, more effective, concentrated cleaning products reduce the total amount of chemistry in the effluent.

KEY GOAL:

Protect Assets

KEY STAKEHOLDER: Engineering Manager

Brewery equipment is not cheap. A central tenet of effective operations focuses on protecting those expensive assets – taking strategic steps to lengthen their useful life and avoid the cost of premature replacement. A variety of factors impact an asset's lifespan, including scale buildup, corrosion, use of the wrong cleaning solutions, high temperatures, infrequent cleaning, or over-usage. Traditionally, the remedy to most of these factors involves non-production downtime. Brewers typically want long production runs, but long runs can hurt asset life and lead to costly repairs or premature replacement.

But by applying a sustainability lens to this challenge, brewers can begin to tweak their production processes and cleaning and sanitization protocols to leverage new chemistries and techniques that can effectively keep product quality and safety constant, while reducing the impact on equipment to extend lifespan and keep operations up and running longer.





Sustainability Considerations

How can we reduce the use of harsh, caustic cleaning and sanitizing chemistries?

How can we lower water temperatures for cleaning and sanitization protocols?

How can more effectively remove residues, without increasing resource consumption?



Sustainability Strategies to Protect Food Safety & Quality

More reliable residue removal

Modern cleaning products can more consistently and effectively remove scale and other residue that can damage and accelerate wear on tanks and other brewing equipment, while simultaneously streamlining cleaning to reduce water and energy usage.

Less-harsh chemistries

Advanced formulations of these modern cleaning products deliver better performance without requiring harsh, caustic chemistries. This helps protect assets from accelerated chemical wear, while improving wastewater quality.

Cool-water cleaning & sanitization

Many of today's advanced chemistries are designed to be highly effective without requiring hot water, significantly reducing energy costs and reducing wear on assets.

Sustainable Brewing is Future-Proof Brewing

Beer is a simple product with only four “official” ingredients: water, barley, yeast, and hops. But in today’s competitive environment, it is far from simple for a brewery to manage its many competing objectives. Any one of the four core goals is difficult to manage on its own. The interdependencies among them further complicate matters. Layering in sustainability goals around reducing energy usage, water consumption and wastewater burden adds a new level of complexity to the challenge. Done well, this is a great balancing act. Done poorly, that balance becomes an endless teetering between competing objectives.

Today’s brewers are increasingly recognizing that sustainable strategies are much more than “greenwashing” to woo eco-conscious consumers. As energy and water costs rise and resource scarcity becomes a growing reality for more brewers, sustainable practices protect a brewer against these sources of volatility – protecting the bottom line while securing operational continuity.

Moreover, forward-thinking brewers are seeing that enhancing sustainability doesn’t have to require big capital outlays to upgrade major equipment. Many substantial and quick-win sustainability opportunities exist within the peripheral components of brewing production – the cleaning, sanitization and facility hygiene that supports

product quality, food safety and employee health. Implementing modern cleaning products and protocols serves to support all these essential sustainability goals, while driving cost-efficiency and performance – and helping to ensure that every bottle or can meets the highest quality standards.

Leaning on Expert Partners

Brewers should take pride in the progress already made on the sustainability front. But they don’t have to tackle this challenge on their own. Trusted vendor partners like Ecolab can provide expert sustainability consultation, examining operational practices to identify opportunities to enhance energy efficiency, reduce water usage, and improve wastewater quality – while prioritizing production quality and performance.

Ecolab offers deep expertise, data-driven insights, and powerful innovations in the areas of sustainable cleaning and sanitizing solutions, microbiology, pest elimination, and water and wastewater management. With expertise across a wide variety of disciplines, and insights delivered by advanced digital programs, Ecolab works directly with many of the world’s best-known brewers to help them manage the interdependencies and arrive at well-balanced outcomes.

Learn more about Ecolab solutions for **commercial brewing** and **craft brewers** >