

Water Technologies & Solutions

LENNTECH
WATER TREATMENT SOLUTIONS

water and process solutions for the brewing industry



ready for the resource revolution





brewing industry: a sector in expansion

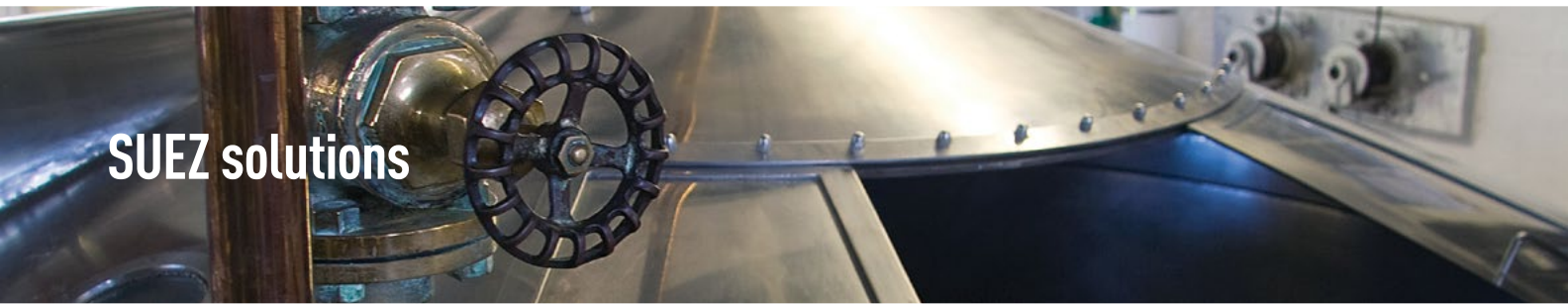
The global brewing market is continuing to expand, particularly in growth markets such as China and Brazil. In conjunction with this growth, there is an increasing focus on also creating a better and more sustainable world. Brewing companies are setting targets around reducing energy and water consumption as well as decreasing their overall greenhouse gas (GHG) emissions.

The brewing process—including the actual brewing, cleaning of vessels and producing the power needed to run a brewery—is both energy and water intensive. Breweries are making significant strides in reducing the energy and water needed; in the early days of the industry, producing one hectoliter of beer required using five times as much water. Today, many major brewers have set aggressive goals of reducing the water needed in the brewing process—potentially approaching and breaching 2 hl/hl.

With a global team of experienced professionals, SUEZ is uniquely positioned to deliver the solutions needed by brewers to create a more sustainable brewery, design more efficient ways to provide power, install water solutions to improve efficiency and water recycling and reuse, and provide the infrastructure necessary to use available resources more effectively.

Get to know more about SUEZ’s solutions and how we can help breweries to reduce their overall cost of operation while allowing increased production in a world of shrinking resources.

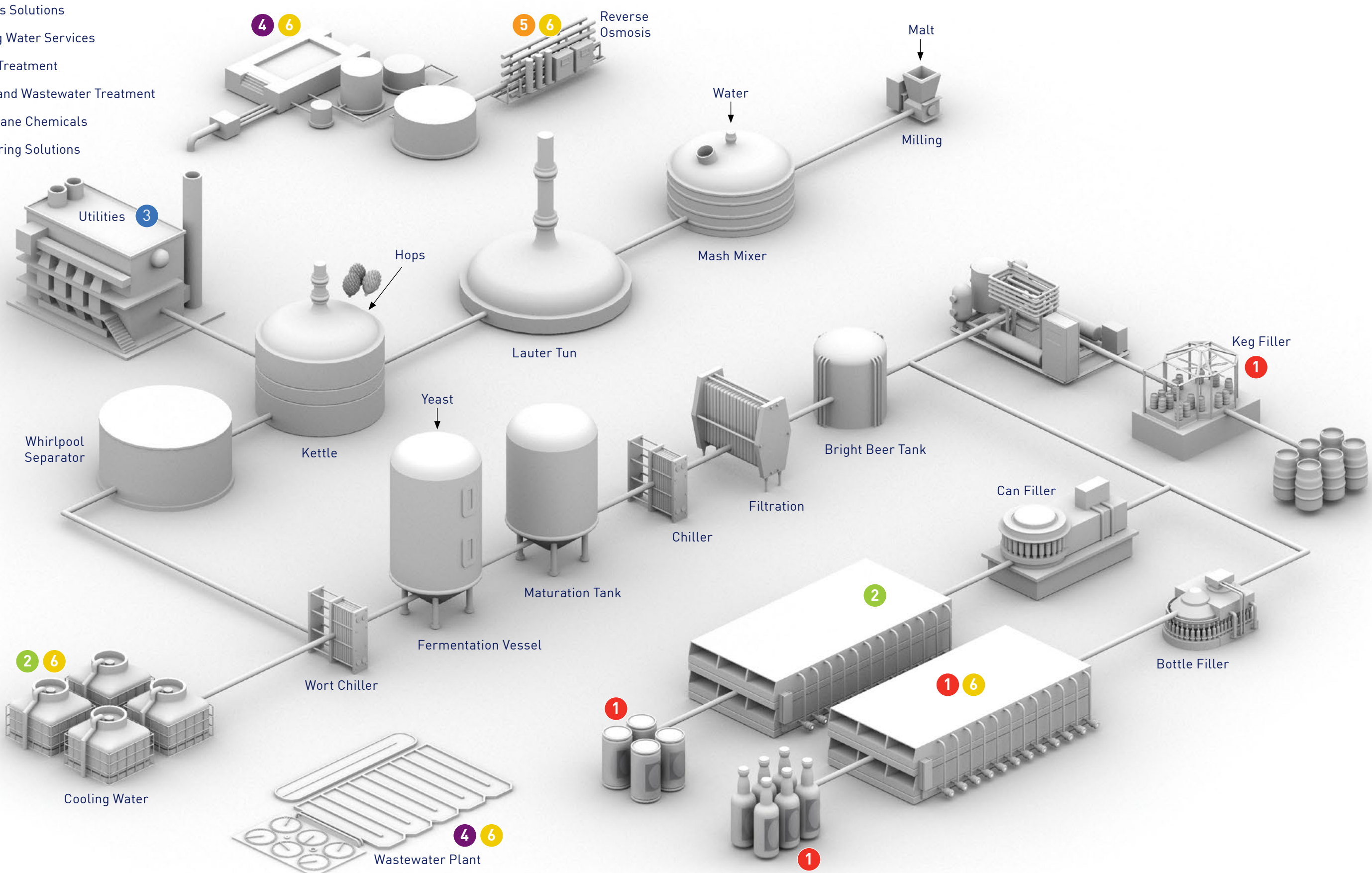
For more than a century, SUEZ has provided sustainable solutions to help customers around the globe address some of the world’s most pressing challenges. Today, SUEZ continues that commitment. We are a forward-thinking and thoughtful leader in developing the water, water recycling, wastewater treatment and process solutions our customers need to operate more efficiently and profitably, while minimizing their environmental footprint. Our goal is to help industries thrive and communities prosper.



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SUEZ solutions for the brewery industry

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tunnel pasteurizer

corrosion and scale control

During pasteurization of beer cans and bottles, corrosion can attack anywhere: the internal parts of the equipment made of different types of alloys, pipes, heat exchangers, recirculation pumps, screens, control equipment, jets, sprays, bottles' and cans' crowns, lids and caps. The treatment to avoid corrosion can be especially difficult when the water has a corrosive characteristic; the water in the pasteurizer is continuously circulated and is highly oxygenated.

Oxygen-saturated water can create a severe environment for corrosion, which is adversely influenced by low pH, carbon dioxide, dissolved solids and temperature. Proper water conditioning—achieved by utilizing the appropriate corrosion inhibitor and proper pH control—is required to minimize the potential for corrosion. Scale can also affect a pasteurizer's internals, damage can and bottle appearance, and impact heat exchanger and water spray efficiency. Scale results from poor treatment control, water quality and high can and bottle spoilage, causing product bio-fouling. The correct water treatment of beer pasteurizers must control scaling by managing proper dosage of scale inhibitors and dispersants.

microbiological control

One of the most challenging issues to control in a pasteurizer system, microbiological fouling can severely limit the performance of the system if not properly managed. Bacteria and fungi (aerobic and anaerobic) can be found in the compartments, pump screens and bulk water of the pasteurizers. Bacterial growth is enhanced by nutrients found in the water system due to container leakage and breakage, as well as contaminations from grain or yeast cells that are scrubbed out of the air in the cooling system.

Serious problems—such as odor, plugged spray nozzles, sump screen fouling and low efficiency of operation for the pasteurizer—may develop if microorganisms are not controlled. Scaling and corrosion are also increased by bio-fouling.

SUEZ provides a complete biocide and microbiological control program featuring products that can be used during running periods and also for holdover conditions.

off line cleaners

During the pasteurization process, cans and bottles often break. The content and the glass solids settle on the compartment surfaces. A collection of this debris, broken glass and slime can act as a haven for bacteria and deposit accumulation. If not quickly addressed, this causes offensive odors, affects the efficiency of pasteurization operations and compromises food and beverage safety.

can staining and spotting

To adhere to environmental regulations, breweries now use non-conversion coated cans. Originally, most cans were conversion coated through a process called "phosphating" or "chrome-phosphating," during which high concentrations of phosphate or chromium phosphate are applied to the metal to form a pretreatment prior to the application of the final layer—typically paint or lacquer. As this conversion coating practice has been changed such that fewer hazardous pretreatment chemicals are used, the cans are unprotected in the pasteurization and packaging process.

Can spotting, known as dome staining, occurs through a corrosion mechanism on the aluminum of the can material. Though it does not affect the quality of the beer, dome staining is an aesthetic problem characterized by the appearance of grayish spots on the cans. The problem can be sporadic at individual breweries or during certain operating conditions, and can usually be tracked back to cans with insufficient coating or to water conditions such as high alkalinity, pH, silica and chlorine residuals.

We understand the cause and implications of dome staining and can design and provide specific treatment programs to meet brewery needs and properly condition the water to prevent dome staining from the start. SUEZ offers Balanced Alkaline Technology (BAT) as a preventative option, along with treatment programs based on zinc, corrosion and scale inhibitors and surfactants.

spent grain recovery system

Spent grain from the brewing process is generally concentrated through the use of dewatering equipment, evaporation, or a combination of both. Once recovered, the spent grain is sold as an animal feed supplement. To enhance the dewatering operation, SUEZ provides U.S. Food and Drug Administration (FDA) approved polymers and deposit control agents to enhance the spent grain recovery process.

anti-scuffing

During the washing process, glass bottles are subject not only to chemical attack, but also to attack from abrasion and friction, which can lead to scuffing. Often used to remove dirt, debris and labels from both the inside and outside of the bottles, caustic can also compromise the glass structure as both calcium and silica ions are released. This has the effect of reducing the protective layer, causing the glass to begin dissolving.

Helping combat these issues, SUEZ's FoodPro* DCF product line is used as a cleaning and anti-scuffing agent, reducing mass loss of glass bottles by over 50 percent.

process solutions

Commonly, the pasteurizer is taken out of service and boiled-out every two to three months, using caustic or other chemicals for cleaning. If the brewery is under high production demands or improper microbiological control conditions, more frequent boil-outs are required, leading to higher water and chemical consumption, elevated wastewater generation, and more downtime when pasteurizers are out of service. A proper pasteurizer treatment would help increase the equipment campaign, consequently reducing chemicals and wastewater.

SUEZ has formulated and tested a specially formulated boil-out program for pasteurizer cleaning, which has been proven effective in many ongoing applications. SUEZ boil-out products are added directly to compartments to establish between a 0.5-5 percent strength solution. The solution is then heated and circulated, resulting in:

- Cleaned pasteurizer surfaces
- Improved heat transfer efficiency
- Less frequent boil-out
- Higher production throughput

bottle and keg washers

Labels, organic debris and other soils must be cleaned off of returnable glass bottles and kegs. Bottles are washed in a 1–2 percent caustic solution, and a mix of detergents and other cleaning additives is used to improve cleaning. SUEZ offers a range of solutions, including:

- Scale inhibitors to be used in the rinse zones to inhibit inorganic scale formation
- Surfactant mix to support label removal
- Silicon-free defoamers

crown and cork corrosion

Crown corks and bottle caps are made of mild steel, coated by a protective layer of paint. The edges of the cork, however, are not completely covered with the paint and are in contact with the process water—which can lead to corrosion on the edges of the crown corks. As a result, rust spots, which are difficult to remove, can form on the glass around the opening of the bottle. These rust spots can cause customer complaints and even hygienic problems. In beer can pasteurizers, crown and cork corrosion is also a matter of concern. SUEZ offers a series of products, specifically formulated according to pasteurizers' water characteristics, to protect the appearance and integrity of crowns and corks, reducing quality losses and reinforcing food and beverage safety.

cooling water in brewery plants

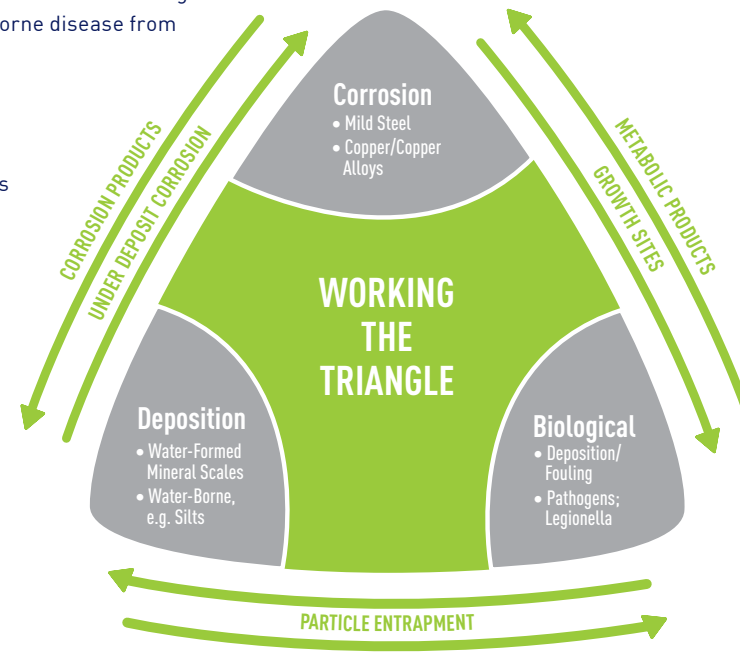
In the brewing process, both cooling towers and heat exchangers require protection from microbiological proliferation, deposition, scaling and corrosion. SUEZ provides a range of applications and technologies to address these forces and keep operations running smoothly.

microbiological: bacteria counts

Cooling towers are prone to microbiological contamination from the high airborne contaminant levels drawn in by induction fans. Process-related contamination can also occur, which then allows for rapid bacterial growth and associated fouling in the cooling tower's nutrient-rich environment. When bacteria growth is not controlled, biofilms interfere with equipment performance. Biofouling reduces, or in some cases blocks, water flow, reducing heat transfer and increasing microbiologically induced corrosion (MIC) rates. Some biofilm organisms attack wood, which weakens structural components of wooden cooling towers. Dirty cooling systems also increase the risk of contracting airborne disease from inhalation of microorganisms that are present in cooling tower drift.

deposit control

The gradual accumulation of deposits in cooling water systems directly affects production. Process heat exchangers are usually the prime sites for deposition since most scaling species have retrograde solubility characteristics. Simply put, scale forms at the hottest locations in the system—the heat exchange surfaces—including the shell/tube and plate/frame variety. Deposition problems can lead to reduced tower efficiency and decreased heat transfer rates, and can reduce the carrying capacity of pipelines. If unchecked, deposition can result in production loss, excessive energy usage, shortened equipment life and increased costs due to frequent cleaning or added pumping requirements.

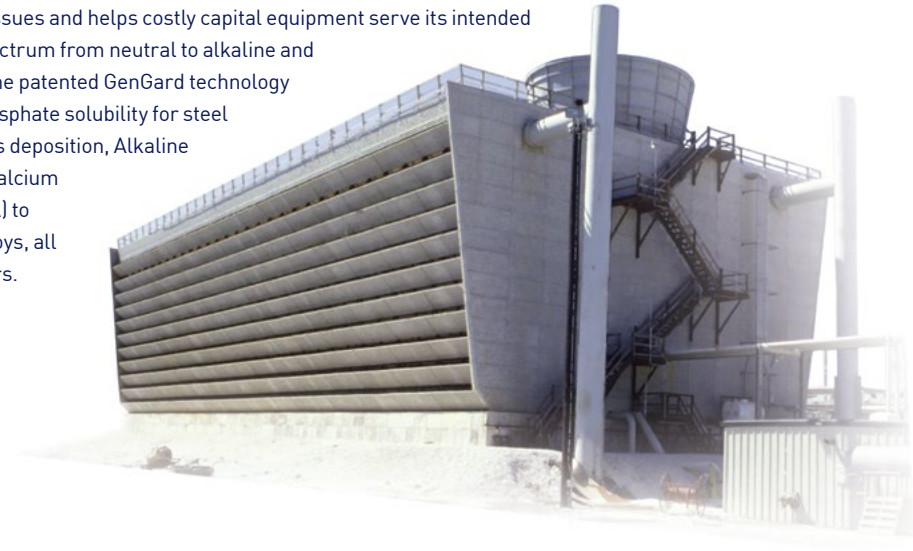


corrosion

Corrosion most often occurs in both the process heat exchangers and system transfer piping. It is the result of an electrochemical reaction that is accelerated in the presence of higher temperatures, low flow or stagnant water conditions and in cases where the cooling water possesses a high concentration of dissolved solids. Causing heat exchangers to leak and rust to form, corrosion shows up as thinning of the tubes or pitting of the base metal. Failure of a critical heat exchanger can mean unscheduled downtime, loss of productivity and increased operational costs. The objective of an effective corrosion control program is to reduce metal corrosion to an acceptable level. Success depends on effective mechanical design, acceptable exchanger metallurgies, and selection and application of an effective chemical treatment program, based on existing system operational and water conditions.

GenGard* technology: for open recirculating cooling systems

GenGard is an advanced and cost-effective water treatment technology for the control of corrosion and deposition in open recirculating cooling systems. GenGard reduces production issues and helps costly capital equipment serve its intended useful life. GenGard programs can be applied across a pH spectrum from neutral to alkaline and GenGard improves results even under stressful conditions. The patented GenGard technology includes a new Stress Tolerant Polymer (STP) to maintain phosphate solubility for steel corrosion prevention, and to control iron and suspended solids deposition, Alkaline Enhanced Chemistry (AEC) to provide threshold inhibition of calcium carbonate scale formation, and Halogen Resistant Azole (HRA) to provide corrosion protection for copper and copper-based alloys, all in combination with phosphate-based steel corrosion inhibitors.



cooling water services



wastewater treatment benefits

By separating liquids from solids, more insoluble matter can be removed. Anaerobic and aerobic biological systems are able to provide high removal rates for soluble contaminants, increased gas production for steam or electricity and low levels of scaling.

biological control

Proper biological control is critical to the prevention of waterborne disease and proper operation of equipment, such as cooling towers, heat exchangers, water scrubbing systems and reverse osmosis units. Encouraging microbial growth in wastewater treatment systems may sometimes be appropriate, however, to help ensure the health of beneficial microorganisms that remove specific types of organic matter. As such, SUEZ offers products and treatments to either reduce or augment microorganism growth in water systems.

clarification

Using exclusive blends of custom-designed polymer formulations, SUEZ's treatment programs can remove organic color, calcium and magnesium hardness, iron and suspended solids from influent water. These polymers help reduce the need for pH adjustment, decrease load on dematerializers, increase filter throughput and reduce sludge volume. SUEZ also offers technologically advanced and comprehensive resources for wastewater treatment, making effluent waters acceptable for reuse or discharge.

metals removal

The removal of heavy metals from waste streams is a critical component of industrial wastewater treatment, as these metals do not naturally degrade and can be toxic to aquatic life, even at low concentrations. SUEZ makes it possible for industrial facility operators to reduce heavy metals—including soluble and/or particulate heavy metals, such as lead, copper, chromium, iron and manganese—from waste streams to help ensure regulatory compliance.

odor control

Whether you process water for public consumption, treat wastewater or run industrial processes in which water purity is essential, control of objectionable odors is a challenge. SUEZ provides a range of advanced products and treatment options for cost-effective odor control in water processing and wastewater treatment.

boiler solutions

In order to provide the heat and power necessary to maintain efficiency and production, deposits and corrosions in boiler systems need to be avoided. FDA standards related to regulated chemical treatments and utility plant operations to prohibit cross contamination from occurring in the steam system also need to be adhered to. SUEZ's goal is to help our customers maintain plant reliability at low cost while producing high-quality products—be it starches or corn syrups, citric acid or ethanol.

boiler deposit control

Getting the maximum heat transfer from fuel to steam in boilers is essential to maintaining safe, cost-effective, long-term boiler reliability and low-cost corn milling product operations. A scaled boiler burns more fuel less efficiently than a clean one and is more subject to tube failure, which leads to lower production. The use of high-quality feedwater coupled with optimized chemical treatment—as found in SUEZ's OptiSpense* AP, OptiSpense CL or OptiSpense PO Series products—helps maintain boiler cleanliness.

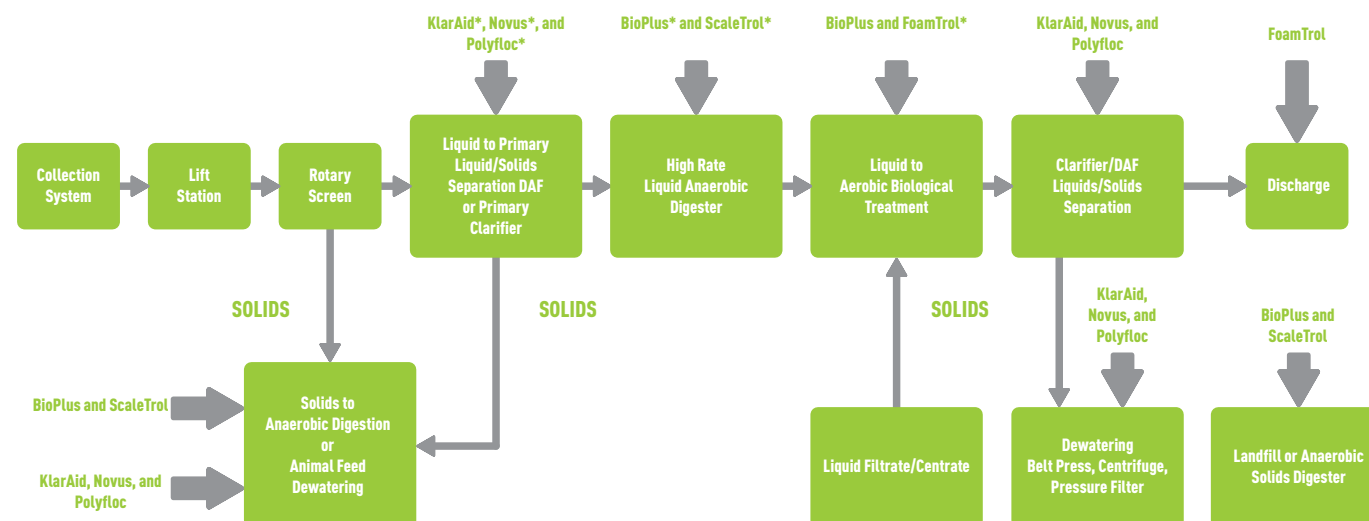
boiler corrosion control

Boiler corrosion can occur in several areas throughout the system. In the preboiler circuit, oxygen pitting can destroy feedwater piping and require a system shutdown while the affected piping is replaced. In the condensate system, boiler feedwater alkalinity or oxygen that has entered the system at some point and process contaminants from evaporator leaks in the corn milling production can cause corrosion. These corrosion mechanisms can cause the loss of piping and transfer of corrosion products into the feedwater, impacting boiler cleanliness and reliability. Proper treatment to minimize preboiler system corrosion requires optimizing mechanical deaeration, followed by using the most appropriate oxygen scavenger—such as CorTrol* IS or CorTrol OS Products.

steam purity

High-purity steam is essential to keep rotating equipment that uses steam as the source of power generation operating safely and efficiently. Solids in the steam that are a result of carryover will slow down this equipment. These solids will also lead to unsafe operation of the steam plant due to water hammer and hot, high alkaline water entering the steam headers or steam end users. To ensure boilers are operating under the best possible mechanical and chemical conditions, steam purity needs to be maintained at the highest level.

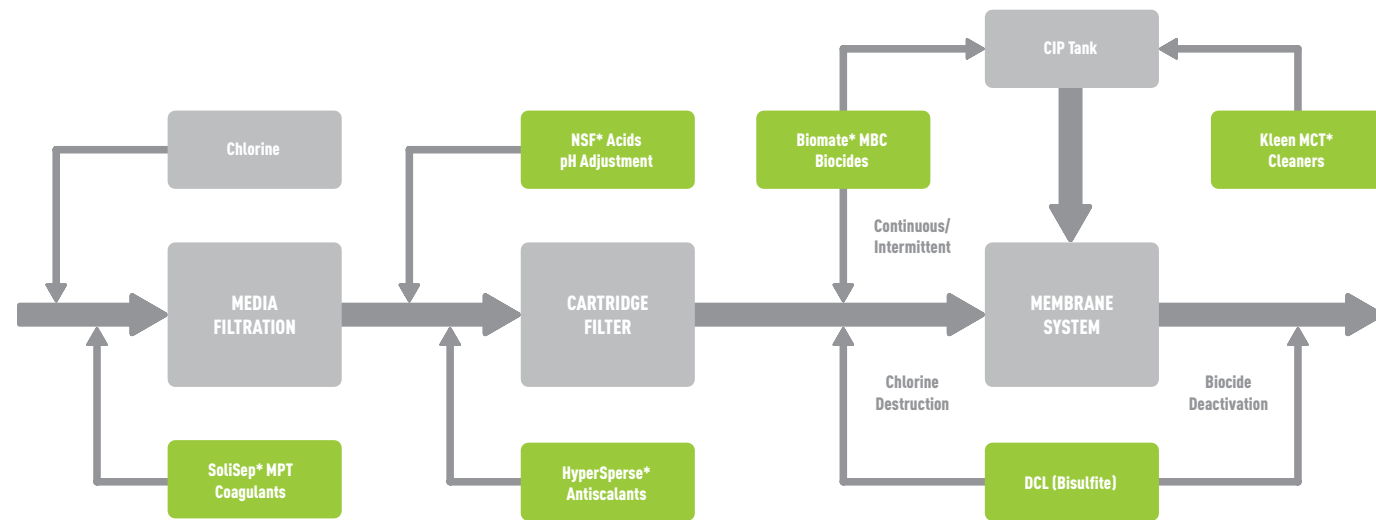
water and wastewater treatment



boiler treatment



MemChem* chemical solutions are designed to reduce operating costs and decrease energy and water demand while simultaneously improving our customers' environmental safety. MemChem solutions include a variety of products, including dechlorination, antiscalants, bio control, cleaners and filtration aids that are formulated to enhance the performance of pure water equipment such as cartridge filters, multimedia filters (MMF), carbon, microfiltration, ultrafiltration, nanofiltration and reverse osmosis (RO). Making it possible for your team to focus on core activities, SUEZ provides on- and off-site services to identify and implement a MemChem service program customized to meet your needs.



 SUEZ products

on-site services:

- Testing of water chemistry, pH, conductivity, free chlorine, turbidity and SDI
- MB tests, microbiological count, BioScan*
- System audits, pretreatment and RO systems, system optimization
- CIP operation training, membrane storage and system trouble shooting and diagnostics
- Optimization of chemical dosages

off-site services:

- Membrane autopsy to identify causes for membrane performance degradation
- Complete water analysis
- Membrane restoration services

MemChem solutions:

- SoliSep* MPT Filtration Aid removes particulates that foul membranes, reduces CIP cleaning frequency and operation cost, extends filters and membrane life
- MPH NSF pH Adjustment maintains desired pH, reduces scaling potential, reduces iron and aluminum fouling
- DCL Dechlorination removes chlorine from water and protects membrane from damage

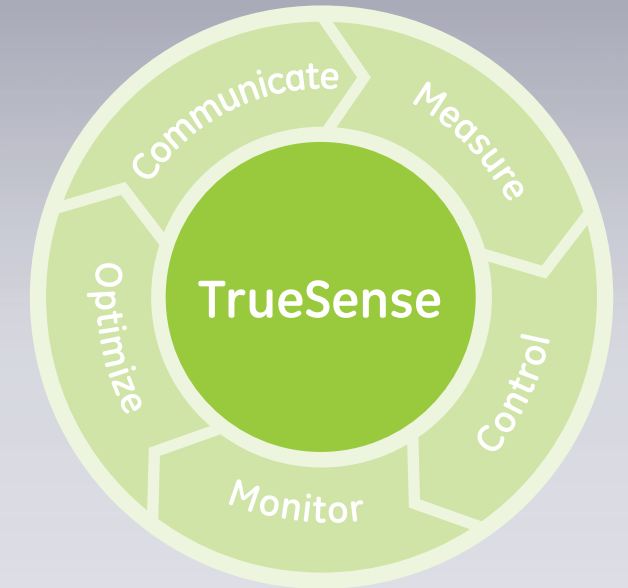
- Biocontrol and BioMate MBC maintain clean pretreatment and RO system, maintain optimum membrane rejection percentage, reduce chemical usage and CIP cleaning frequency
- HyperSperser MDC and MSI Antiscalant optimizes RO operation at maximum recovery and extends membrane life, reducing capital cost and chemical costs by reducing CIP cleaning usage
- Kleen MCT Cleaner restores membrane performance, lengthens membrane life and helps reduce membrane replacements

productivity tools:

- Argo Analyzer* Software predicts critical fouling potential, offers guidance in selecting the best antiscalant, recommends dosages for best RO operating conditions and percent RO recovery and supports operational cost savings
- Winflows* engineering design simulates RO system's optimum configuration and operation and provides predictions of permeate quality throughout membrane lifespan
- RO Normalization Data Sheet engineering tool tracks and monitors RO performance by tracking key operational parameters, helps users troubleshoot and maintain RO and provides guidance in selecting membrane chemicals to provide optimum performance

membrane chemicals





TrueSense monitoring and control

SUEZ proudly provides TrueSense, a technology platform that offers users previously unavailable tools to optimize productivity and increase water savings in the monitoring and control of cooling water systems.

TrueSense integrates three new and unique functionalities into one platform: direct online monitoring of critical water chemistries; personal instrumentation that dramatically cuts offline testing time; and a powerful data analysis and display capability that provides deep insight into system status. TrueSense is a tangible result of SUEZ's focus on developing solutions to address water management challenges even in the toughest operating conditions.

Key elements of the TrueSense platform are TrueSense Online for Cooling and TrueSense View.

- TrueSense Online for Cooling is a single, unified online technology that can directly measure and monitor multiple core chemistries that are applied for effective cooling water treatment such as orthophosphate for corrosion control; proprietary polymers for deposit control; and the management of halogens like chlorine or bromine for microbiological control. TrueSense Online provides a better understanding of cooling system status, enabling users to tighten control parameters to avoid or better respond to system

variation and upsets, reduce water use and costs and to lower total cost of operation.

- TrueSense View provides a knowledge-management solution for system visualization, analysis, alarming and reporting. TrueSense View arms plant personnel with the right information in terms of content, frequency and form, with the flexibility to have data stored either locally and/or on the Web. In addition, wireless features minimize deployment time and cost. TrueSense View is compatible with other platform components.

The TrueSense platform is designed to work in conjunction with SUEZ's most advanced cooling chemistry, GenGard with Stress Tolerant Polymer. The synergy between these two technologies enables optimal performance of cooling water systems with forgiving chemistry that performs even in the toughest conditions.

case study: Bioscan helps successful treatment of tunnel pasteurizer

A brewer in northeast France operated a tunnel pasteurizer made of mild steel. Because of major biological problems, the plant experienced unplanned downtime and had to undertake regular manual cleaning of the system and filters, further increasing the risk to the pasteurizer, its efficiency and integrity.

SUEZ conducted a thorough study of the system to determine the water volume and distribution throughout the different zones of the tunnel pasteurizers and installed a fully automated dosing system. A Bioscan unit checks the ideal dosing regime and controls the biological activity in the system on an ongoing basis.

The complete approach to the microbiological treatment of the tunnel pasteurizers was determined through identification of the optimum dosing points, optimization of the non-oxidizing biocide dosing regime, and microbial monitoring with Bioscan. Adopting this program resulted in problem-free tunnel pasteurizer operation and a 350 percent return on investment from reduced cleaning frequency.

case study: changing treatment and monitoring program of brewery pasteurizer improves performance and saves water

A large brewery in Iberia produces draught and bottled beers for distribution throughout Portugal and Spain. The brewery faced several challenges, including bacterial fouling in the tunnel pasteurizers, distribution channels, sprays and pipe work; cap corrosion; production downtime; high product reject rate and high water usage.

SUEZ performed a complete audit of the water quality and flow characteristics within the pasteurizers and concluded that the main area of concern was the point of chemical dosing. By adjusting the application points and changing the control strategy, it was possible to reduce the cleaning demands—which increased production—and to reduce the crown corrosion—which led to lower reject rates and reduced water consumption. In addition to the revised application strategy, a performance monitoring program was introduced, allowing precise monitoring of system conditions in terms of microbial activity, corrosion rates, cleaning frequency, chemical addition rates and product quality.

As a result of SUEZ's solutions, water usage at the brewery was reduced by 5.3 m³/hr, productivity increased, and the product reject rate decreased.

case study: reduction in beer out temperature

A brewery in Ireland operated a tunnel pasteurizer that became increasingly fouled with microbial slimes, requiring weekly boil-outs to remove them. Simultaneously, beer out temperature (BOT) increased, causing a reduction in throughput of beer and an increasing number of quarantined cans due to the high final product temperature.

SUEZ investigated the operating conditions of the tunnel pasteurizer and recommended a complete chemical treatment regime and monitoring program. When implemented, it reduced the cooling tower fouling and improved the boil-out efficiency and efficacy. Additionally, the former non-oxidizing biocide regime was replaced with a more effective program.

The result was a dramatic reduction in beer out temperature, an 87 percent reduction in the amount of product quarantined due to BOT and a 29 percent reduction in electrical energy used in the operation of the cooling tower due to reduced load on the fan. The throughput of beer improved 3 percent, the water makeup to the pasteurizer was reduced 23 percent, and the time between boil-outs increased from one week to six weeks.

case study: biocide regime saves significant costs in pasteurizer treatment

A large brewery in northwest England with the largest, double deck pasteurizer was spending US\$148,300 (£75,000) on annual treatment costs. SUEZ already provided cooling and boiling water treatments, and sought to provide the pasteurizing treatment for this brewery as well. After a thorough analysis, SUEZ proposed a two-biocide program complimented by a zinc inhibitor and control of makeup pH.

Since implementation, plate counts have shown microbial activity at 1x10⁵ bacteria/ml. Corrosion rates are at <5 mpy and the pump screens have shown no increase in fouling. Finished cans remain bright and shiny with no evidence of tab and dome staining. SUEZ's carefully monitored biocide regime and accurate pH control resulted in smooth tunnel pasteurizer operation and significant cost savings for the brewery.

case study: eliminating corrosion during tunnel pasteurization saves brewery US\$691,000

Aluminum can corrosion during tunnel pasteurization at a Portuguese brewery bottling plant caused quality defects resulting in products that were unfit for sale.

SUEZ undertook a comprehensive pasteurizer audit of water quality, hydrodynamic balance, flow rates, water consumption, biocide screening and other factors. This study revealed the need for a more effective biocide dosing system and for a specific neutral corrosion inhibitor with proportional dosage on the hottest baths. After the new FoodPro ST series treatment program was implemented, it was fine-tuned to reduce chemical dosages to the lowest possible levels.

With the elimination of corrosion, the brewery was able to pasteurize four million shiny cans a year with no aesthetic problems, representing an annual net savings of US\$691,000 (€518,847).

case study: Ferroquest* cleaning increases chiller capacity at uk brewery

A brewery in northern England produces a popular brand of beer for packaging at a sister plant. This plant operates with active corrosion, iron oxide deposits, fouling and low chilling efficiency, reducing capacity from a planned four brews per day to only three.

The inefficient chilled water system was the bottleneck in the process, which was treated with Ferroquest rust remover to clean the system. The Ferroquest treatment has reduced chilling times from 8 to 5 hours per fermentation vessel, resulting in an increase in chilling output from 2,113 to 3,698 gallons (80 to 140 hectoliters) per hour, allowing the production of four chilled brews per day. Significant energy savings also resulted from the cleaning, with electricity costs per hectoliter of beer falling by 34 percent for an annual savings of US\$155,722 (£98,000).



a SUEZ commitment to the environment

Protecting the major existing asset—the world—is one of SUEZ's highest priorities. SUEZ is committed to imagining, encouraging, developing and building innovative solutions to today's environmental challenges while also driving economic growth.

SUEZ is committed to providing customers with innovative and responsible solutions to the hurdles they face now and in the future. The SUEZ Innovation, Development & Advanced Services Center (SUEZ IDEAS Center), applies a century of global experience to product and technical services research. SUEZ's state-of-the-art laboratory is staffed by renowned research and development engineers and scientists who are equipped to analyze the composition of water and wastewater samples to develop the best technical, cost-effective solutions for SUEZ customers. Every day, we invest in developing new technologies to meet industry challenges, from reducing the total cost of producing water to reducing waterborne diseases and to providing environmentally friendly chemicals. We also continue to invest in our people so that they continue to provide the very best value to our customers.

SUEZ partners with world-leading institutions and industry leaders to expand our research and testing capabilities and to develop comprehensive, seamless solutions. SUEZ is at the forefront of wastewater reclamation, treatment, and reuse and we are focused on providing our customers with current solutions

that help them save water and energy, and reduce operating costs. SUEZ offers a unique range of solutions and experience across industries such as oil and gas, refining, power, municipal, mining, steel, commercial and institutional, and food and beverage.

We understand how to help our customers tackle environmental regulations because we've established stringent environmental policies of our own that make us even more responsible in the way we conduct our operations. At SUEZ, we imagine new models, new technologies, new solutions, to secure a resourceful future for all.

We engage in the resource revolution to reinvent the way we manage resources in the new circular economy.

proof not promises award

SUEZ's Proof Not Promises* Award (PNP) recognizes customers and sales representatives for significantly improving industrial operational performance.

As part of the award program, customers and sales representatives work to solve operational, production, environmental and health and safety issues to meet strategic business goals that result in proof—not promises. The PNP three-tier selection process examines the set goals as well as the achieved operational and financial benefits.





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