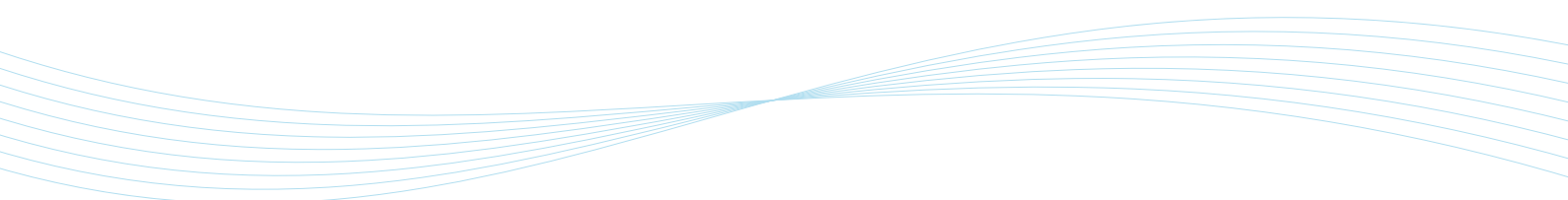




eVOQUA
WATER TECHNOLOGIES

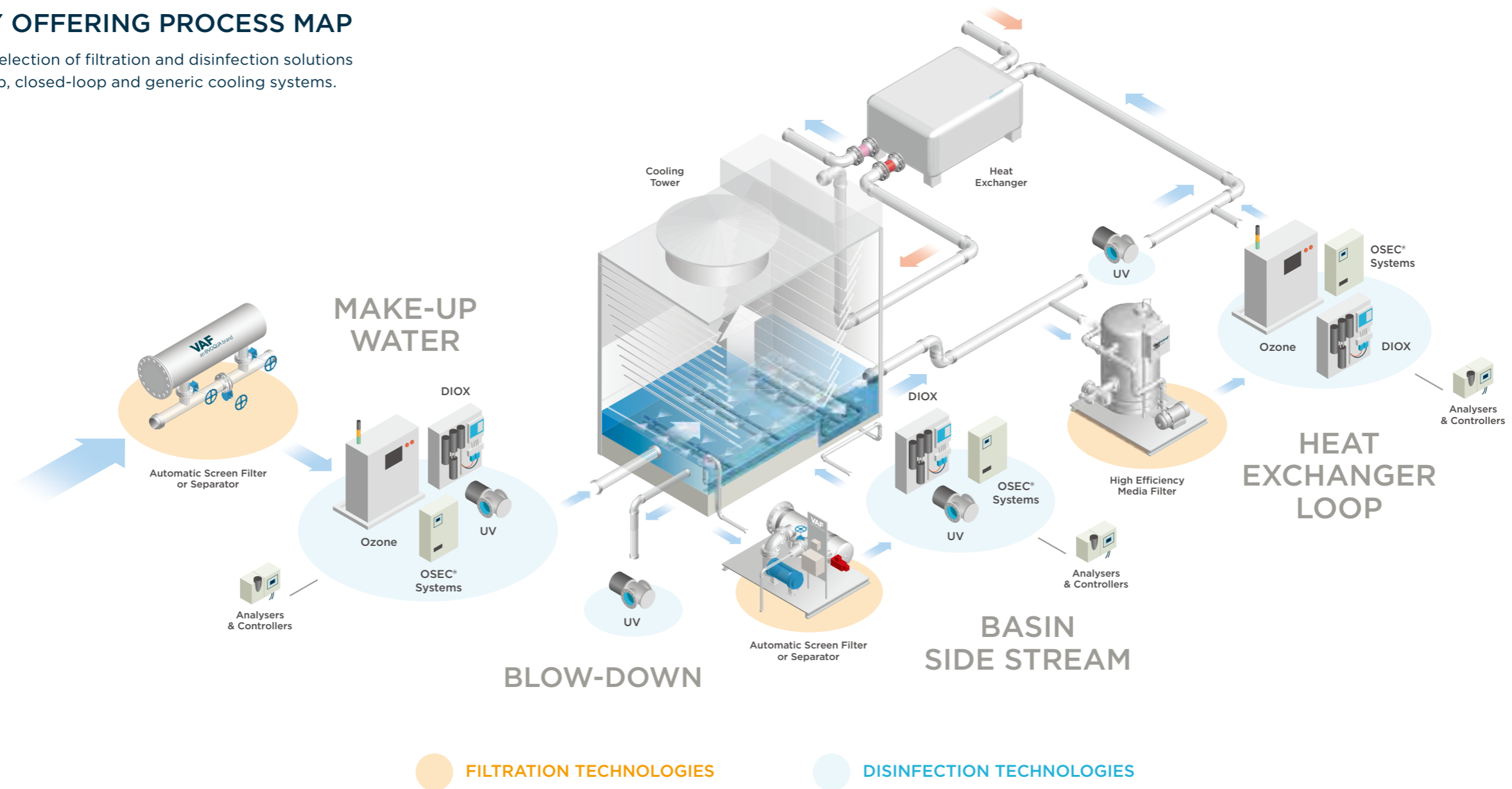
COOLING TOWER
WATER TREATMENT

**MAXIMISE EFFICIENCY
OF COOLING ASSETS**



TECHNOLOGY OFFERING PROCESS MAP

Evoqua offers a broad selection of filtration and disinfection solutions applicable for open-loop, closed-loop and generic cooling systems.



COOLING TOWER WATER SOLUTIONS

HIGH QUALITY WATER FOR COOLING TOWERS

Water quality has a direct impact on the performance of cooling systems. It can affect efficiency, available uptime, maintenance needs and equipment longevity.

Water disinfection and filtration systems play a critical role in keeping cooling towers operational. In some cases, thousands of cubic meters of water flow through cooling systems each day – water that must be kept clean to maintain heat transfer surfaces and

enable process heat removal. Any fouling of the heat exchanger surface by scale, debris or biological contamination reduces energy efficiency, leading to more electricity required and increased overhead.

THE RIGHT SOLUTION FOR YOUR NEEDS

Evoqua offers a complete portfolio of advanced water treatment packages to address all cooling applications.

Our leading treatment solutions increase the overall efficiency; resulting in reduced consumption of water, energy and chemicals,

helping facilities to maximise productivity, and save costs.

Evoqua's filtration solutions remove suspended solids and control biological growth in the recirculating water stream. Installing a filter system, either side stream or full flow can extend the life of heat exchangers, reduce maintenance costs, and improve cooling efficiency while improving return on investment.

BENEFITS OF OPTIMISING COOLING TOWER WATER TREATMENT

- Maximise efficiency and lifetime of cooling assets
- Maintain uptime with reduced operating and chemical costs
- Reduce water, energy, and chemical consumption
- Reduce biofouling, scaling and corrosion
- Effective microbiological control
- Minimise annual cleanings

Ultraviolet (UV) Solutions

UV SYSTEMS FOR COOLING WATER

UV treatment provides a solution to cooling applications where water is used in a single pass before being discharged into the environment. UV is a proven solution to inactivate micro-organisms such as bacteria, viruses, moulds and pathogens without the use of chemicals. It is highly effective for Legionella¹ control.

Evoqua's leading UV treatment systems are used in a range of cooling applications to keep cooling systems cleaner and healthier. In conjunction with a chemical treatment program, UV can supplement microbial control and prevent the buildup of microbial biofilms. It is a safe and environmentally process with very little operator involvement.

WHAT IS UV DISINFECTION?

UV treatment is a physical process that works by causing permanent damage to cell DNA. Once the DNA becomes damaged, the organism is unable to carry out the routine cell functions of respiration.² The option of utilising precision dosing of UV light helps

facilities improve their operations and lower operating costs.

EVOQUA UV RANGE

Evoqua offers a range of medium and low pressure UV models to suit your application. The industry-leading UV systems are designed to provide the minimum 3 log (99.9%) disinfection at water qualities as low as 30% UV Transmittance (UVT). All systems include Evoqua's patent-pending* TwistLok™ lamp configuration, AT-900 UV intensity system and Spectra 3 control system for full plant room system integration.

*Patent pending in some countries

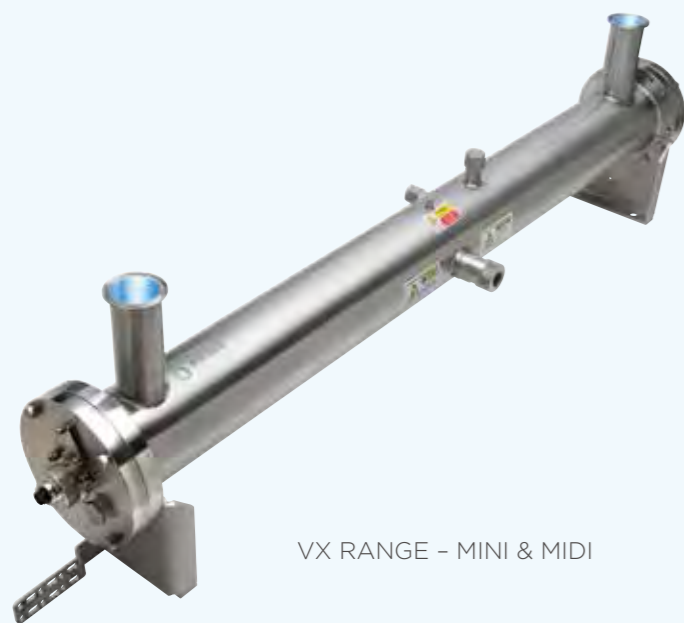
1 Silvia Cervero-Aragó, Regina Sommer, Rosa M. Araujo, Effect of UV irradiation (253.7 nm) on free Legionella and Legionella associated with its amoebae hosts, Water Research, Volume 67, 2014, Pages 299-309, <https://www.sciencedirect.com/science/article/pii/S0043135414006538>

2 USEPA Ultraviolet Disinfection Guidance Manual for the Final Long Term 2 Enhanced surface Water Treatment Rule, United States Environmental Protection Agency, Office of Water, EPA-815-R-06-007, November, 2006.

ADVANTAGES OF UTILISING EVOQUA UV SYSTEMS

- Inactivates microbial contaminants prone to develop in cooling systems
- Helps to reduce biofilm build-up
- Improving water quality can reduce water consumption, delivering cost and sustainability targets
- Flexible installation & integration
- Low maintenance
- Fully automatic process and cannot be overdosed

Evoqua UV disinfection generator systems undergo third-party validation testing in accordance with the UVDGM (USEPA, 2006). Validated products are tested to confirm a minimum inactivation equivalent of 3 log (99.9%) for microorganisms in accordance with NSF/ANSI 50 and the UVDGM. Performance is not claimed nor implied for any product not yet validated; unvalidated products use single point summation calculations to provide delivered dose recommendations. Performance limitations depend on feed conditions, overall installed system design, and operation and maintenance processes; please refer to Operations Manuals. For more information: Contactus@evoqua.com



VX RANGE - MINI & MIDI



Leading the path to sustainable cooling

Efficient, sustainable treatment solutions like the OSEC® system, UV and Ozone can help reduce facilities' energy costs, water waste, lost time and unplanned maintenance.

On-site Hypochlorite Generation Solutions

OSEC® SYSTEMS FOR COOLING WATER

OSEC On-Site Hypochlorite systems safely produce sodium hypochlorite - a powerful biocide and disinfectant that is a highly effective and safe solution for water treatment. From drinking water to microbiological control in cooling water, chlorination has been an established method for over a hundred years. Chlorine-based treatment can optimise heat exchangers in cooling processes, and when added to cooling water circuits, provides a residual form of disinfection to help eliminate the build-up of biofilm.

Evoqua's OSEC systems utilise an in-situ process to provide facilities with the flexibility to produce their own, safe disinfectant, eliminating concerns for transporting or storing chemicals.

WHAT IS AN OSEC SYSTEM?

OSEC systems safely generate a low strength sodium hypochlorite solution on-site from salt, water and electricity. Salt is not only safe and easy to handle; it reduces transportation costs associated with bulk chemical supply, reducing your carbon footprint. The solution can be dosed directly

into the cooling water to control bacterial growth by reducing biocide formation and preventing the build-up of biofilm.

OSEC systems provide optimal treatment with minimal effort. Generation takes place on-demand only by the electrolysis of the brine solution and can be produced in batch operation, thus retaining its strength over extended periods compared to bulk hypo which faces degradation.

EVOQUA OSEC RANGE

Evoqua's OSEC systems are fully automated, pre-packaged solutions that generate a <1% sodium hypochlorite solution. Evoqua's OSEC L systems include up to four, 5PPD 100g/h electrolyser cells which are designed to be easily interchangeable to simplify maintenance and reduce downtime.

Additional operational advantages can be gained through the systems' ability to innovate by leveraging reclaimed water, plus having a hypochlorite solution at a stable concentration always available. The systems simplify disinfection storage and give greater operational flexibility when necessary.



OSEC® L SODIUM HYPOCHLORITE GENERATOR

ADVANTAGES OF AN OSEC SYSTEM

- Safe and sustainable method
- Economic production according to demand
- Eliminates concerns for transporting or storing toxic chemicals on-site
- Operational independence
- Effective and proven treatment
- No handling of chemicals: Just Salt, Water and Electricity
- Improved accessibility to raw materials

Evoqua OSEC® systems are designed to produce 0.65-1% sodium hypochlorite under normal operating conditions. With less than one minute of contact time, the OSEC®-produced concentration range (6,500-10,000ppm) is significantly higher than the concentration requirements to meet industry standards for microorganism inactivation and disinfection. Specific disinfection rates depend on dose, concentration and time (CT value), pH, and water temperature. Performance limitations depend on feed conditions, overall installed system design, and operation and maintenance processes; please refer to Operations Manuals. For more information: Contactus@evoqua.com



Chlorine Dioxide

CHLORINE DIOXIDE FOR COOLING WATER

Chlorine Dioxide is a highly effective treatment and oxidizing agent that offers many clear advantages to ensure a clean and safe water supply. The solution lowers the risk of organochlorine (AOX) and trihalomethane (THM) formation. The dosage required for biocidal control remains fairly constant over a wide range of cooling water conditions, making chlorine dioxide an excellent choice for cooling water that has a high pH, or that has high levels of organic or ammoniacal contamination.

WHAT IS CHLORINE DIOXIDE GENERATION?

Chlorine dioxide generation can be based on two methods: Acid-Chlorite and Chlorine-Chlorite. In both instances, chlorine dioxide is produced as an aqueous solution with a constant strength. For the Acid-chlorite method Hydrochloric acid (HCl) and Sodium Chlorite (NaClO₂) are used, and for the Chlorine-Chlorite method Sodium Chlorite (24.5% NaClO₂) and Chlorine (Cl₂) gas are used. The optimal ratio of the two chemicals ensures maximum yield of chlorine dioxide.



DIOX-A CHLORINE DIOXIDE GENERATOR

ADVANTAGES OF CHLORINE DIOXIDE

- On demand production means you only produce what you need, lowering costs and reducing waste
- Effective for biofilm and algae control³
- Stable disinfection over a wide pH range
- System designed for safety

³ Loret JF, Robert S, Thomas V, Cooper AJ, McCoy WF, Lévi Y. Comparison of disinfectants for biofilm, protozoa and Legionella control. J Water Health. 2005 Dec;3(4):423-33. doi: 10.2166/wh.2005.047. PMID: 16459847.

Evoqua's Chlorine Dioxide Generation systems make no claim regarding disinfection. These systems apply EPA-registered chlorine dioxide precursor chemicals, for which the generation of chlorine dioxide used as a disinfectant for microbial control in water is presented on the labels' directions for use. Performance limitations depend on feed conditions, overall installed system design, and operation and maintenance processes; please refer to Operations Manuals. For more information: Contactus@evoqua.com

Monitoring and Control

Reliability of water treatment systems and the ensuing water quality are essential to maintain cooling tower health and consistent system performance. In chemistry-controlled environments, Evoqua's process analysers and controllers provide constant monitoring

of water quality parameters to ensure health, safety, and regulatory compliance. The fast and reliable systems balance the required chemicals, ensuring safe, cost-effective process water.



DEPOLOX® 400 M ANALYSER

ADVANTAGES OF MONITORING

- Provides the optimum balance of chemicals to ensure low energy use and optimised costs
- Improve plant operation through ensuring efficient processes
- Ensures compliance to regulations and standards
- Prevent corrosion, fouling and scaling

Controller Offerings	Description
SFC	Flexible one channel water treatment measurement systems
MFC	Flexible multiple channel disinfection measurement and advanced control systems
DEPOLOX 400 M Analyser	Online 1-3 channel analyser with 4" capacitive touchscreen and multiple communication options
DEPOLOX 700 M Analyser	Online 1-5 channel analyser and controller with 7" resistive touchscreen and multiple communication options
VariaSens™	Flow cell for use with membrane sensors. Compatible with 400 M, MFC and SFC electronics modules
DEPOLOX 5 Measurement Module	Flow cell and measuring module with the fast-reacting and reliable bare electrode and self-cleaning system. Compatible with 400M, 700M, MFC and SFC electronics modules
Sensors	<ul style="list-style-type: none"> • Electrode sensors: Total chlorine, Free chlorine, Chlorine dioxide (ClO₂), Ozone (O₃) Potassium permanganate (KMnO₄), pH, Fluoride, Redox (ORP), Conductivity, Temperature • Membrane sensors: TC3 (total chlorine), FC2 (free chlorine), CD10.1 (chlorine dioxide), OZ7 (ozone)



Each day thousands of cubic metres of water can flow through an average data centre cooling system bringing with it debris, scale, and biological activity. Evoqua is a proven provider of cooling water treatment systems with over 200 data centre installations worldwide and 30 years' experience in the industry. By integrating a combination of high media filtration and disinfection systems, a facility can significantly reduce the amount of chemicals required and optimal data centre cooling performance can be achieved.

Filtration Solutions

FILTRATION SYSTEMS FOR COOLING WATER

As energy efficiency and resource conservation gain more importance, facility owners and engineers are recognising the dramatic improvements they can achieve by efficiently filtering their cooling water.

High-efficiency filtration technology can help to optimise the performance of your cooling system. Evoqua's side stream or full-flow filtration solutions are designed to continuously filter cooling water to remove suspended solids, reducing fouling, biological growth, and controlling other issues such as scaling and corrosion.

VORTISAND® CROSS-FLOW MICROSAND FILTRATION SYSTEMS

Vortisand filtration systems with high-efficiency cross-flow technology reduce the build-up of fine particles responsible for fouling cooling systems, helping to keep cooling equipment running at peak performance. Cross-flow media filtration achieves submicron (0.5 micron) filtration⁴ which reduces the biofouling rate to minimise heat transfer resistance, downtime, and maintenance.



V-SERIES™ AUTOMATIC SCREEN FILTERS

High filtration rates mean Vortisand filters have one of the smallest footprints of any media filter. The high-efficiency microsand filters are fully automated, require minimal maintenance and have a user-friendly interface complete with maintenance reminders.

VAF™ FILTRATION SYSTEMS

Evoqua's VAF™ filtration systems provide cost-effective, efficient, and space-saving solutions that reduce water waste while limiting maintenance. The self-cleaning screen filters utilise innovative technology designed for greater cleaning efficiency and reduced maintenance.

The VAF automatic self-cleaning screen filters can remove suspended solids from 1500 to 10 micron. The patented bi-directional drive design does not require electric motors, limit switches, gearboxes, or hydraulic pistons, thereby eliminating external shafts and seals.



VORTISAND® SYSTEM C-SERIES

⁴ Brian Hayward, Cooling Tower Institute, 2001, High Efficiency 0.5 Micron Sand Filtration

HYDROCYCLONE SEPARATORS

Hydrocyclone Separators effectively remove suspended particles from water utilising a centrifugal action to separate high specific gravity particles from water.

Facilities struggling with high levels of sand or suspended solids in the make-up water can reduce maintenance and extend the life of their cooling assets with separators due to their low cost and simplicity.



ADVANTAGES OF FILTRATION

- Reduced energy consumption by reducing fouling on heat transfer surfaces
- Improved effectiveness of anti-corrosion and biocide treatment
- Decreased nutrient sources and habitat for Legionella growth⁴
- Minimised maintenance and downtime
- Improve operating efficiencies

Service

Evoqua Water Technologies is one of the world's leading providers for water treatment equipment and service. We offer industrial customers and communities sustainable solutions for highly efficient water usage and supply.

Service is a key issue for the satisfaction of our customers. Aftermarket services offers unique, product-related service and support across a product's entire lifecycle.

To protect your investment in our premium quality equipment, we deliver unrivalled after-sales service packages—including technical support, training, on-site service, troubleshooting and spare parts—provided by a worldwide network of factory trained and dedicated professionals.

EVOQUA SERVICE

Service Contracts—Recurring scheduled services with a defined scope of work for operations, or maintenance of a customer's water treatment systems.

Field Services—One time event services covering a broad range of activities; equipment repairs, warranty services, new equipment startups, unscheduled maintenance and safety audits.

Spare Parts/Repairs—Evoqua provides both proprietary spare parts, consumable items and comprehensive repair services for clients.

Technical Support—Evoqua can quickly support you in all technical queries during the complete product life cycle.

Training—Evoqua offers training directly from the manufacturer and therefore first hand know-how.

TRANSFORMING
WATER
— **ENRICHING** —
LIFE



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Disinfection efficacy and microbial control will vary based on the facility and influent water quality, ambient conditions, the specific treatment products incorporated and system design, operating conditions, and maintenance practices. Contact Evoqua for more details

The information provided in this literature contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms and of the contract.