



Sustainable Water Management for the Power Industry

WATER TECHNOLOGIES



Creating Water Solutions

Water and Wastewater Treatment Specialist for the Power industry

Veolia Water Technologies has hundreds of power generation references throughout the world. Our local teams - present in over 60 countries - design, install, commission and service the complete power plant water cycle.



With decades of experience in the power industry, Veolia Water Technologies is your key partner to develop and implement the most reliable water and wastewater systems, providing an extensive range of technologies and services adapted to the power industry's requirements:

- Turnkey projects via a one-stop shop approach
- Custom, standardized and hybrid solutions
- Extended offering through maintenance and operating services
- Power industry experts working together with water treatment specialists at a local level
- Portfolio of 350 technologies including specific solutions for the power industry
- Risk Management (water supply, environmental compliance, revenue loss, safety)
- Solutions that address health, safety and environmental concerns
- Water Sustainability Management using tools such as Carbon Footprint evaluation and Water Impact Index to help our customers achieve their corporate sustainability goals.

Your concerns are our concerns

Veolia Water Technologies engineers develop solutions for power generation clients by focusing on their key requirements:

- **Reliability** - avoiding costly downtime through proven technologies and local service
- **Efficiency** - developing solutions that help clients generate the maximum amount of electricity using the minimum amount of resources and creating value by reducing heat rate
- **Compliance** - engineering systems that ensure compliance with environmental legislation while minimizing the plant's water footprint
- **Dependability** - delivering the project on time through proven and often standardized technologies, and finding alternate sources of water by reusing reclaim and waste waters

Proven technologies

Actiflo®

The Actiflo® process is an ideal solution for treating all cooling tower waters: make-up, sidestream and blowdown; pretreatment for boiler feed and other process water, as well as recycling valuable process wastewaters, while reducing pond volumes. Actiflo has also proven to be very efficient for metals and algae removal.



The main benefits to other clarification systems are:

- Quick start-up (< 15 minutes); for power unit start/stops
- Very high rate settling due to microsand ballast results in reduced space and packaged units' ability to treat large flows
- Ability to handle large spikes in turbidity of inlet water as well as cold water temperatures due to circulating sand

Actiflo® Softening is a technological breakthrough in water treatment, offering unique advantages over traditional clarification systems with the chemical precipitation of:

- Hardness
- Silica
- Alkalinity
- Other constituents (e.g. heavy metals)

Demineralization units

- Systems utilize ultrafiltration, nanofiltration, reverse osmosis, electro-deionization, and/or ion exchange
- May include UV TOC destruction and membrane degas
- Achieve ppb levels of TOC, ppt levels of metals, and > 18 megaohms

Discfilters

The sturdy and compact California Title 22 approved Discfilter is a great choice for:

- Applications requiring space and backwash savings with large flows and fine filter openings down to 10 microns
- Clarification polishing (or primary and secondary clarification polishing)
- Cooling tower make-up and sidestream filtration
- Process water filtration
- Pond water volume reduction

Evaporation & crystallization

- Zero Liquid Discharge (ZLD) systems
- Volume reduction, reuse/recycling of water
- Systems for fossil fuels as well as nuclear power

OPUS® technology

- High water recovery and low waste volume
- RO-based system with effective scaling and fouling control
- Available with CeraMem® or Multiflo™ pretreatment options
- Achieves Zero Liquid Discharge with the addition of a brine crystallizer

Condensate Polishing Plant

- Custom and standardized mixed bed ion exchangers
- State-of-the-art external resin regeneration technology: SeparIX™
- Condensate filtration of suspended metals (iron and copper)
- Combination of filtration unit and SeparIX™ external regeneration allowing operation in the ammonia cycle

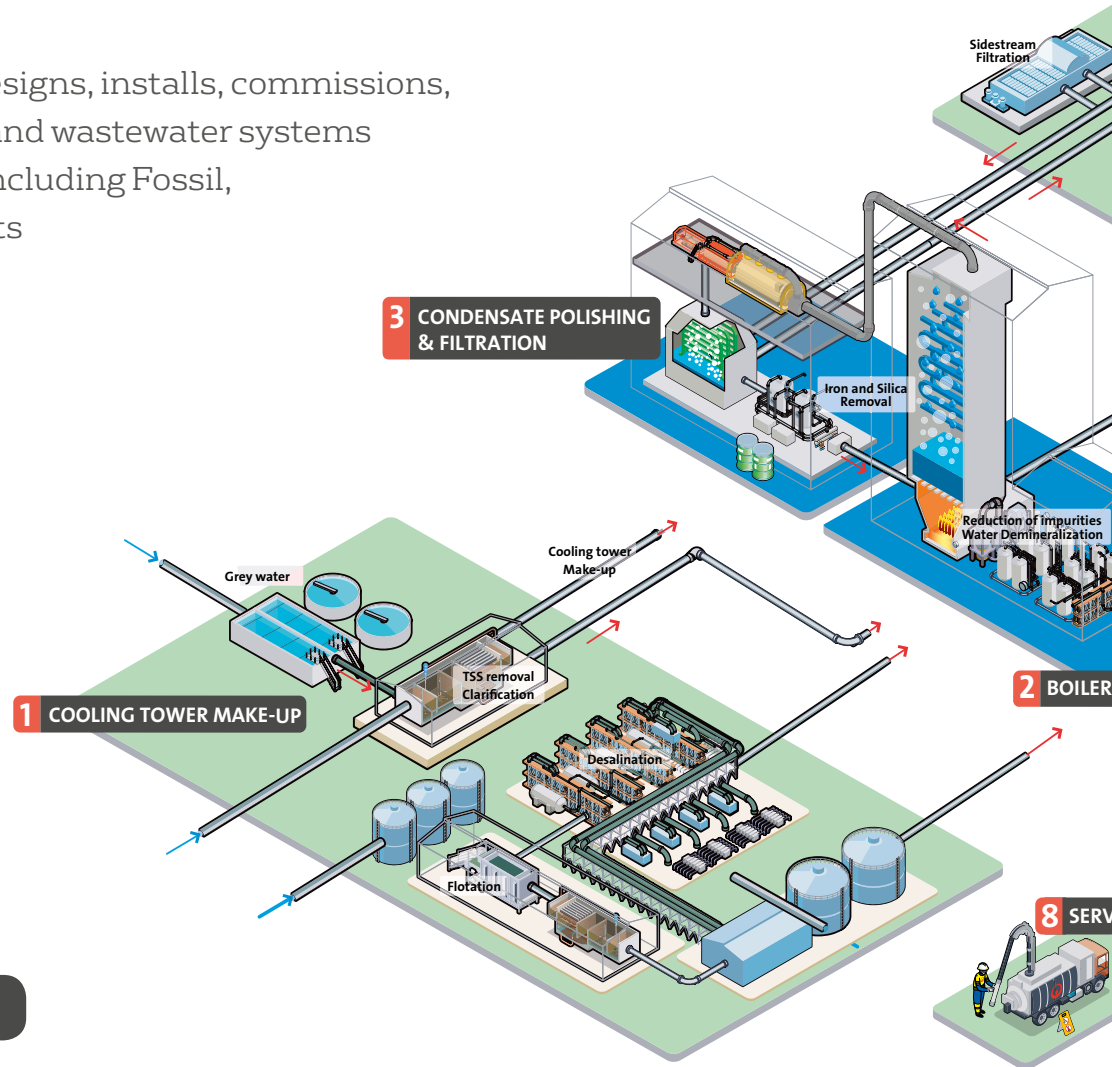


STANDARDIZATION

Veolia offers a range of in-house standardized systems including Sirion™ RO and Rapide Strata™ Ion Exchange Deionization. Veolia also works with clients to develop duplicable solutions that can be designed once and deployed across many plants. Such approaches save time, reduce risk and offer cost advantages.

Creating water solutions to meet your needs

Veolia Water Technologies designs, installs, commissions, operates, and services water and wastewater systems for all types of power plants, including Fossil, Nuclear and Solar Power Plants



1 COOLING TOWER MAKE-UP

For all types of feed water including sea, ground, surface, reclaim (sewage) as well as reuse of power plant wastewater (recycling).

- Typical applications include removal/reduction of suspended solids, hardness, silica, organics, iron and manganese
- High quality cooling water allows for high efficiency fill to be used in the tower, resulting in a lower heat rate and higher power plant efficiencies

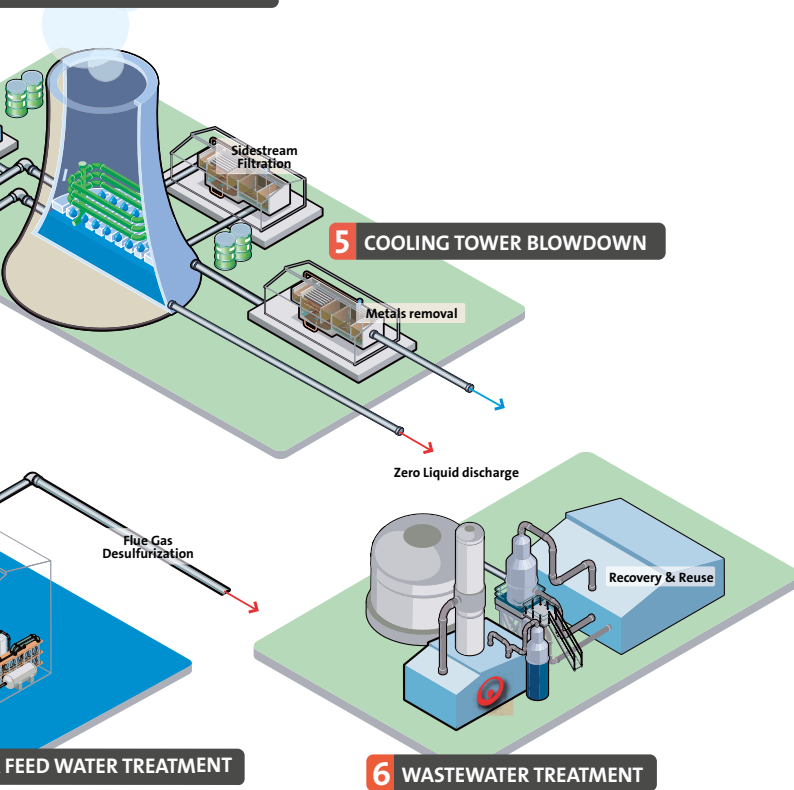
2 BOILER FEED WATER

- Processes and technological solutions for all water sources
- Reduction of impurities entering the boiler system that cause reduced heat transfer, increased fuel consumption, steam contamination, carry-over, condenser corrosion, and turbine deposits which can all lead to a loss of production

3 CONDENSATE POLISHING & FILTRATION

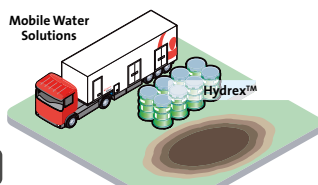
- Removal of impurities from the condensed steam; resulting in reduced heat rate and therefore improved power unit efficiency
- Faster power unit start-ups; reducing fuel costs and air emissions and resulting in an increase of profitability-while protecting power generation assets

COOLING TOWER SIDESTREAM



FEED WATER TREATMENT

6 WASTEWATER TREATMENT



7 POND MANAGEMENT

7 POND MANAGEMENT

- Volume reduction and closure
- Mobile, very high rate clarification systems
- Disc filtration- high rate, low cost filters requiring little space
- Dewatering, including operations

4 COOLING TOWER SIDESTREAM

Clarification, softening, filtration, water treatment chemicals and associated services to help power generation companies effectively manage their cooling towers.

- Reduce scaling and deposition, minimize microbial activity and more specifically legionella control

5 COOLING TOWER BLOWDOWN

Technologies to treat cooling tower water in order to minimize blowdown while protecting against corrosion, deposition and organic fouling which threaten efficiency.

- Minimize water use by increasing cycles of concentration
- Silica and metals removal
- Using as raw water for demin water production

6 WASTEWATER

Wastewater treatment applications for flue gas desulfurization, coal pile runoff, stormwater and cooling tower blowdown in order to minimize environmental impact, create volume reduction and comply with discharge requirements.

- Zero Liquid Discharge (ZLD), including our patented CoLD® process for FGD and IGCC wastewater
- TSS reduction using very high rate (ballasted) clarification and filtration (media and disc options)
- Metals removal to EPA required levels, including biological and specialty medias for Nitrates and Selenate
- Integrated complex systems, including required chemistry, solids dewatering, automated controls with remote monitoring and operations, if requested by Owner.

RECYCLING AND REUSE SYSTEMS

Wastewater may be treated and recycled for use within the original application or be reused in another, either within your plant or sold externally. Contact us to 'water audit' your site, which will help you to:

- > Lower heat rate to improve power unit efficiency, while reducing water use (improve water footprint)
- > Meet environmental regulations and reduce plant discharges
- > Reduce the burden and costs for local water treatment plants



Reliable services

Outsourcing

Veolia provides outsourcing solutions that enable clients to remain focused on their core business. Outsourcing to a water treatment specialist leads to more efficient operations and thus cost savings.

Hydrex™ chemicals

- A complete range of products to improve the efficiency and reliability of cooling towers, condensers and boiler, by managing microbiology, scaling and corrosion.
- Hydrex™ is ideal for use in recirculating, open and closed water cooling systems as well as once through applications
- Hydrex™ will significantly improve the management of scaling and corrosion of your boilers

Hydrex™ also provides green chemistry

- To minimize the impact of additives in the environment
- To comply with tight environmental regulations
- To meet societal preferences

Mobile Water Solutions Applications

- Operational emergency
- Plant commissioning
- Plant downtime for maintenance purposes
- Delayed delivery of new plant
- Changes in raw water quality
- Peak demand
- Steam blows
- Ash pond treatment



Advantages

- Highest flow and performance mobile clarifier in the market
- Consistent treated water quality down to 0.08 $\mu\text{S}/\text{cm}$
- Off-site regeneration of resins
- Automatic monitoring
- Maximum water yield
- Reliable contingency planning
- Mobile service network
- Fast delivery and commissioning



A world of experience

Redhawk Power Station

Arlington, AZ, USA

- > Zero Liquid Discharge (ZLD) system utilizing evaporation & crystallization
- > Treats 450 gpm of high salinity cooling tower blowdown
- > Make-up water is treated municipal effluent



TransAlta Sundance Power Station

Alberta, Canada

- > Complete turnkey water treatment system
- > Cooling pond water treatment
- > Proprietary Actiflo® clarification technology and Dusenflo gravity filters



Supercritical Pulverized Coal Power Plant

WV, USA

- > Design-Build river water treatment system for make-up water needs
- > Proprietary Actiflo® clarification, multimedia filtration and reverse osmosis technologies
- > Control systems minimize energy use based on influent water quality



New Harquahala Generating Project

Tonopah, AZ, USA

- > Zero Liquid Discharge (ZLD) system
- > 2,600-gpm sidestream softening
- > RO pre-concentration system
- > HPD® evaporation & crystallization



750MW Combined Cycle Natural Gas Plant

SC, USA

- > Cooling tower and plant makeup water
- > Capacity: 5,000 gpm
- > Actiflo®, Hydrotech™ Discfilter

Bayswater Power Station

Australia

- > Design, Build, Operations and Maintenance
- > Capacity: 5,000 m³/h
- > Lime softening, 8 Actiflo® clarification units, filtration, ion exchange, reverse osmosis, brine concentration, crystallization

Mobile Pond Reduction

OK, USA

- > Mobile treatment of coal pile runoff
- > Recovery of \$5 million in coal from the pond
- > Mobile Actiflo® trailer plus Hydrex™ water treatment chemicals



FHI Limay Power Plant

Limay, Bataan, Philippines

- > EPC Contract
- > Capacity: 100 m³/h
- > Actiflo®, Zero Liquid Discharge (ZLD) System

Resourcing the world

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