



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 treatment 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 250 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 recycling valuable process water and providing pretreatment for boiler feed, product water and cooling tower make-up water to the power industry. Actiflo has also proven to be very efficient for treatment of cooling tower blowdown and wastewater applications such as pond level reduction or elimination, including 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 resulting in reduced space and packaged units' ability to treat large flows

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

- Hardness
- Silica
- Alkalinity
- And other constituents (e.g., heavy metals)



Demineralization units

- Systems typically utilize ultrafiltration, nanofiltration, reverse osmosis, electro-deionization, and/or ion exchange
- Achieve ppb levels of TOC, ppt levels of metals, and > 18 MΩ-cm resistivity

Zero Liquid Discharge (ZLD)

- Reduced environmental impact
- Volume reduction, recycling of valuable water, and reuse
- CoLD™ Process to achieve ZLD on difficult coal-fired wastewaters at greatly reduced operating costs

Multiple Effect Distillation (MED)

- Can be coupled with reverse osmosis desalination for an innovative, energy-saving hybrid solution
- Veolia Water Technologies has provided more than 80% of the world installed capacity of desalination plants using the MED process



Multiflo™ & DAF for seawater and other applications

- Efficient process for removing total suspended solids (TSS), color, algae and heavy metal co-precipitates
- Suitable for treating water with an average to high turbidity level (10 - 4000 mg/l TSS)

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

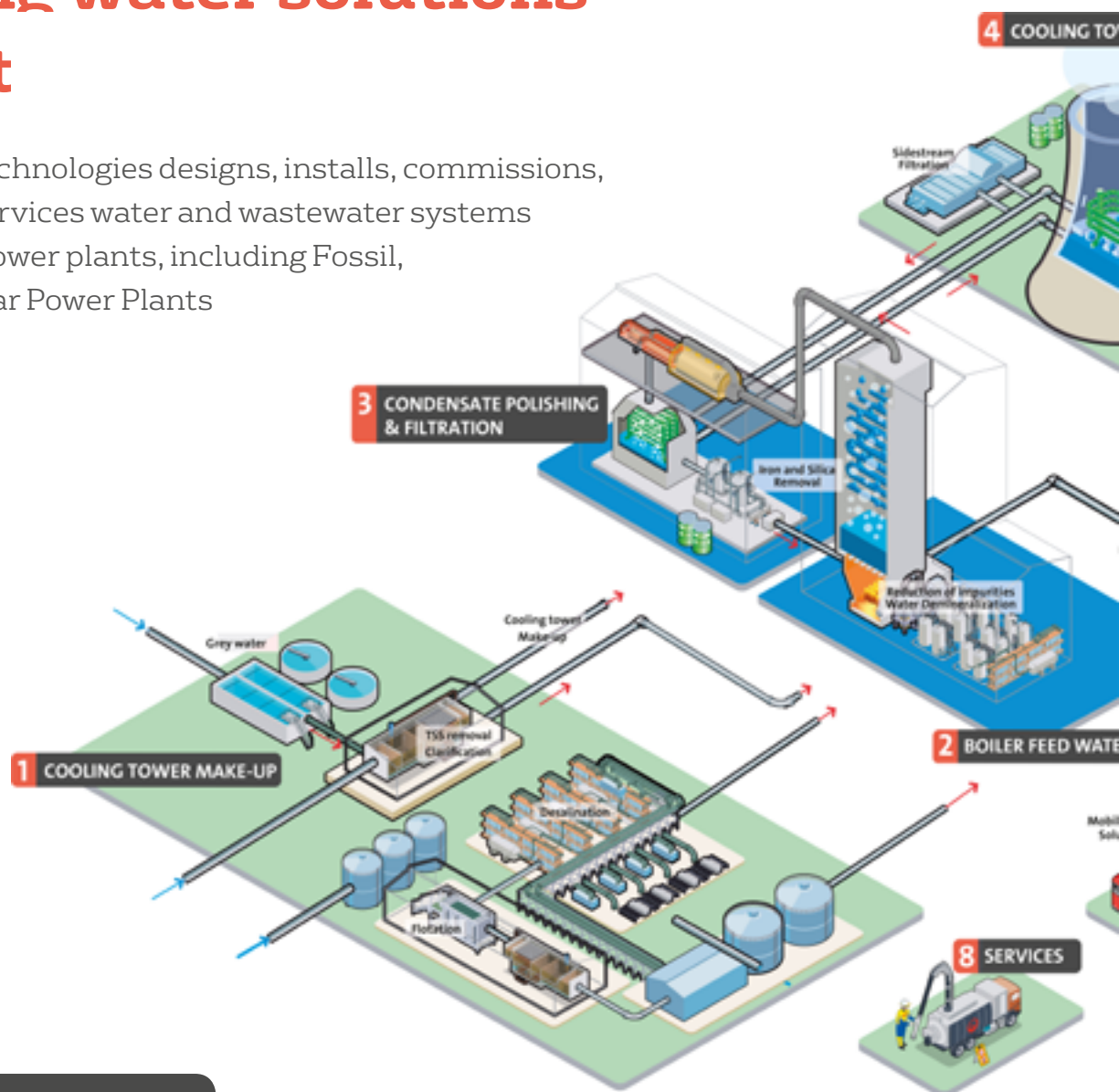


STANDARDIZATION

Veolia proposes 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

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).

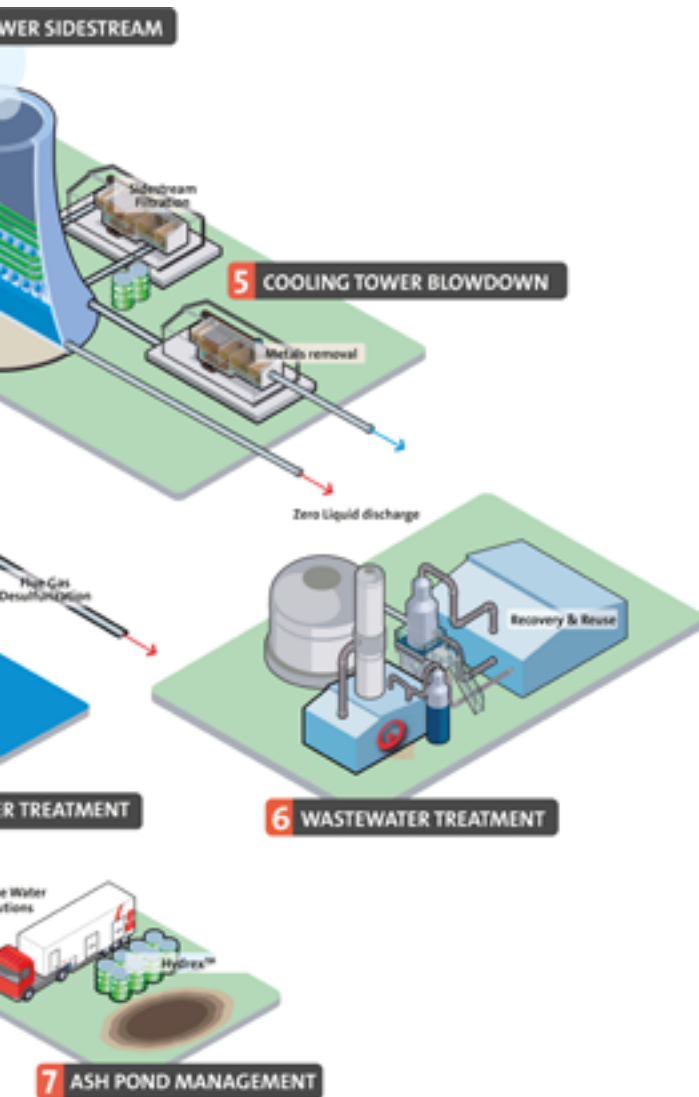
- Typical applications include removal/reduction of suspended solids, hardness, silica, organics, iron and manganese
- High quality cooling water allows for high efficiency fill to be used in the tower, resulting in a lower heat rate and higher power plant efficiencies

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



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 or minimize blowdown water, in order to avoid corrosion and organic material in cooling towers due to excess concentration of contaminants.

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

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

6 FGD 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)
- Proprietary CoLD™ process for FGD blowdown and IGCC wastewater.
- Heavy metals removal- both conventional Phys/Chem treatment and filtration or proprietary technologies (e.g. METCLEAN™)

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, odor and corrosion.
- Hydrex™ is ideal for use in recirculation, open and closed water cooling systems and 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

- Consistent treated water quality down to 0.08 µS/cm
- Off-site regeneration of resins
- Automatic monitoring
- Flow rates from 2 to 400 m³/h
- Maximum water yield
- Reliable contingency planning
- Mobile service network
- Fast delivery and commissioning



A world of experience

Bayswater Power Station

Bayswater, Australia

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



Redhawk Power Station

Arlington, AZ, USA

- > Design and Build
- > Source: reclaim water
- > Capacity: 102 m³/h of high salinity blowdown from the cooling towers
- > Process: Zero Liquid Discharge (ZLD) System



Al-Hidd IWPP

Al-Hidd, Kingdom of Bahrain

- > Capacity: 950 m³/h
- > Process: 10 Multiple Effect Distillation (MED) units



Hamburg Moorburg

Hamburg, Germany

- > Capacity:
 - Service Water Treatment (Multiflo®): 2 x 240 m³/h
 - Demineralization plant (Multimedia filter, Cation and Anion exchanger, Reverse osmosis, Mixed bed exchanger): 120 m³/h
 - Condensate Polishing Plant (Cartridge filter and Mixed bed exchanger with external regeneration): 2 x 1,000 m³/h



Seabank Power Station

Bristol, United Kingdom

- > TEMPORARY SOLUTION
- > Capacity: 25-60 m³/h
- > Process: MODI™ Mobile ion exchange deionization

400MW Combined Cycle Plant

Daegu City, South Korea

- > Design and Build
- > Capacity: 2x198 m³/h
- > Process: Condensate Polishing, SeparIX



FHI Limay Power Plant

Limay, Bataan, Philippines

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



FGD Wastewater Treatment Plants

Poland

- > 10 FGD wastewater systems in the last three years

Resourcing the world

Veolia Water Technologies Russia

Veolia Water Technologies

Россия • Москва • 115093 • Серпуховский пер. д. 5 стр. 3
tel. + 7 921 996 02 96 - info.russia@veolia.com

www.veoliawatertechnologies.ru