



# Desalination

**World-class expertise in all types of desalination —  
seawater, brackish water, and wastewater reuse**

Black & Veatch is a leader in desalination, assisting clients with a comprehensive range of technologies and project types. Our global portfolio addresses all types of challenging source waters treating seawater, brackish groundwater and wastewater for both municipal and industrial clients with projects on six continents.

We offer a full program of services tailoring our approach to each client's needs, from traditional engineering and design services to turnkey design-build.



**BLACK & VEATCH**



## Diverse Service Offerings

We execute desalination projects with our clients' best interests in mind, which includes offering a variety of project execution methods. In addition to providing traditional consulting and Owner's Engineering services in both energy and water, Black & Veatch is a leading EPC company furnishing projects under a full range of design-build (DB) and design-build-operate (DBO) models as well as offering operational and management consulting services to address clients' financial needs.

- Traditional Engineering Consulting & Design Services
- Feasibility & Economic Studies
- Facility Planning
- Research & Pilot Programs
- Owner's Engineering
- Lender/Investor's Engineering
- Permitting & Regulatory Compliance
- Construction Phase Services
- Startup & Commissioning
- Operational Assessments
- Design-Build (DB)
- Design-Build-Operate (DBO)

## Energy Efficiency

Desalination is an energy-intensive treatment alternative, where operating costs can make up more than 50 percent of the total cost of treated water. Black & Veatch develops energyconscious solutions to minimize energy use applying the best available membranes, energy recovery devices and high-efficiency motors with variable frequency drives.

## Process Understanding

We apply appropriate technology solutions, tailored to meet the individual needs of each project. Our experience in source water characterization enables us to develop cost-effective process solutions to achieve finished water quality objectives over the full spectrum of desalination options and associated systems. We address all design challenges from intakes and pretreatment to corrosion control in the distribution piping and waste brine minimization and disposal:

- **Intakes** — Subsurface, Wells, Open
- **Pretreatment** — Dissolved Air Flotation, Sedimentation, Membrane Filtration, Granular Media
- **Desalination** — Membranes (Reverse Osmosis, ED, NF), Thermal (MSF, MED)
- **Stabilization** — Air Stripping, pH Adjustment (e.g. Caustic, Lime, Carbon Dioxide, Calcite Media)
- **Disinfection** — Chlorine, Chlorine Dioxide, Ozone, UV, Oxidation with UV/H<sub>2</sub>O<sub>2</sub>
- **Reduced or Zero Liquid Discharge (ZLD)** — Thermal, Chemical and Membrane-based Methods
- **Concentrate Disposal** — Discharge, Injection Wells, Beneficial Use.

## Life-Cycle Costs

Prudent selection of process equipment, RO membranes, and materials of construction is critically important to balancing capital costs with longer-term operational costs. Optimizing life-cycle costs requires a careful balance — understanding the importance of process decisions to meet the finished water quality requirements while applying energy-efficient solutions with reasonable rate of return.

# Experience Highlights

Black & Veatch received the Industrial Desalination Plant of the Year award at the 2017 Global Water Summit.

| Project   | Size                                  | Services   | Highlights   |
|---|---------------------------------------|--|--|
| Seawater Desalination for Municipal Drinking Water        |                                       |  |  |
| Jurong Island Seawater Desalination Plant, Singapore      | 36 MGD (136 MLD)                      | Engineer for DBO contractor — design, construction management, commissioning             | Co-sited with a power plant  |
| Claude Lewis Carlsbad Desalination Plant Carlsbad, CA USA | 54 MGD (254 MLD)                      | Investor's due diligence (technical, financial, permit reviews)                          | Desalination Plant of the Year (2016), Global Water Intelligence   |
| Tseung Kwan O (TKO) Plant Water Services Dept., Hong Kong | 36 MGD (164 MLD)                      | Owner's Engineer, Design   | Landfill gas used for power generation   |
| Tuas, Tuas II, and Marina East PUB, Singapore             | 3 projects totaling 156 MGD (590 MLD) | Consultancy, Owner's Engineer, Design  | Includes a fast-track (7-month) project  |
| Seawater Desalination for Industrial Use                  |                                       |  |  |
| Escondida Water Supply BHP Billiton, Chile                | 57 MGD (216 MLD)                      | Preliminary design through detailed design, resident engineering including commissioning | Largest desalination plant in the Americas serving world's largest copper mine. Industrial Desalination Plant of the Year, 2017, Global Water Intelligence |
| Escondida Water Supply Expansion BHP Billiton, Chile      | 19 MGD (72 MLD)                       | Preliminary design through detailed design, resident engineering including commissioning | Expanded the largest desalination plant in the Americas; Over 1 million manhours without safety incident   |
| Spence Growth Option, Desalination Plant BHP, Chile       | 23MGD (87MLD)                         | Conceptual Design  | Project was further developed into a BOOT scheme (Caitan)  |



# Experience Highlights

| Project  | Size   | Services   | Highlights   |
|--|--|--|--|
| Brackish Groundwater Desalination for Municipal Drinking Water                     |  |  |  |
| Groundwater Desalination Plant<br>SAWS, San Antonio, TX USA                        | 12 MGD (45 MLD) with expansion to 30 MGD (114 MLD)                     | Program manager — led multi-firm design and construction including wells, desalination plant, distribution and disposal of brine through injection wells | One of the largest inland brackish water RO facilities in the USA  |
| Dunedin groundwater desalination plant, Florida, USA                               | Changi I 60 MGD (227 MLD)<br>Changi II 60 MGD (227 MLD)                | Design Builder for refurbishment of existing plant — replacement of RO, control system, post-treatment and activated carbon                              | Construction while the existing plant is in operation  |
| Wastewater Reclamation for Municipal Potable Reuse                                 |  |  |  |
| Groundwater Replenishment System Expansion<br>Orange County Water District, CA USA | Initial Expansion 30 MGD (114 MLD)<br>Final Expansion 30 MGD (114 MLD) | Design, construction phase services  | Largest indirect potable reuse plant in the world  |
| Changi I and Changi II NEWater Plants<br>Singapore                                 | Changi I 60 MGD (227 MLD)<br>Changi II 60 MGD (227 MLD)                | Changi I: DBO contractor's engineer — design, construction management and commissioning<br>Changi II: Owner's engineer for DBO contractor                | Both plants built on top of existing wastewater treatment plant requiring efficient design to minimize footprint   |
| BHP Mining Wastewater Treatment  | Various  | Evaluation and preliminary design of conventional and emerging highly innovative treatment technologies for salinity or selective constituent removal    | Developed preliminary design for tretment of 2 BHP operations water sources and range of emerging technologies for removal of salinity or selective constituents for reuse, metal recovery etc. Targeted near ZLD or ZLD |