VEOLIA

Sustainable Water Solutions for the Mining Industry

WATER TECHNOLOGIES

Creating Water Solutions for the mining industry

Veolia Water Technologies specializes in potable water, process water and wastewater treatment solutions for all types of mining sites (such as gold, copper, nickel, bauxite, iron, coal, uranium, phosphate, potash, zinc, silver and rare earth metals).

Meeting your needs

- To **improve productivity** by treating water for production process requirements
- To **manage environmental risks** by treating contaminated water to achieve water quality suitable for reuse or for safe discharge into the environment
- To **add value** to the bottom line by treating sludge streams to recover suspended and dissolved constituents
- To secure **high quality drinking water,** even at remote mining sites
- To have **robust and reliable equipment** requiring minimal unplanned maintenance
- To cope with production peaks while **complying with stringent regulations**
- To guarantee long-term efficiency and cost control through **operations services**

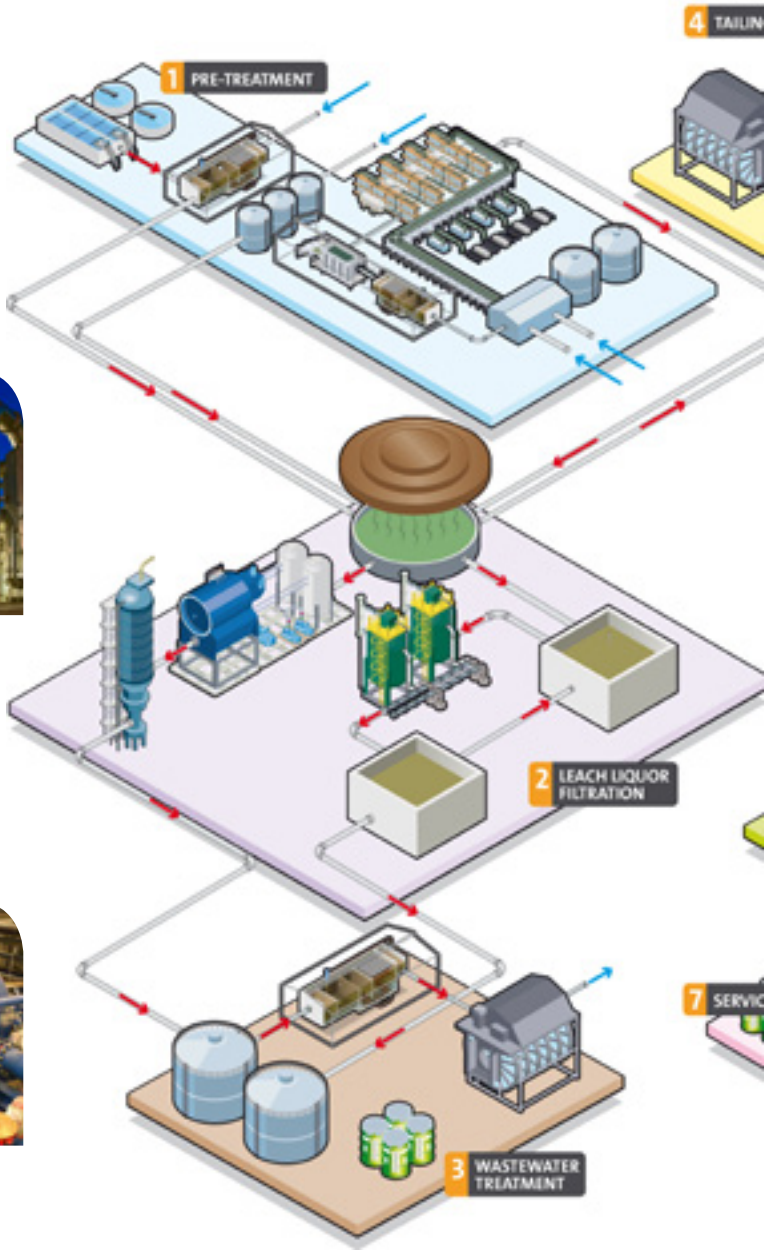
Dedicated experts at your service

Specialized expertise

We provide specialized water systems, thanks to our understanding of the unique requirements of mine operations and our worldwide expertise in mine water issues.

Focusing on system performance, compliance with process and environmental requirements and long-term cost-effectiveness, we are able to meet the demanding reliability, safety and quality standards of the mining industry.

A world of experience



1 PRE-TREATMENT

- **Ground water, surface water, grey water**
- **Seawater desalination**
- **Pipeline supply**
- **Process water treatment**

POTASH CORP - AURORA PHOSPHATE MINE
North Carolina, USA

- Design and build a boiler feed water pretreatment plant
- Capacity: 340 m^3/h
- Process: Multimedia filtration, double-pass RO and ion exchange

2 LEACH LIQUOR FILTRATION

- **Recovery of precious metals from leach stream**

BARRICK GOLD
Pascua Lama, Chile/Argentina border

- Filters supplied for Merrill-Crowe process for a gold mine
- Capacity: 316 m^2 of filter area each x10
- Process: Ten Filtra-Matic™ precoat filters for gold cyanide clarification

3 PROCESS WASTEWATER TREATMENT

- **Removal of contaminants: suspended solids, heavy metals, cyanide, arsenic, selenium, iron, manganese, chromium, etc.**

SASOL EDR BRINE
South Africa

- Design, supply, installation and commissioning of a system for desalination and reuse of mine water
- Capacity: 3,240 m^3/d Electro-dialysis Reversal (EDR) brine feed
- Evaporation capacity: 134 T/h
- Process: The largest forced circulation evaporator in Africa along with three crystallizers

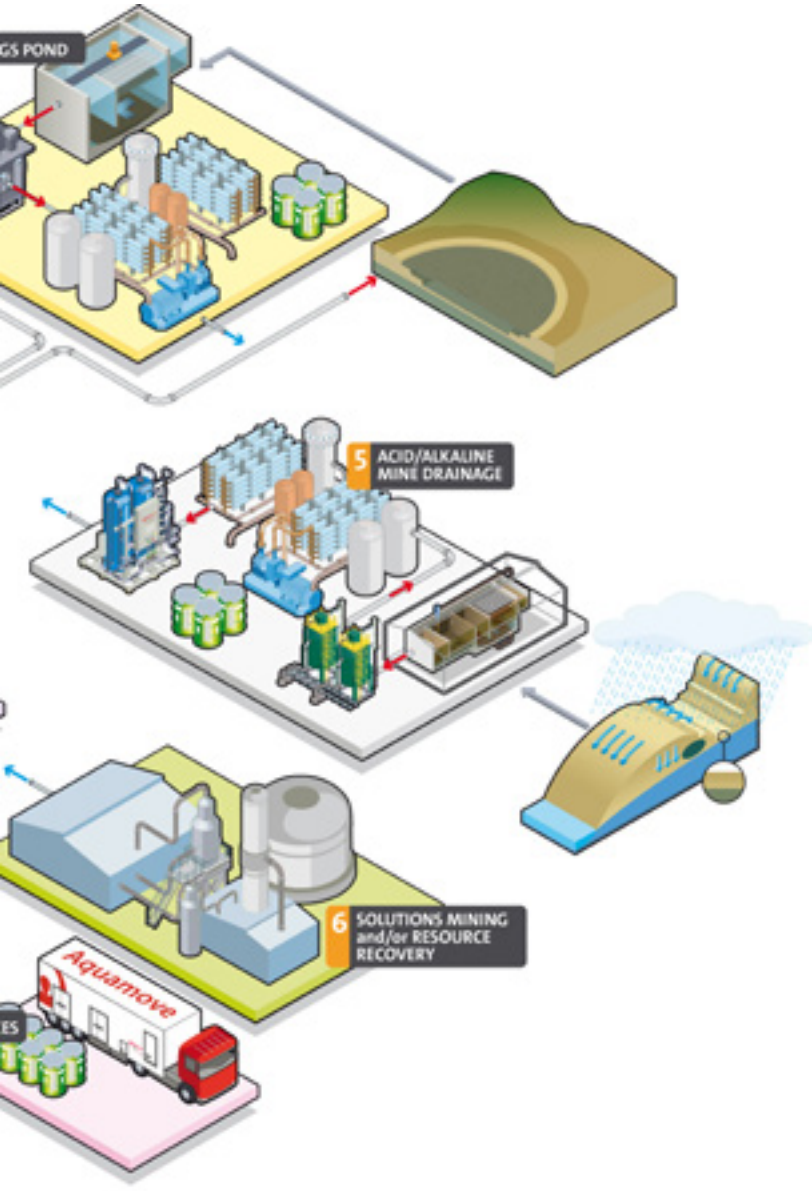
7 SERVICES

- **Complete water cycle management & outsourcing**
- **Mobile and temporary solutions**

WHEAL JANE MINE
Cornwall, England

- Operate and maintain a treatment plant that extracts water from a closed tin mine until 2020
- Capacity: 405 l/s (max)
- Process: Sludge recirculation, reaction using lime addition, lamella clarification, sludge management

in the mining industry



4 TAILINGS POND

- **Dewatering and drying**
- **Water Recovery and Reuse**
- **Discharge compliance**
- **Positive water balance control**

GOLDCORP MARLIN GOLD MINE
Guatemala

- Design and procurement of a cyanide oxidation and metals removal plant to treat tailings impoundment
- Capacity: 500 m^3/h from tailings impoundment
- Process: Actiflo® clarification and Hydrotech™ discfilter

5 ACID/ALKALINE MINE DRAINAGE

- **Mine water control**
- **Positive water balance control**
- **Groundwater reclamation**

MEPCO, LLC
Pennsylvania, USA

- Design and procure an AMD treatment plant for a coal mine
- Capacity: 910 m^3/h
- Process: DenseSludge™, maximizing water recovery and minimizing sludge volume

6 SOLUTIONS MINING and/or RESOURCE RECOVERY

- **Production systems and product recovery**

AMERICAN SODA
Parachute, CO USA

- Crystallization system for production of sodium carbonate monohydrate, sodium bicarbonate, and recovery of sodium carbonate decahydrate from purge stream
- Capacity: $Na_2CO_3.H_2O$ = 1 million tons/year, $NaHCO_3$ = 150,000 tons/year, $Na_2CO_3.10H_2O$
- Process: Production from solution mined nacholite

- **Water treatment chemicals**
- **Spare parts and consumables**
- **Local support staff**

NIOBEC MINE
Quebec, Canada

- Temporary treatment system, operation and chemical supply for a WWTP for a niobium mine
- Capacity: 417 m^3/h
- Process: Actiflo® clarification for TSS removal and Hydrex™ chemicals





Proven technologies

- Water recovery system for Acid Mine Drainage: **AMDRO™**
- High speed clarification & softening: **Actiflo® and Actiflo® SOFTns™**
- Enhanced clarification & softening for higher TSS waters: **Multiflo™**
- Reverse Osmosis membranes for high water recovery: **OPUS®**
- **Membrane filtration** (Micro-, ultra- and nano-filtration, Reverse Osmosis (RO))
- High density sludge process: **DenseSludge™**
- **Ion exchange**
- Discfilters: **Hydrotech™**
- Sulfate Removal: **LoSO4™**
- Water treatment chemicals: **Hydrex™**
- Moving Bed Biofilm Reactor biological treatment for nitrogen and selenium in mine effluent: **AnoxKaldnes™**
- Merrill-Crowe clarification filters: **Auto-Jet™ and Filtra-Matic™**
- **Zero Liquid Discharge** (ZLD): **HPD®** Evaporators and crystallizers, **Evaled™** Evaporators
- Adsorption process for the removal of heavy metals to an active media surface to minimize sludge and residuals: **MetClean™**
- **Mobile Water Services** for temporary or emergency water needs
- **Zero Liquid Waste** (ZLW) solution creates a clean water resource and meets new discharge limits for TDS and chlorides
- **Desalination** for make-up water and process water: **Sea water Reverse Osmosis** (SWRO) and **Thermal Distillation** (MED)
- **Pipeline** supply and conveyance

NEW DECISION-MAKING TOOLS FOR SUSTAINABILITY:

> **Total Carbon Cost Analysis:** Quantifying the CO_2 emissions of our solutions and technologies in order to optimize processes and reduce costs.
> **Water Impact Index (WIIX):** Quantifying water footprint by incorporating additional factors like resource stress and water quality.
> **True Cost of Water:** an economic evaluation of risks and benefits related to water use

Resourcing the world

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