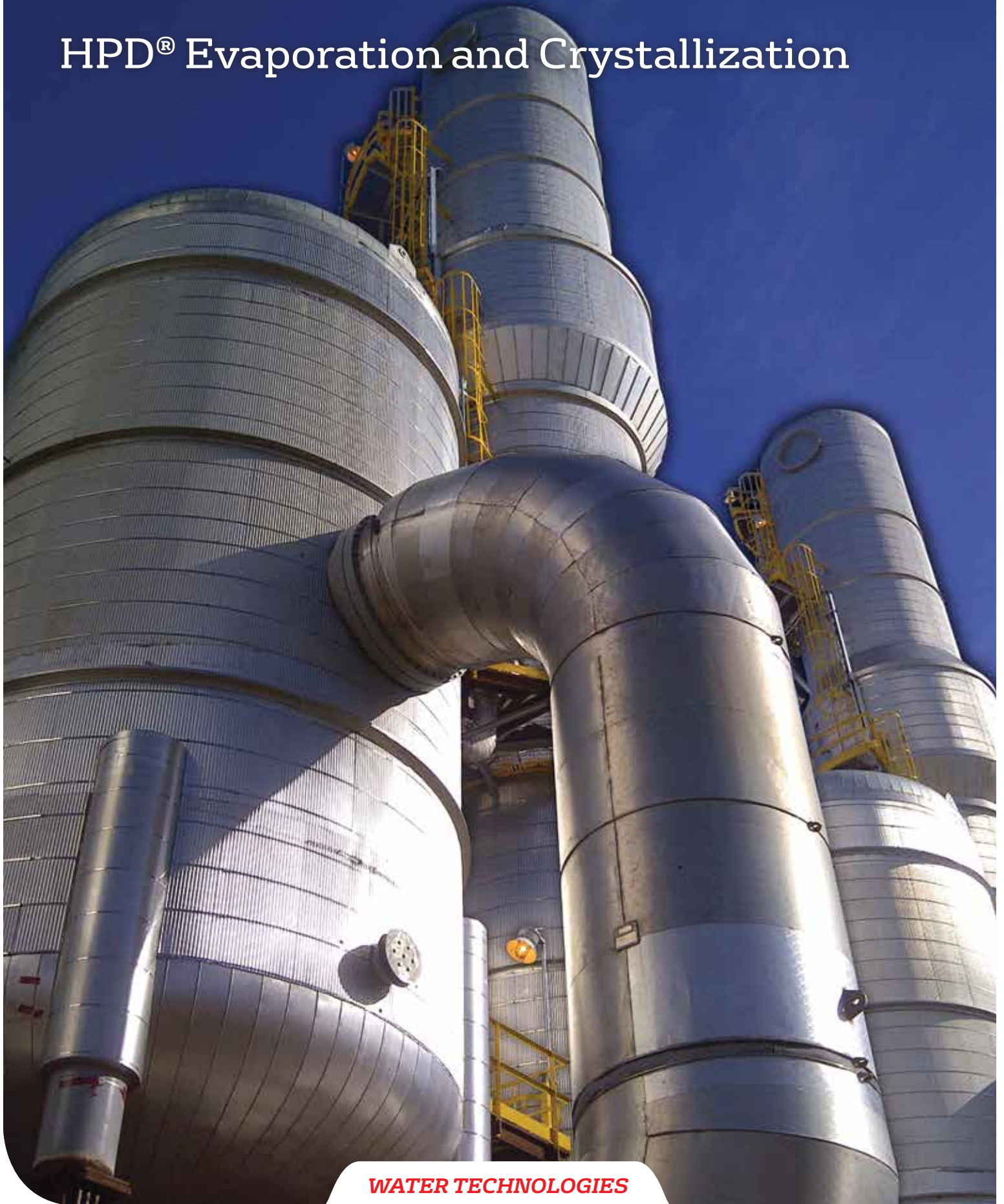


HPD[®] Evaporation and Crystallization



Evaporation and Crystallization Solutions for Industrial Markets

With over 1,000 installations in more than 30 countries, Veolia is a worldwide leader in the development of innovative process solutions utilizing HPD® evaporation and crystallization as core technologies.

Veolia has developed a complete range of efficient and fully integrated systems for production of premium chemical products, recovery of valuable by-products, and recycle and reuse of wastewater for a diverse group of customers and industries worldwide.



Oil and Gas

- Steam Assisted Gravity Drainage (SAGD) produced water treatment systems featuring Silica Sorption™ technology
- OTSG Blowdown and WTB feed water treatment
- Produced water treatment for shale gas, coal seam gas (CSG), and tight oil
- Zero Liquid Discharge systems
- Tailings pond treatment / reuse



Pulp and Paper

- Black liquor evaporation systems
- High solids concentration
- Chloride Removal Process (CRP™) for sodium recovery and NPE removal
- Condensate stripping and segregation
- Methanol rectification and handling systems



Metals and Mining

- Systems for evaporites mining, coproducts from extraction & refining, by-products, and tailings & bitterns
- Alumina spent liquor evaporation and oxalate removal systems
- Nickel, lithium, magnesium and zinc salts crystallization
- Vanadium, tungsten, molybdenum



Power Generation

- Integrated water and wastewater facilities
- Zero Liquid Discharge (ZLD)
- FGD Blowdown and IGCC gray water systems using CoLD™ Crystallization
- Radwaste evaporation / crystallization



Ethanol/Biofuels/ Agri-products

- Evaporator systems for wet and dry milling processes
- High Efficiency Stillage Concentration (HESC™) system achieves high solids ($\geq 50\%$)
- Energy saving process integration
- Vinasse concentration
- Processes for unique feedstocks



Chemical Processing

- Evaporation and crystallization systems for chemical production
- Proven processes for more than 50 chemical compounds
- Specialty chemical production: herbicides, amino acid, synthetic sweeteners, Ibuprofen, Bisphenol-A, Metabisulfite, Thiocyanate



Fertilizer

Crystallization circuits to produce water-soluble crop nutrient products.

- Ammonium Sulfate
- Ammonium Phosphate (MAP/DAP)
- Ammonium Nitrate
- Potassium Phosphate (MKP/DKP/MKDP)
- Potassium salts (MOP/SOP)
- Potassium and Sodium Nitrate
- Magnesium Sulfate
- Phosphoric Acid Concentration and Defluorination



Salt

- High-purity sodium chloride crystallization
- Calcium chloride concentration
- Sodium sulfate crystallization
- High-purity brine treatment



Chlor-alkali

- High-purity brine treatment
- Sodium and potassium hydroxide concentration systems
- Sodium chlorate crystallization
- Membrane Cell brine circuit integration



Soda Ash

- Sodium carbonate and bicarbonate crystallization
- Sodium carbonate purge minimization and alkali recovery
- Pretreatment systems for solution-mined or natural ores

Total Project Capabilities

In-house Expertise



Veolia's capabilities to deliver both first-of-its-kind solutions and complex, highly integrated projects require a broad range of expertise:

- Process engineering team with decades of experience in new process development
- Cross-discipline engineering teams including mechanical, electrical, instrumentation, structural, and civil/foundations
- Research & Development and testing
- Permitting and scope development
- Turnkey project execution
- Worldwide network of reputable suppliers and strategic partnerships
- Aftermarket and Field Service support

Design-Build Project Execution



A Design-Build project integrates all major engineering services and the best available technologies. This approach ensures that clients benefit from the expertise and attention to detail needed to design and build projects of all sizes, with guarantees on capital costs, process performance, operating costs, and project schedules.

- Single point of responsibility
- Detailed design and engineering
- Project and construction management
- Modularized equipment supply expertise
- Site-based "Operate and Maintain" contract services
- Performance Guarantees

A Preferred Partner – Project Development

Veolia is a reliable partner in the development of each unique project. Combining expert process development and validation with early scope development provides the client with options for achieving both optimum system performance and business objectives.

Resources such as research and testing facilities, in-house multi-disciplined engineering teams, and a single-point project management model allow a comprehensive overview of the project for the client. This flexible approach makes Veolia a preferred partner for **FEED** or phased engineering contracts for highly complex projects.

Quality Assurance

Veolia's office located in Plainfield, Illinois, USA is an ISO 9001:2015 facility (Certificate #30630), certified for engineering, procurement and project management. This ensures consistent execution and quality on every project.

Our quality management is a philosophy -- not merely a procedure.



Research & Development Center

A world-class, 50,000+ square-foot research facility is dedicated to support new process development for Veolia's HPD® Evaporation and Crystallization Technologies. These capabilities provide clients with the confidence that the commercially installed system will perform as designed.

- Complete range of analytical, bench and pilot-scale testing capabilities
- Detailed sample and product analysis
- Extensive cataloging of physical and chemical pilot evaluations and critical design data
- Development of commercial processes based on new, unknown feed stocks to define product specifications



Technical Services & Field Service

Aftermarket and Technical support services includes:

- Spare parts, replacement, and upgrade of major process equipment, vessels/tanks and ancillary equipment
- Troubleshooting, system inspections & process evaluation (including non-Veolia equipment)
- System startup support and performance testing
- Service agreements for system “healthcare” that includes scheduled service, operation/process support, and operator training



Resourcing the world

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