

ADDRESSING THE NEW CHALLENGES OF THE ENERGY AND CHEMICAL INDUSTRIES





**PRODUCING ENERGY
AND CHEMICALS
MORE SUSTAINABLY**

THE CHALLENGES OF YOUR SECTOR

All human activities are faced with global climate change and the call for ecological transformation is stronger than ever.

As a key player in the energy & chemical industry, you hold a crucial role in driving positive change, as you face major challenges. The need to focus more on climate change mitigation and regulatory reporting is real. This results in a multiple imperative:

- Improve your environmental footprint;
- Reduce costs to remain competitive;
- Improve acceptability and inclusion in the territories where you operate;
- Optimize the efficiency of your facilities, reinforcing safety in and around them.

1. Maintaining the license to operate

Regulatory hurdles, encompassing stringent environmental standards, safety protocols, and emissions reduction targets, demand continuous adaptation to an ever-changing compliance landscape. At the same time, ensuring sustainable practices while coping with fluctuating resource availability, such as water scarcity, presents a complex exercise. Navigating this complexity requires a delicate equilibrium between economic viability and responsible stewardship, pivotal for sustaining your operational legitimacy.

2. Reducing your environmental footprint: cutting carbon emissions and protecting natural resources

The energy and chemical industry is a major consumer of water and energy resources as well as a producer of hazardous waste and an emitter of greenhouse gasses. With companies under constant public scrutiny, sustainability now has to be an operational mode and carbon emissions reduction, a target to reach. The increasingly stringent environmental standards constrain you to rethink your extraction, production and distribution processes. In addition, to preserve your acceptability within the communities that you serve, you are also requested to provide guarantees and demonstrate transparency and concrete actions regarding environmental, social and corporate governance (ESG).

3. Controlling costs to remain competitive

All along your value chain, keeping costs low to stay competitive is a major challenge. Optimizing production systems and the use of utilities on currently operating sites is therefore a priority. This maximizes production efficiency, reduces the costs of extraction and refining and thereby offsets the exploration costs.

4. Maintaining productivity to meet the global demand

To sustain feedstock availability, extending the lifespan of mature upstream sites has become a priority. This is also the case for refining and chemical plants where asset integrity is key and investments are made to have better performing facilities. There is therefore an imperative to achieve 100% reliability: no unplanned shutdowns, increased throughput, and secure industrial assets. This also means reinforcing health and safety, both within the facilities and for the neighboring populations and environment.

5. Ensuring health and safety in and around facilities

Complex processes, hazardous substances, and high-pressure and high-temperature operations pose risks to workers. Accidents, fires, and chemical releases demand rigorous safety measures and training. Additionally, the extensive infrastructure and remote locations complicate emergency response. Ensuring the well-being of neighboring populations adds another layer of complexity, requiring stringent safeguards to prevent environmental pollution and mitigate potential health impacts. Striking a balance between productivity and safety necessitates ongoing innovation, regulatory compliance, and comprehensive risk management.

VEOLIA'S SOLUTIONS FOR THE ENERGY AND CHEMICAL INDUSTRIES

Veolia designs and implements solutions for the management of water, energy and waste resources in a perspective of decarbonization, preservation and regeneration of resources and pollution treatment. Our range of offers focuses on the needs of the entire energy and chemicals value chain, from upstream exploration and production to the refining and chemical manufacturing industries.



WATER

Water is inherently part of the energy and chemicals value chain. Upstream, water is produced along with oil and gas and is essential both in the refining process and in chemical manufacturing. But fresh water is becoming scarce.

In response to growing water scarcity and increasingly strict regulations, industries are looking for both effective and sustainable solutions to recycle more and effectively manage different water flows such as injection water, produced water, process water, boiler feed water, cooling water, or wastewater.

As a leading expert in industrial water management, Veolia controls all the stages of the water cycle and can address all your industrial challenges thanks to its longstanding experience and a portfolio of hundreds of proprietary technologies. In particular, we provide solutions that will allow you to achieve recycling and reuse while making the most of the recovered by-products.

ENERGY

Veolia supplies industrial utilities such as steam, power, cooling, compressed air, and introduces the use of renewables and low-carbon fuel sources for utilities production (e.g. replacing coal with Refuse-derived fuel or using biomass). Veolia's solutions meet the reliability, quality, availability and cost requirements of industrial customers for which energy is a key competitiveness issue. We also optimize your utilities, regardless of their nature, as well as energy use related to processes and industrial installations.

WASTE

Veolia offers an integrated waste management system that deals with hazardous and non-hazardous wastes, with a specific attention to safety, traceability, and compliance. This allows you to optimize production flows, reduce transportation and landfilling costs and lower the impacts on the environment. Veolia has the proven experience, expertise and technology to effectively and cost-efficiently address the broad variety of waste streams emitted from your plants guaranteeing the safe disposal of all waste and their maximum recovery.

With a global recognition of its expertise along the water, energy and waste value chains, we also master all the interactions and synergies between them. This convergence of expertise enables Veolia to offer differentiating solutions to meet the challenges of the global management of your resources and processes.

We innovate and build with you your solutions for tomorrow

According to Veolia, ecological innovation must be an innovation of solutions serving the real needs of our societies in order to live harmoniously and sustainably on the planet. It aims to be local, co-developed, economic and technological. Therefore, fostering innovation with our stakeholders is key to meeting these challenges and needs.

YieldUp* Catalytic Coating Extends Furnace Run-Lengths, Increasing Yield for Ethylene Producers

The steam-cracking furnace for ethylene production is one of the most energy-intensive processes in the petrochemical industry. The buildup of coke on the furnace coils is inevitable, and decoking typically must be performed roughly every 40 – 60 days depending on furnace design. Furthermore, furnace coils are damaged by the heat over time and must be replaced every four to six years on average. Ethylene manufacturers are constantly looking to prolong the life of these coils and extend the periods between both decoking and maintenance.

In order to provide relief in such a pressurized environment, Veolia developed the patented technology YieldUp, a micro-thin catalytic coating applied to the inner surface of steam cracker furnace coils in the radiant section. It gasifies coke or any carbon upon contact, thereby reducing its accumulation.

Successful application of the YieldUp coating can extend the time between decoking by a factor of two or more, thereby increasing annual ethylene production by 3%. This also translates into the corresponding energy savings and a reduction in CO₂ emissions.

As more petrochemical operators utilize YieldUp, we continue to define and prove the value of our catalytic coating for ethylene production. We also remain committed to developing innovative solutions that drive ecological transformation, to help petrochemical manufacturers improve performance to benefit shareholders, their customers and the planet.

*Trademark of Veolia; May be registered in one or more countries.



SOLUTIONS AND TECHNOLOGIES FOR YOUR SECTOR



— ACTIFLO® CARB

By combining the qualities of powdered activated carbon with ACTIFLO®'s high rate clarification, treatment efficiency, operational flexibility and reduced footprint, ACTIFLO® CARB represents the ideal solution in water pollution control and polishing.

ACTIFLO® CARB is well suited for industrial applications, specifically for the removal of COD that is refractory to chemical and/or biological treatment.



— MPPE

Macro Porous Polymer Extraction systems remove dissolved and dispersed hydrocarbons such as aliphatic, aromatic, polyaromatic and halogenated compounds. The technology is robust and compact, particularly adapted to offshore constraints and gas field produced water.



— MEMBRANE TREATMENT FOR INJECTION WATER

The ZeeWeed 700B inside-out ultrafiltration membrane offers seawater pretreatment for injection and solids removal in offshore oil and gas applications. When compared to granular filter media and cartridge filters, the ZW700B membrane produces superior water quality and is virtually unaffected by variable raw water quality. This allows to protect and extend the lifespan of the sulfate removal unit downstream the pretreatment. The SWRS Series is a nanofiltration membrane specifically developed for seawater sulfate removal. It is built on Veolia's robust DK membrane platform, which has been used for over 30 years in some of the most challenging applications.



— HYDROCARBON PROCESSING CHEMICALS

Veolia's chemical portfolio has various product lines to solve customer problems within the energy and chemical industries including antifoulants, corrosion inhibitors, phase separators, finished product additives, H₂S scavengers and more. A thorough analysis of the customers' specific issues dictate which product or products are applied for the most cost effective and efficient solution.

SOME OF OUR REFERENCES



— OPTIMIZING THE WATER CYCLE MANAGEMENT OF A PETROCHEMICAL COMPLEX — LG & LOTTE CHEMICAL (SEETEC)

Daesan, South Korea

LG & Lotte Chemical (SEETEC), specializing in the manufacture of chemicals and petrochemicals, has entrusted Veolia with operating one of the largest reverse osmosis units in Asia, and managing its water plants and two cooling towers. Veolia supplies the Daesan petrochemical complex with purified water, demineralized water, cooling water and domestic water.

Veolia has implemented solutions for optimizing reverse osmosis systems and recycling backwash water in order to prolong the life of the membranes and reduce the amount of wastewater produced. With a dehydration method that decreases the percentage of wet matter contained in processed material, there is also less residual sludge. Steam engines were replaced by electric motors for better energy efficiency. Several water production phases have been automated, and a SCADA control room, in operation 24/7 with real-time monitoring data, provides operational security and continuity.

90,000 m³
of water cooled
per hour

870,000 m³
less backwash
water to process

10.5%
annual energy
savings

— TREATING NON-CONVENTIONAL COAL SEAM GAS PRODUCTION WATER (SURAT BASIN)

Surat Basin, Queensland, Australia



QGC is the world leader in coal seam gas exploration and production, of which Shell, a major player on the world energy market, is the operator and majority interest holder. QGC recognized Veolia as a partner capable of operating and maintaining its two water treatment plants located in the Surat Basin coal seam gas fields.

Veolia is responsible for managing the ultrafiltration, ion exchange, reverse osmosis and concentration systems as well as the pumping stations and electrical substations. The Group will treat the production water of 6,000 wells by 2030, as and when they are put into service. In total, nearly 200,000 m³ will be treated per day with a long term guarantee of very high quality output. The treated water, 97% of which is reused, is distributed within a water supply agreement to local farmers.

Veolia also provides QGC with a total waste management solution with an approach based on the following key characteristics:

- Structured resource recovery program that focuses on each individual segregating waste at the disposal source. The program also includes the identification of reuse, recovery, recycling, treatment and disposal options locally and throughout QLD.
- Standardized operational model applied across QGC's entire upstream operations and service area.
- Specialized regulated and liquid waste collection vehicles to support well engineering operations, and multi-skilled labor.
- Tailored waste management services for the various operational requirements of both QGC's fixed facility assets and well-engineering rigs and drill camps.
- Veolia's approach takes into account the desirable steps of the waste management hierarchy for avoiding, reusing, recycling and recovering waste. The end goal of the process is to minimize waste going to landfill.

200,000 m³
of production
water treated
per day

97%
of the treated
water is recycled





— COMPLETE WATER CYCLE MANAGEMENT FOR ASIA'S LARGEST REFINER (SINOPEC)

Beijing, China

Veolia brings years of experience in water cycle management for the oil and gas industry to reduce overall water footprint and boost water recycling rate in the Yanshan petrochemical complex.

In 2006, Sinopec selected Veolia as its partner for a joint venture established to improve the operation and maintenance of its wastewater treatment system, as well as to improve the capacity and efficiency of Beijing Yanshan Petrochemical (BYPC) wastewater recycling. This cooperation with Veolia leverages the latter's outstanding technical expertise in the water industry, allowing Sinopec to focus on its core business.

In 2016, the scope of cooperation expanded to the entirety of BYPC's water cycle management (including cooling water, demineralized water, industrial water, drinking water, chilled water, and firefighting water) with the objective of upgrading wastewater treatment plants and optimizing energy management. It has reduced the site's water and carbon footprints and brought it into compliance with increasingly stringent emission standards.

The Niukouyu Wetland Park

Around 2 km west of Fangshan District, Beijing locates a quiet and vibrant wetland park—The Niukouyu Wetland Park—. It is now a people's favorite leisure center and a lovely ecological wetland that wild animals like to visit. However, it was originally Niukouyu Ecological Center, a reservoir used for sewage treatment by Yanshan Petrochemical. In June 2017, led by Yanshan Petrochemical, Yanshan Veolia carried out a comprehensive rehabilitation for the eight-hectare ponds. The wetland park currently hosts as many as 144 bird species. It has improved the environment and quality of life for local residents, while restoring the damaged ecosystem.

84,000
m³/day
Industrial
wastewater

74,000
m³/day
Demineralized
water

5,600,000
m³/day
Recycled
cooling water



— TREATMENT OF HAZARDOUS WASTE FROM OIL REFINING – ADNOC REFINING

Abu Dhabi, United Arab Emirates

A consortium comprising Veolia, Vision Invest and ADQ has signed a historic agreement with the Abu Dhabi National Oil Company Refining (ADNOC Refining) for the treatment of hazardous industrial waste.

Through this agreement, Veolia and its partners will treat the hazardous industrial waste of Abu Dhabi's biggest industrial complex in Al Ruways that includes the largest oil refinery in the Middle East. They will operate two hazardous waste sites, with a combined annual capacity of around 70,000 metric tons.

The solutions developed by Veolia will help to further mitigate the environmental impact of industrial activities and promote a circular economy approach. Veolia will specifically focus on maximizing the resource recovery (water and oil) from the oil and gas hazardous waste, to reuse them on nearby industrial plants, setting up innovative circular economy and local energy loops. The consortium will also significantly expand the existing solar farm to produce more locally sourced green energy.



70,000
metric tons:
combined
treatment
capacity
of both sites

WHO WE ARE

Decarbonization, preservation and regeneration of resources, and pollution treatment: these are the three challenges we address for all our stakeholders.

Veolia is a leading provider of environmental solutions to the energy & chemical sector across water services, energy services, industrial cleaning, waste management and resource recovery. At Veolia, we help our customers maximize productivity while limiting their carbon and environmental footprint.

This approach to performance in the service of all our stakeholders is a guarantee of quality and safety, as well as a lever for accelerating your ecological transformation.

€42.9
billion in revenue
(in 2022)

Sector turnover
€4.8 billion

220,000
employees
worldwide

ESG

Veolia is committed to a multi-faceted performance that places the same level of attention and requirements on its economic, financial, commercial, social, societal and environmental performance. Through this approach, we make concrete commitments to our five stakeholders: our planet, our society, our clients, our employees, and our shareholders. To measure and monitor progress on those commitments, we have defined 19 key performance indicators, which are regularly measured and audited by independent bodies.



UN Sustainable Development Goals (SDGs)

Veolia participates to a varied extent in the implementation of all 17 SDGs. In particular, the Group plays a major role in 13 SDGs, where the challenges directly cut across its Purpose.



WHAT IF WE PARTNERED WITH YOU TOMORROW?

Resourcing the world

Veolia

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