

THE NEW CHALLENGES OF THE OIL & GAS INDUSTRY

JULY 2016





THREE MAJOR CHALLENGES FOR THE OIL & GAS INDUSTRY

With rising global demand, highly volatile prices and increasingly stringent environmental regulations, the oil and gas industry faces three challenges: reducing costs, optimizing the performance of its industrial assets and improving its environmental footprint.



1.

Reducing costs to remain competitive

Producing crude oil and refined products at a lower cost to stay competitive on the market is one of the industry's major challenges. Optimizing production systems and environmental utilities on currently operating sites is therefore a priority for the oil industry. This maximizes production efficiency, reduces the costs of extraction and refining and thereby offsets the exploration costs.



3.

Improving the environmental footprint to meet increasingly stringent standards

The oil and gas industry is a major consumer of water and energy resources and is therefore subject to increasingly stringent environmental standards. This constrains them to rethink extraction, production and distribution methods in order to obtain or maintain their licence to operate. They also have to provide guarantees and ensure transparency in the environmental management of their activities.

In the Beijing area in China for example, where water shortages are becoming more frequent and where tackling air pollution is a major central government commitment, environmental standards are particularly strict. The standards governing wastewater discharges in particular are currently the most demanding in the world. This is a major compliance challenge for the industrial groups in the region, in particular for Sinopec. It is the largest refining company in Asia and operates the Beijing Yanshan petrochemical complex, one of the largest refined petroleum products production sites in the country.

2.

Improving performance to ensure the valorization of assets

To sustain their supply of crude oil or gas, oil companies are looking to extend the life of mature sites but are also compelled to seek new sources of oil or gas for which extraction, transport and refining are much more complex and costly. For that, they aim to achieve 100% reliability of their plants: no unplanned shutdowns, increased throughput, secure industrial assets.





VEOLIA'S SOLUTIONS FOR THE OIL & GAS INDUSTRY

Veolia designs and implements water resource, energy and waste management solutions intended to develop the circular economy which help:

- improve performances and profitability
- reduce operational costs and risks
- optimize the water cycle management
- treat hazardous waste
- recycle by-products
- reduce energy consumption in the oil industry

The range of offers focuses on the needs of both upstream (exploration and production) and downstream customers (refining and petrochemicals) in the oil and gas industry.

Upstream, Veolia builds and operates treatment systems for injection water and water produced, offers mobile water treatment solutions, manages waste (including hazardous waste), decommissions platforms, and offers a range of services tailored to the specific needs of the sector.

Downstream, the Group treats process water, wastewater, and cooling water, provides surface treatment and automated cleaning services, treats hazardous waste, produces steam and electricity, optimizes energy efficiency in facilities and recovers products such as solvents, oily sludge, etc.

Managing the life cycle of oil companies' resources

Water is central to all activities of the oil and gas industry. As a leading expert in water management, Veolia controls all the stages of the water cycle and can address all industrial challenges, thanks to a portfolio of more than 350 proprietary technologies.

Resource management, production and delivery of process water, collection, treatment, recycling and recovery of wastewater, effluent and products derived from their treatment (organic matter, salts, metals, complex molecules and energy), desalination of seawater, design and construction of treatment and network structures: all these skills allow Veolia to support the oil industry in the development of an integrated and sustainable management of water resources.

Veolia also offers solutions for the management of hazardous waste, recycling by-products, industrial services, decommissioning and soil remediation.

Veolia's expertise in water, energy and waste management allows the Group to be the world leader in the provision of environmental services for the oil and gas industry.



— VEOLIA'S ACTIFLO® CARB TECHNOLOGY

ACTIFLO® is a compact process for high rate clarification, and an ideal solution for producing process water, treating industrial effluent, and recycling it to the production sites.

The ACTIFLO® CARB process combines the performance of ACTIFLO® with the absorption qualities of powdered activated carbon in order to eliminate refractory compounds during the clarification stage.

With the use of activated carbon, ACTIFLO® CARB ensures the production of very high quality drinking water and is an optimal solution for industrial water pollution control treatments.

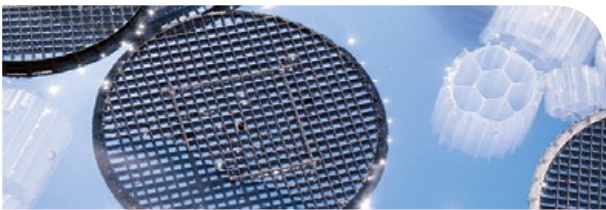


— ZERO LIQUID DISCHARGE

Regulatory thresholds for liquid waste and sewage effluent are becoming stricter. In terms of efficiency and innovation, the complete management of the water cycle for industrial applications aims to reach zero liquid discharge (ZLD).

With decades of innovation in the use of the HPD evaporation and crystallization technology, Veolia has a wide range of solutions that reduce volumes with the goal of zero liquid discharge.

The water produced by the exploitation of oil and gas deposits, effluents from refineries, and the chemical industry are among the many possible applications.



— VEOLIA'S MBBR ANOXKALDNES™ TECHNOLOGY

The MBBR AnoxKaldnes™ technology is based on the principle of active biofilm growing on small plastic carriers, specially designed and kept suspended in the reactor.

The MBBR technology is applicable in particular to industrial wastewater and is used to remove organic compounds and for nitrification and denitrification.

The versatility of the MBBR AnoxKaldnes™ makes it an ideal solution either for new installations or for rehabilitating old installations.



— TANK CLEANING WITH THE GATOR ROBOT

Even under optimal circumstances, oil tank cleaning can be risky. Therein lies the added value of the Gator robot and related services. To reduce or remove the risk, Veolia also provides detailed planning, engineering, advanced technology, security protocols and on-site process controls. Veolia's tank cleaning techniques ensure full containment of the process, tank ventilation, steam recovery and automated technology to minimize employee exposure.

OUR OIL & GAS INDUSTRY REFERENCES



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

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.

80,000 m³
of water cooled
per hour

870,000 m³
less backwash
water to process

10.5% annual
energy savings



— SHELL AND QATAR PETROLEUM: ACHIEVING ZERO LIQUID DISCHARGE FOR THE LARGEST GAS TO LIQUIDS (GTL) PLANT IN THE WORLD

Ras Laffan, Qatar

Pearl GTL, the world's largest gas to liquids plant (fuel, etc.), is operated by Shell and its partner Qatar Petroleum. Each day it produces 140,000 barrels of oil equivalent of fuels such as gasoline, diesel, and kerosene, and 120,000 barrels of oil equivalent of natural gas and ethane.

The transformation of natural gas into fuel generates significant amounts of water which is a scarce resource in the region.

Veolia, in a joint venture with Italy's Saipem and the Qatari Al Jaber, was selected to design and build an effluent treatment plant.

The facility is designed to treat 45,000 m³ of water per day, which is then reused in the plant's production process, either as cooling tower makeup water or as a supply for the boilers. No liquid effluent is discharged into the natural environment, making Pearl GTL a Zero Liquid Discharge (ZLD) site.

45,000 m³
of water treated
per day

100%
of the treated water
reused on the site

— QGC: TREATING NON-CONVENTIONAL OIL PRODUCTION WATER

Surat Basin, Queensland, Australia

QGC, the world leader in coal gas exploration and production, is a wholly-owned subsidiary of the BG Group, a major player on the world energy market.

QGC recognized Veolia as a partner capable of operating and maintaining its three water treatment plants located on the Surat Basin coal gas production site.

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, could be distributed to local farmers for irrigation.



200,000 m³
of production water
treated per day

60
the equivalent of
60 Olympic size pools

97%
of the treated
water is recycled





— **MARAFIQ:**
DESALINATING SEA WATER TO MEET THE WATER REQUIREMENTS OF A PETROCHEMICAL COMPLEX

Jubail, Saudi Arabia

In the 1970s, the Saudi government developed the two industrial cities of Jubail and Yanbu. The aim was to build infrastructure and installations that would be conducive to the development of a diversified industrial base.

In a region where water is a scarce resource, the water requirements of these two industrial cities have since continued to increase.

Veolia was selected by Marafiq to design, build, and operate Jubail II, the country's largest reverse osmosis and ultrafiltration desalination plant, which will supply the Sadara petrochemical complex operated by Saudi Aramco and Dow Chemicals. To meet the high water quality standards laid down by Marafiq, and to minimize the impact of desalination on the environment, Veolia designed a combined seawater treatment solution, using two membrane processes.

The water supply is therefore secure, the risk of failure limited, and the site's energy consumption is reduced.

178,000 m³
of water desalinated per day



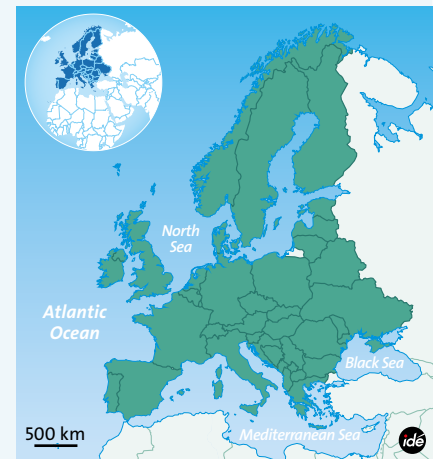


— TOTAL: CRUDE OIL TANK CLEANING BY ROBOT

Various sites, Europe

Since 2004, TOTAL, one of the world's leading oil companies, has employed Veolia's automated cleaning process, without the use of people inside (non-entry), for cleaning and degassing the oil tanks on its European sites.

Most importantly, the process protects the health and safety of employees by preventing exposure to hazardous products and atmospheres – along with ensuring the safety of the customer's installations. It also helps to protect the environment, by minimizing waste gas emissions thanks to a closed circuit cleaning process, and by recovering up to 90% of the initial volume of sludge in the tank. This Veolia patented technology halves the amount of time the tanks are out of service compared to traditional intrusive methods, thereby producing a substantial productivity gain for TOTAL.



47
tanks cleaned,
all refineries combined



90%
Up to 90% of sludge
recovered



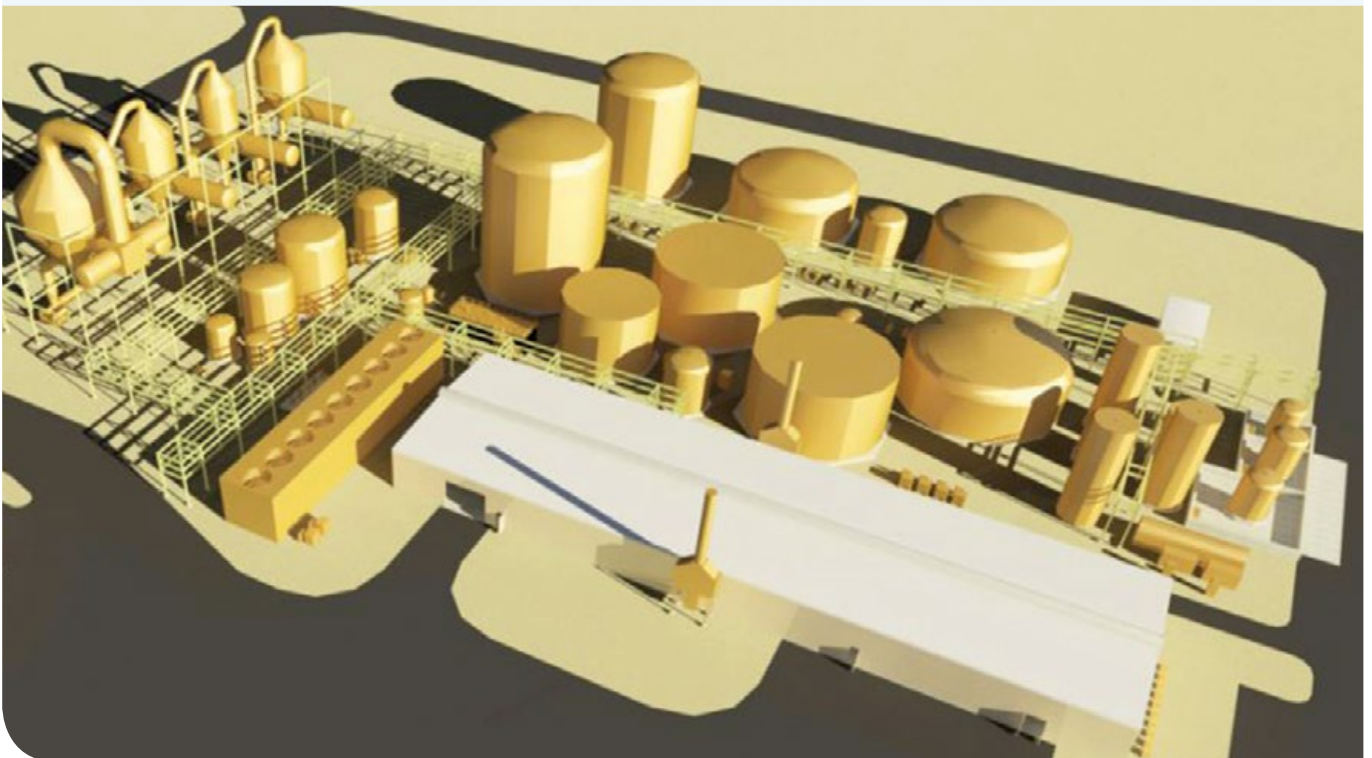
— ANTERO RESOURCES: TREATING AND RECYCLING WATER FROM THE PRODUCTION OF SHALE OIL AND GAS

Doddridge County, West Virginia, United States

Antero Resources, a company specializing in the production of shale oil and gas, has entrusted Veolia with the treatment and recycling of industrial water at its Doddridge County site in West Virginia. The Group will design, build, and operate an ultra-modern plant capable of producing high quality water for reuse in industrial processes.

The future plant, which will start operations in late 2017, will benefit from Veolia's proprietary technologies, including the CoLD Process® for crystallization and Actiflo® and AnoxKaldnes™ MBBR (Moving Bed Biofilm Reactor) for clarification and wastewater treatment – three particularly innovative treatment processes that maximize water reuse. By choosing these technologies, Antero has positioned itself as a leader in the responsible management of water derived from the production of shale gas and oil.

60,000
barrels of
industrial water
treated and
recycled per day,
i.e. around
9,500 m³/day



— NESTE & BOREALIS: FEEDING A COMBINED HEAT AND POWER PLANT USING REFINERY BY-PRODUCTS

Porvoo, Finland

Veolia, with its two partners, Neste, world leader in renewable fuel production, and Borealis, a leading polyethylene and polypropylene leader, will be launching the construction of four steam and power production units, due to start operations in 2018.

These units will be fueled by asphaltene, which is a refinery by-product and the main fuel of the boiler, and natural gas as a supplementary fuel.

The facility will help provide reliable energy at competitive prices to Neste's refinery and Borealis's petrochemical plant.

The joint venture created by the three partners will operate and maintain the plant for twenty years, in compliance with the latest environmental regulations (including the European Directive on industrial emissions).



4 production units
with a capacity of 450 thermal megawatt hours
and 30 electrical megawatt hours





— **REFINERY IN LOUISIANA:
RECYCLING OILY SLUDGE TO REDUCE
THEIR ENVIRONMENTAL IMPACT
AND INCREASE ECONOMIC PERFORMANCE**

Louisiana, USA

All refineries produce oily sludge, which is included in the hazardous waste category, generating high treatment costs and major environmental impact.

Veolia has implemented a treatment and recycling system for these by-products based on a three-phase centrifuge which separates water, oily sludge and solid waste. Water, once treated, is re-injected into the refinery’s production process. Oily sludge is recycled in 31,000 barrels of recycled oil every year. Finally, the volume of solid waste is reduced by thermal desorption, which removes them from the hazardous waste category and allows them to be neutralized at a competitive price and removes the environmental risk.



500,000
barrels of oily sludge
produced per year

31,000
barrels of recycled
oil produced per year



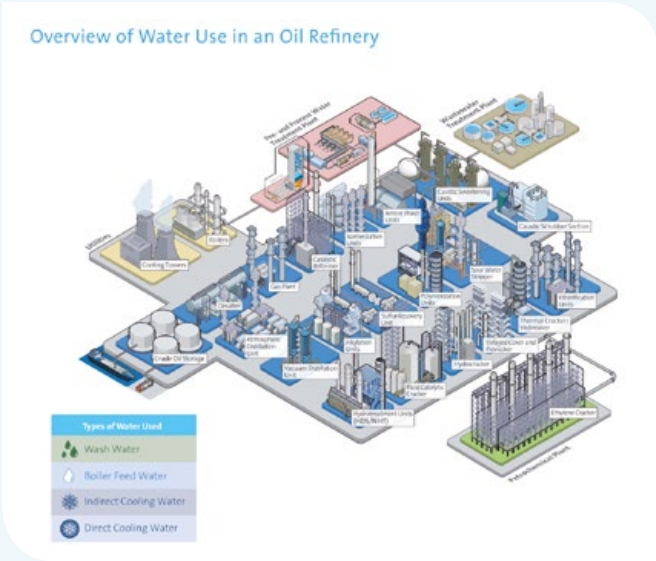
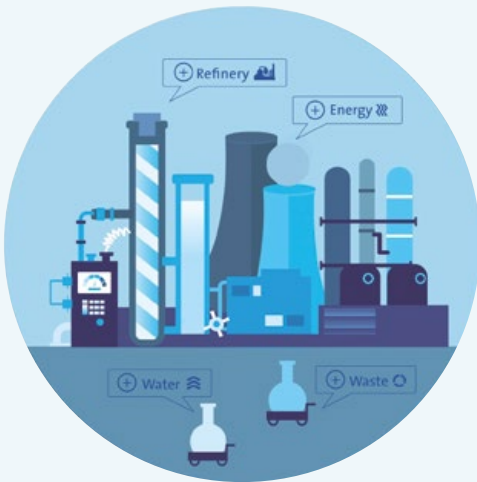


Regarding water management for refineries you will find at the link below information and designs about refineries and water usage in refining processes:

http://www.midasdesign.com.hk/clients/veolia/og_animation/opening/

More info

http://www.midasdesign.com.hk/clients/veolia/og_animation/s2/main-loader.html



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