VEOLIA

wave

#19

Insights from Veolia Water Technologies

Reuse

Water is too precious to be used only once.

WATER TECHNOLOGIES

SCARCITY

Water reuse secures drinking water in France

COMPLIANCE

Global water reuse in food and beverage manufacturing

INNOVATION

Recycling polluted industrial wastewater

BUSINESS CONTINUITY

Securing water production in a water-scarce world

Sustainable enhanced performance

WATER TECHNOLOGIES

Orion™, innovative purified water.

- > 30% reduction in CO_2 emissions
- > 50% energy reduction
- > 40% water recovered
- > 99% materials that can be recycled

The new Orion has been developed to provide purified and highly purified water through environmental excellence and reliable operational effiiency.

Discover it at: www.veoliawatertechnologies.com/orion

Resourcing the world

VEOLIA

INSIGHTS

It is undeniable. In order to reduce both the impacts and drivers of climate change, we need to make substantial changes in the way we use and reuse our limited water resources.

Every day, on a global scale, we see how climate change affects water access — for some, this means severe droughts, for others extreme flooding.

Today's extreme weather conditions — scorching temperatures, violent storms and torrential rain — are directly impacting the availability and distribution of our precious water resources. How? Because these conditions are altering everything from our rainfall patterns, to the flow of our rivers and groundwater availability.

As we continue to navigate these unprecedented changes in our climate, the demand for safe, clean water continues to rise. Threatening our very way of life.

The United Nations estimates that two billion people will be living in countries or regions with absolute water scarcity come 2025. A further two-thirds of the world's population will be facing water shortages. This is compounded further as water demand is projected to increase 55 percent by 2050 — this includes a 400 percent rise in demand to maintain manufacturing processes.

Alone, these challenges would be worrying. Together, and without intervention, we are heading towards a global catastrophe. For me, it is apparent that urgent and decisive action is needed today, not tomorrow.

Owing to the huge amount of unpredictability we are facing — and will continue to face — in regards to water availability, we must focus on water reuse and wastewater recycling to maintain our way of life.

Unlike many of our resources, wastewater is growing in volume due to the increase in domestic and industrial water consumption. By reusing this water and utilizing byproducts we can create a secure alternative to existing water supplies that improve water security, sustainability and resilience.

As well as the significant environmental and resource scarcity concerns, water reuse is an increasingly important tool for all industries and all regions wanting to optimize their consumption and their costs.

At Veolia Water Technologies we have developed a wide range of innovative technologies that improve the environmental impact of water consumption.

Our purpose is to help our customers contribute to human progress by helping them achieve a better and more sustainable future for all. In doing so, we have firmly committed ourselves to ecological transformation. This means we are continuously working to radically change patterns of production and consumption by accelerating and expanding the deployment of existing solutions, while simultaneously creating the solutions of tomorrow.

Join us as we move forward, hand-in-hand with our stakeholders because together we can make a difference.

Vincent Caillaud
Chief Executive Officer
Veolia Water Technologies

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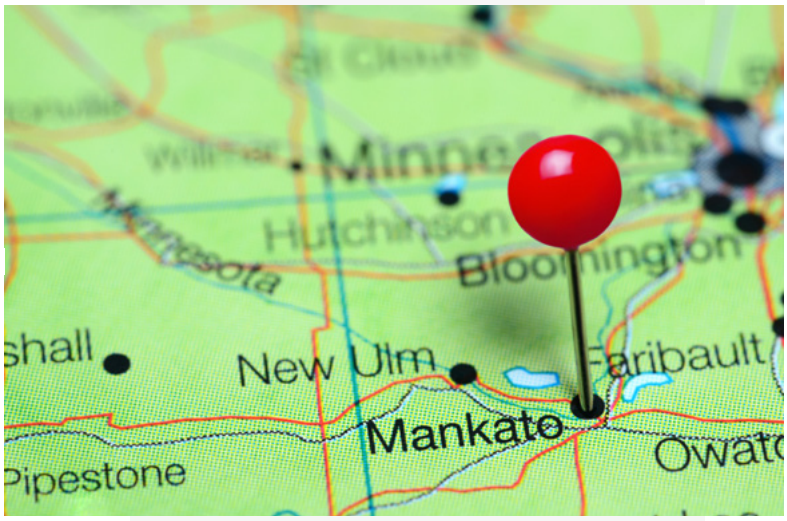

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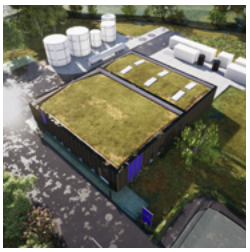

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State of play

It is 2022 and it is clear that the world is not on track to meet Sustainable Development Goal six: securing sustainable water and sanitation for all by 2030. With less than eight years to go, a global water crisis is looming meaning business-as-usual is no longer viable.

Never before has humanity's future been so closely entwined with environmental concerns — a critical one being our limited water resources. At the same time, even though water plays a key role in issues such as food security, energy production, economic development and poverty reduction, the word "water" rarely appears in international climate agreements.

We must change this as the 2020 World Water Development Report on water and climate change shows how water, its use and its management, plays a large part in both limiting the impact of climate change and achieving goal six.

And here is why. From biomass production as a source of renewable energy to recycling water to reduce water stress and droughts, better water management can support efforts to both mitigate and adapt to climate change while providing access to water for those in need.

The proven potential of water must be utilized because, as well as causing humanitarian crises, the growing scarcity of water — due to rising water demands and a changing climate — presents a major risk to industry, since water is an essential ingredient to many industrial processes.

The World Bank predicts that global GDP growth rates will fall six percent by the middle of the century as a result of increased competition for water. This would result in costs of $2.5 billion for companies at the mercy of increased water scarcity and associated business continuity risks.

As a result, the reuse of treated wastewater and the view that it is not to be thrown away is becoming a way of the future. From industries to fields to taps, wastewater is being recycled and reused more and more.

For example, why take water from the natural environment to irrigate a field or cool industrial facilities when wastewater is available nearby and can be treated? In the case of agriculture — which, according to the OECD (Organisation for Economic Co-operation and Development) accounts for 70 percent of the world's freshwater consumption — the presence of certain elements such as phosphorus and nitrogen in wastewater which can be widely used as fertilizers.

Additionally, in industries as varied as microelectronics, pulp and paper, power and food and beverage, the amount of water consumed during manufacturing processes represents a significant expense. With what are now considered standard solutions, we can recycle and reuse water, ensuring high-quality process water, to reduce costs and protect water resources for municipal populations. In some regions of the world affected by water stress, investing in this type of solution has even become a prerequisite for manufacturers.

One thing for certain is that the techniques that enable wide water reuse are ready and waiting. Today, we can produce drinking water from a wastewater treatment plant and we have all the tools to control and monitor its quality to protect human health. We can even make ultrapure water for microelectronics or pharmaceuticals, with only H_20 molecules.

For municipalities, it is also a matter of acceptance by local populations as they see their water resources being drained. With the emergence of water stress zones, some municipalities are concerned about the resilience of their infrastructure and water supply and realize that they have a resource in wastewater that is currently under-exploited.

With the rapid increase in the world's population, the acceleration of urbanization and climate change, the depletion of "blue gold" is now a global issue. The United Nations' Sustainable Development Goal six recognizes the importance of solving water-related issues in continued sustainable development and the vital role that improved drinking water, sanitation and hygiene play in progress in other areas such as unlocking economic growth and productivity.

This situation has placed us at a pivotal point where, if we make the correct decisions, we can fight climate change while better safeguarding our water resources, in turn preventing disruption to our water-dependent industrial operations and even our way of life. Or not.

© GETTY IMAGES

World-class central district focuses on world-class sustainable innovation

Malaysia's new international finance and trading hub is committed to reducing its carbon emissions by 40 percent. From the get-go, the metropolis was designed to align with Kuala Lumpur's 2020 objectives with wastewater treatment and reuse proving to be fundamental to the sustainable mission of the project.

In September 2014, Veolia Water Technologies South-East Asia proudly announced a 20-year partnership with TRX City Sdn Bhd for the prestigious Tun Razak Exchange (TRX) project.

Scheduled to be completed in phases — the first stage in 2023 — TRX is on track to be a world-class international trading hub, located in the heart of the capital, with over 70-acres of commercial, leisure and cultural spaces as well as residences.

From its initial conception, TRX was always set to be an impressive financial district. However, in addition to this, it also focused heavily on sustainability and is already adding several awards to its mantel as it seamlessly blends commercial needs and environmental responsibility.

Even before completion, TRX has already received a Gold Certification from the United States of America Green Building Council for its leadership in energy and environmental design (LEED) and was the first township in Malaysia to be rated Platinum by the Green Building Index (GBI) accreditation panel.

Thanks to cutting-edge energy, water and waste management technologies, the TRX development project is also set to be a world-class example of sustainable city design. TRX has committed to reducing its carbon emissions by 40 percent, diverting 70 percent of its waste from landfill and reducing its total freshwater intake by 50 percent, when compared to conventional development.

TECHNOLOGIES INCLUDE

Multiflo™ — an adaptable sludge-clarifier technology for municipal and industrial use. It is ideal for small to large-sized plants and can treat any kind of water characteristics and pollutant loads, removing total suspended solids (TSS), color, algae and heavy metal co-precipitates for drinking water production.

AnoxKaldnes™ Moving Bed Biofilm Reactor (MBBR) — is an active biofilm carrier with optimal bacteria culture conditions for wastewater treatment. MBBRs are compact, simple to operate and very efficient for the removal of biochemical oxygen demand (BOD), ammonia and nitrogen.

Hydrotech™ disc filters — provide a large filtering area in a small footprint for municipal effluent polishing and industrial water reuse. The compact design of the disc filter results in two to three times more filter area compared to drum filters of the same external dimensions.

Alizair™ deodorization treatment — ensures biofiltration to avoid the propagation of odors and provide the operating agents with a healthy and safe environment.

"This will be the first plant in Malaysia that processes the wastewater and produces the recycled water to supply the entire development." — Muhammad Baharuddin Mohd Nordin, Construction Manager, TRX.

The project is focusing its efforts on better treatment practices for wastewater towards achieving the goals which the Malaysian government outlined in its Economic Transformation Program. The treatment plant, along with water efficiency measures, will reduce water demand on TRX by over 50 percent.

To ensure these targets are achieved, Veolia Water Technologies is using state-of-the-art technologies to recover at least 80 percent of the expected 3.8 million cubic meters of sewage generated every year, for reuse purposes within the new district, consequently reducing site-wide freshwater demand by more than 50 percent.

Olivier Estienne, Country Director of Malaysia for Veolia Water Technologies, explains: *"Wastewater treatment and reuse is fundamental to the sustainable mission of the project. To achieve this, we are combining several technologies which will result in lower chemical consumption and achieve the lowest possible energy consumption to minimize the site's carbon footprint. This is another milestone as the TRX project is an affirmation of our leading position in the water industry."*

Wastewater treatment and reuse is fundamental to the sustainable mission of this project.

TRX is set to be the first fully-integrated commercial reclaim water project in South East Asia and a global reference for sustainable development.

The sewage water treatment plant (SWTP) that Veolia Water Technologies is operating and managing was completed in early 2020 and is now operational. Once the first phase of TRX is completed in 2023, the SWTP will be operated 24 hours a day, seven days a week. The treated water will also be delivered in a smart network eliminating leakage and targeting better than 98 percent network efficiency.

Lowering the carbon fo of the food and beverag

Most food-related greenhouse gas emissions (GHG) are from producing food. With heightened public awareness, the food and beverage industry is under increasing pressure to better manage its resources to cut its carbon.

Currently, food production accounts for more than a third of global GHG emissions.

Following a series of Netflix documentaries, big title publications and celebrity advocates, the carbon impact of our diet has been thrust into a harsh spotlight.

Currently, food production emissions make up more than a third (37 percent) of global GHG emissions, and this fact was relatively unknown just a few years ago. However, in recent years, there has been a huge effort to call attention to the true impact our diets have on the planet, especially in relation to climate change.

In December 2019, the European Union (EU) published its updated BREF — a Best Available Techniques (BAT) Reference Document — for the food, drink and milk (FDM) industry.

The BREF features best practice measures, solutions and techniques for preventing or minimizing the environmental impacts of FDM operations and includes Associated Emission Level (AEL) standards for air, land and water that are to be implemented at each country level.

New adapted measures have been brought in by the food and beverage industry to limit their impact and reuse is proving to be a game-changer.

When it comes to water, the food production sector is heavily reliant, with an estimated 70 percent of all extracted freshwater used for agriculture alone. A further 20 percent is used in the production and processing industries, leaving just 10 percent for domestic use, such as drinking water.

By December 2023, the AELs — including those associated with water — must be met within a given range. Some countries may adopt more stringent limits, whilst others may consider these new limits acceptable; however, a failure to meet these AELs (or stricter country-specific limits) will result in financial penalties and/or the removal of operating licenses so action needs to be taken by companies now.

otprint
ge industry

The good news is as well as challenges there are opportunities for the industry that will not only lessen their environmental impact but also make business sense. These include the recycling of water to prevent or minimize environmental impacts and damage, such as central wastewater treatment plants and central incineration or oxidation plants. This is why wastewater treatment to allow recycling and reuse is considered a preventative emission and waste solution.

In recent years, we've seen a mass of new adapted measures brought in by the food and beverage industry to limit their impact and reuse is proving to be a game-changer.

An example is Aviko, one of the world's largest producers of frozen chips and part of the Dutch company Royal Cosun. During the construction of a new production plant in Poperinge, Belgium, it wanted its wastewater treatment plant to be capable of treating all organic pollutants, such as chemical oxygen demand (COD), removing nutrients such as nitrogen and phosphorus, while also recovering and reusing effluents.

They invested in Veolia's Biothane Advanced UASB anaerobic reactor as well as a two-stage aerobic treatment process with advanced nutrient removal. All of these processes lead to a reduction in the GHG emissions associated with their operations per year and also helped reduce operating costs by utilizing the biogas for heating the process water in production.

An estimated 70 percent of all extracted freshwater is used for agriculture.

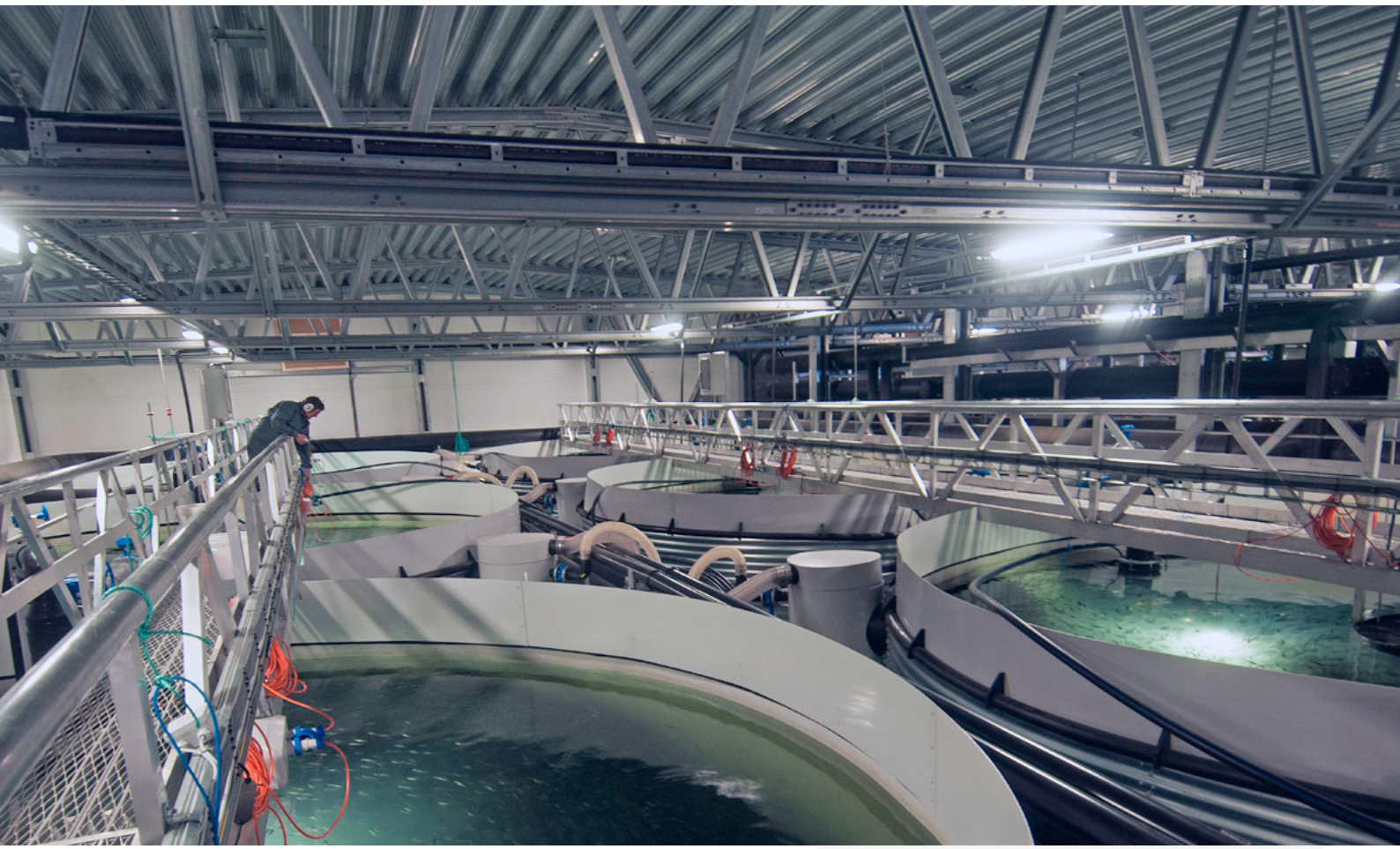
Next, ElPozo Alimentación, a pioneer in healthy food in the Spanish meat sector, saves more than 200 million liters of water each year.

Veolia Water Technologies Spain and ElPozo have been collaborating on several projects for almost two decades with a common objective to ensure sustainability. One of the greatest exponents is the industrial wastewater treatment plant (WWTP) of the Alhama de Murcia factory. Together, they set out on a project to optimize the conversion rate of the existing reverse osmosis plants, also provided by Veolia.

Their optimization efforts mean 48 cubic meters of water per hour are reused, which represents a significant reduction in the water footprint of the site since it no longer relies on more than 200,000 cubic meters of water per year from the public network.

As well as challenges, there are opportunities for industry.

A different kettle of fish is water reuse in aquaculture. Aquaculture, also known as fish farming, has expanded almost 14-fold



By December 2023, the AELs — including those associated with water — must be met.

since 1980. In fact, today, the world produces more farmed fish than beef, and demand is expected to increase upwards of 35 percent in the next 20 years — so sustainable aquaculture is paramount.

Norway's first commercial, land-based salmon farm is underpinned by a unique grow-out solution. This technology means fish are farmed in a controlled environment with state-of-the-art recirculation technology, ensuring stable water parameters to optimize growth and safeguard survival.

Veolia Water Technologies' RAS2020™ (Recirculating Aquaculture System) technology reuses water within the system, keeping water intake and the associated carbon footprint as low as possible. It has a flow rate of 10,000 cubic meters by hour; however, it only needs 65 cubic meters by hour of freshwater owing to the in-system treatment and recirculation. Meaning over 99 percent of the water is re-used. This creates a sustainable, resource-efficient and eco-friendly way of feeding our growing population while easing pressure on wild fish stocks and thus protecting the oceans.

These three examples are just the start of what many companies across the diverse food, drink and milk industry are working on. It is now widely known that from farm to fork, the sector can have significant negative impacts on energy consumption, water consumption, climate change, and other environmental subsystems and so businesses and brands are on the line.

The December 2023 D-Day is fast approaching and with it comes more stringent regulations across Europe to lessen the environmental impact of operations; however, let's not forget the opportunities businesses have to strengthen themselves in the process and to improve their environmental footprint by reusing their resources.

BLUE GOLD

SDG: TRANSFORMING WASTE INTO A RESOURCE

WATER TECHNOLOGIES

Innovation is our belief, water is our expertise...

In nine podcasts

Discover real people

Working every day to protect our global water resources

Blue Gold is the story of our employees, our partners and our customers who are working together to contribute to the United Nations' Sustainable Development Goals (SDGs). Listen as they share their efforts and inspirational stories in their own words.

In this episode, focused on SDG 7: Affordable and clean energy, learn how anaerobic digestion captures biomethane from wastewater to create green energy.

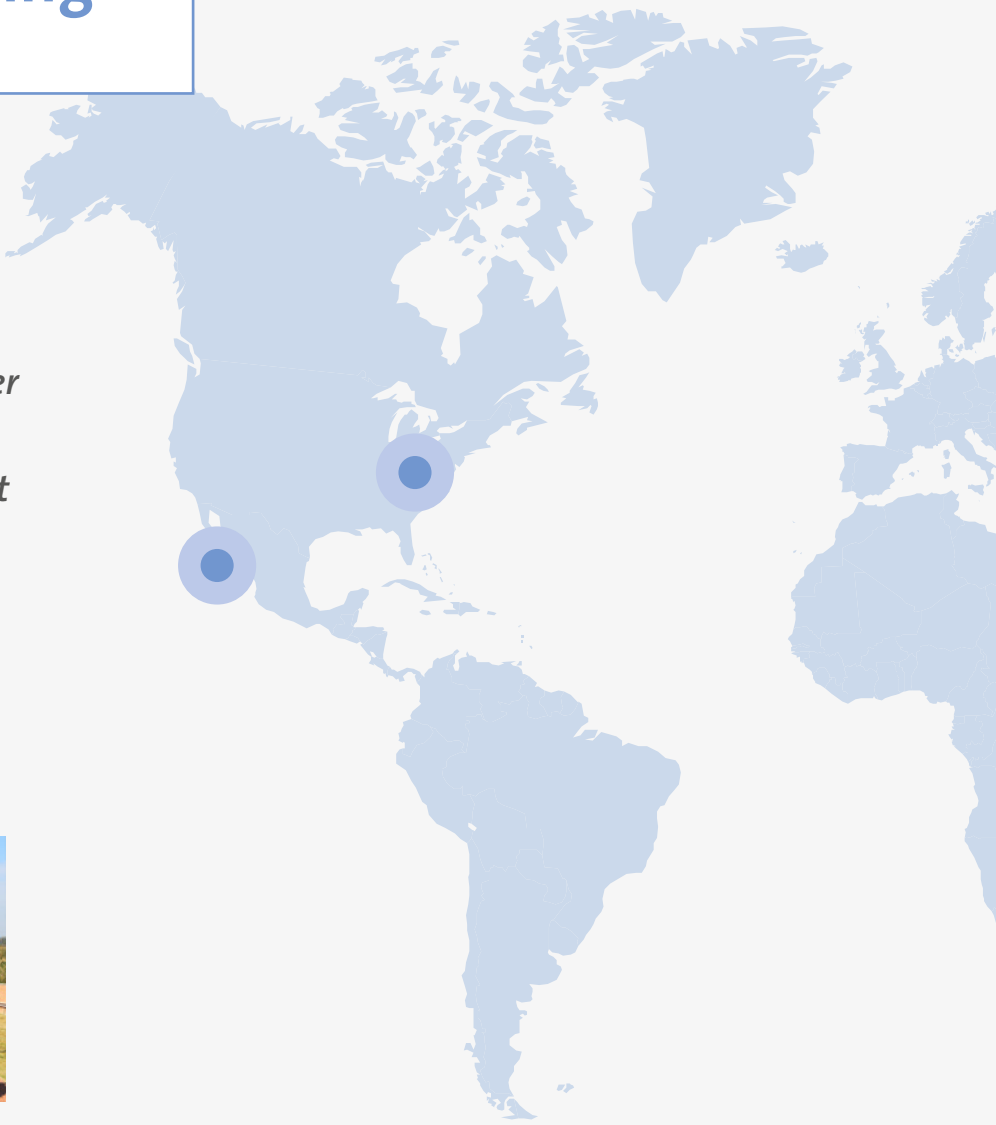
Podcast producer tootakpro.fr / Pierre Denis
Audio director Katia Grivot
Audio reporter and voice Zoe Brown

Resourcing the world

VEOLIA

Global water reuse in food and beverage manufacturing

Water reuse, recycling and reclamation lower the water footprint of a water heavy-weight industry and protect local freshwater supplies.



LATAM

GUAYMEX recovers fats and solids

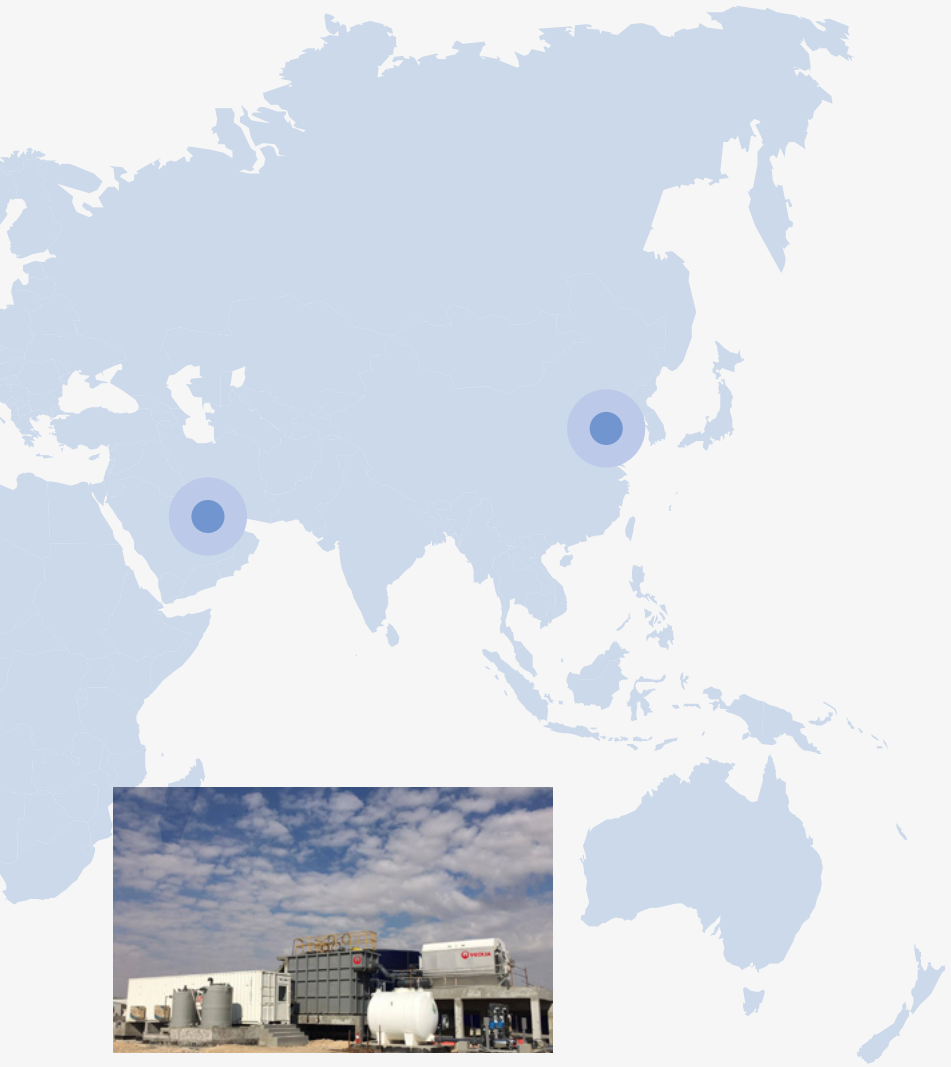
A leader in the processing of canned sardines in Mexico is making its environmental contribution by better managing its resources. In 2019, while expanding its process plant in Matancitas, GUAYMEX sought to upgrade its wastewater treatment plant to lower the environmental footprint of its operations.

For the treatment of their residual discharges they use a dissolved air flotation system, IDRAFLOT™, to lower chemical consumption, and a self-cleaning screen filter, Idrascreen®, is used for wastewater pre treatment and solids separation. The reduced solids and fats are then recovered, reducing the environmental impact and increasing the overall profitability of the plant.

NORTH AMERICA

With water being a main ingredient in beer, there is a direct correlation between the incoming water quality and the flavor of the end-product. Realizing these normal chemistry fluctuations could cause taste inconsistencies, MadTree Brewing located in Cincinnati, Ohio, sought ultra-high purity ingredient water to control their beer's taste.

They invested in a 0.45 cubic meters per-minute SIRION™ Mega Reverse Osmosis (RO) technology to remove up to 97 percent of dissolved inorganic and more than 99 percent of large dissolved organic material, colloids and particles. Additionally, any excess output from the RO is reused as water make-up for boilers which increases operational, water and energy efficiency, aligning with the brewer's sustainable values.



APAC

Reclaiming effluent at Nestlé

Laixi within the Shandong Province of China has seen rainfall levels decline drastically over the past 20 years. With a population of over five million, the region faces an increasingly acute and chronic water shortage issue, with per capita water resources allocated to the city at only 12 percent of the national average.

In response to the water scarcity issues, Nestlé's Qingdao facility has invested in an effluent reclaim system and a Condensate of Whey "COW" water reuse system to lessen its water intake, freeing up more water for the local population. Today, Nestlé reclaims 750 cubic meters of water each day, mainly from secondary effluent and COW water, which is reused for non-potable purposes.

MIDDLE EAST

Baladna invests in agricultural irrigation reuse

To facilitate wastewater reuse, Qatar's leading dairy producer, Baladna, decided to upgrade its existing wastewater treatment facility at its cow farm located in Al Khor, north of Doha. With a capacity of up to 24,000 cows and an area spanning 2.4 million m^2, it is the biggest cow farm in Qatar and the barn and milk parlor flushing area generates around 6,000 cubic meters by day of wastewater.

Following an upgrade of the existing lagoon system to optimize its process performance and with an array of Veolia proprietary technologies, Baladna now reuses its treated wastewater for agricultural irrigation purposes. As well as this, following an additional reverse osmosis treatment, the water is also reused to cool the cows, via a soaking and misting system, during hot summer months.

Hubgrade makes a reclamation plant smarter

Smart data can revolutionize site management and also facilitate better tertiary treatment and reuse. One of the largest oil refinery clusters in Southern Europe has done just this by investing in digital tools to make their water reuse processes more economical and sustainable.

Our customer was required to supply water to companies at a nearby petrochemical industrial park that is home to some of the largest oil refineries in Southern Europe.

To ensure business continuity across the park, an independent water supply is required owing to the water stress seen throughout the region. Veolia Water Technologies was commissioned in 2011 to build a reclamation plant to effectively remove pollutants from the local municipal secondary effluent wastewater to produce recycled water mainly for the cooling towers.

Operations began in 2012 and the reclamation plant is now dependent on our patented high-rate clarification technology, Actiflo™, as well as Hydrotech® filtration processes and two-pass reverse osmosis units.

Managed day-to-day by the customer, the purpose-built reclamation plant receives water from the nearby wastewater treatment plants. The treated water is then fed through a pipeline to various sites within the petrochemical complex for alternative industrial use.

To ensure continuous best-in-class operation, the customer utilizes Veolia's digital service offering, Hubgrade.

As a complete service offering, Hubgrade can provide three separate services; Essential, which evaluates and continuously monitors connected equipment; Assist, which

OPERATOR'S POINT OF VIEW

"Coagulant consumption is the main cost item on the Actiflo. Replacing our monthly consumption analysis with real-time and predictive analytics gives us better visibility, saves time on reporting and enables us to find optimization opportunities," explains Joan Sanz, a member of Veolia Water Technologies technical team.

supports operational teams in their daily monitoring and offers on-site support; and Performance, which aggregates real-time data and applies analytics and algorithms to optimize plant performance.

Aude Giard, Chief Digital Officer at Veolia Water Technologies, explains *"Across the board, we are seeing a need to reuse water. Digital optimization solutions are improving water treatment facility performance in real-time, supporting industries and municipalities in reducing their environmental footprint and carbon emissions and enhancing operational cost savings.*

To improve the performance of the clarification processes of the reclamation plant, Hubgrade Performance — the Insight module — was applied to the Actiflo technology."

Giard continues: *"With 'Smart Actiflo' we use powerful algorithms to predict the effluent quality and run optimization scenarios, enabling operating teams to become more proactive, and able to anticipate and mitigate process deviations. All the while reducing operating costs while preserving quality and meeting production targets."*

Real-time and historical data are acquired on Hubgrade's cloud platform, processed and fed to machine learning algorithms conceived by our in-house experts and data scientists.

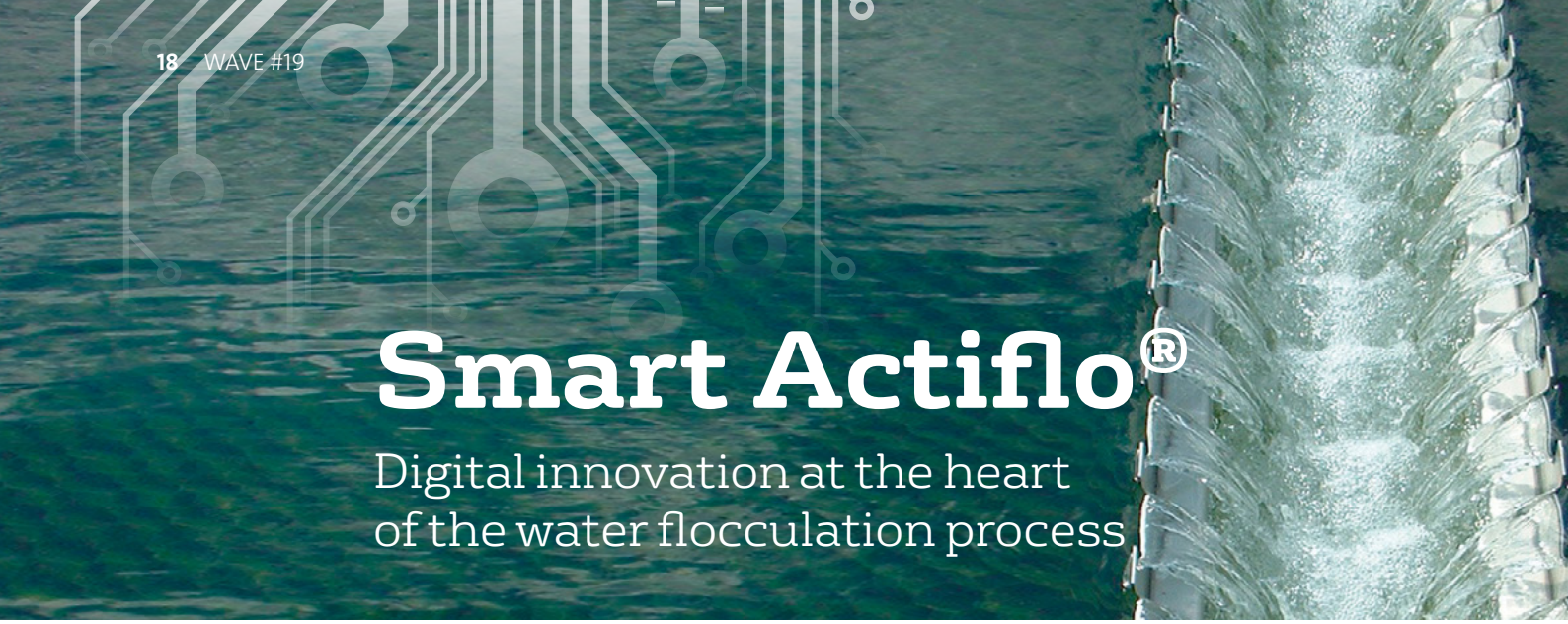
"Thanks to the real-time Operational Expenditure (OPEX) calculation, operational teams can evaluate seamlessly the costs of Actiflo, by monitoring, for example, the specific energy and chemical consumption of the clarification process, and assess the impact of optimization actions," Giard adds.

With the smart alarms feature, operational teams gain in reactivity to achieve their consumption objectives: they receive notifications when an indicator exceeds a predefined targeted value. Relying on advanced algorithms, Smart Actiflo predicts the consumption of the chemicals, therefore enhancing the stock management of chemicals.

Currently under development, another machine learning algorithm predicts the effluent quality. When combined with smart alarms, the operating team can take necessary corrective actions thanks to the alerts received when there is a risk of non-conformity of the effluent.

One step beyond predictive analytics is to prescribe recommendations to the operational teams. Giard concludes: *"Increasingly, sustainability is becoming a differentiator that is having profound impacts on businesses and operations. Our ambition is to unlock the power of digital to support sustainability which is fundamental to long-term success and resilience."*

Across the board, we are seeing a need to reuse water and digital optimization solutions are improving water treatment facility performance in real time.



Smart Actiflo®

Digital innovation at the heart of the water flocculation process

Flocculation and sedimentation process with patented micro sand.

Plant operators are faced with increasing demands for continuous process optimization including reducing water usage, wastewater production and chemical and energy consumption.

They must achieve this without jeopardizing the process stability and while meeting tightening regulations. For the Actiflo® process, proprietary artificial intelligence is now being used to reach the right balance between cost and compliance.

Actiflo is Veolia Water Technologies' patented high-rate clarification process. Available in standardized modular units or as a custom-designed solution, it covers all municipal and industrial treatment applications. Benefiting from over 25 years of operational experience, Actiflo is used at more than 1,000 references around the world to treat over 50 million cubic meters of water every day.

With Smart Actiflo, we combined our extensive process knowledge and artificial intelligence to enable best-in-class operations and process optimization.
By using advanced algorithms to predict effluent quality and run optimization scenarios, operating teams are able to become more proactive by anticipating and mitigating process deviations. This reduces operating costs while preserving quality and meeting production targets

How we respond to your needs

REAL-TIME ACTIONABLE INSIGHTS

With real-time OPEX calculation and predictive chemical stock management, be proactive, detect drifts and optimizations and save time on analysis and reporting.

RISK MITIGATION

With effluent quality prediction, anticipate process deviations and act in time to avoid non-conformities.

OPEX OPTIMIZATION

Run operating scenarios with our cost and quality balance feature to find the optimum chemical dosage.

France's first energy-positive wastewater treatment plant

Innovative water and resource reuse technologies accelerate ecological transformation while powering the grid.

According to the European Commission, at present, one billion cubic meters of treated urban wastewater is reused annually. This represents only 2.4 percent of treated urban wastewater effluents and less than 0.5 percent of the annual European Union (EU) freshwater withdrawals.

The European Commission argues that the EU's potential is far higher, estimated at some six times the current volume (14.4 percent). And, as a result, a new regulation on minimum requirements for water reuse for agricultural irrigation will be entered into force from 26 June, 2023.

However, Cyprus, for example, already reuses more than 90 percent of its wastewater, clearly indicating a significant potential for improvement. A similar ethos has now been introduced to France with the country's first energy-positive wastewater treatment plant beginning operations in 2019 which is underpinned by reuse.

OTV, a subsidiary of Veolia Water Technologies, was commissioned to work on the Cagnes-sur-Mer wastewater treatment plant in southern France. Today, the plant treats the wastewater of 160,000 inhabitants through the implementation of innovative treatment processes such as Spidflow®, Biostyr® Duo, GasTop™ and Bioco™.

To ensure that it produces more energy than it consumes, it relies on a number of reuse and recycling practices: the treated water is reused to power heat pumps to recover the calories from the water; and the sludge is digested to produce biomethane, which is re-injected into the GRDF network — Europe's leading natural gas distributor.

Thanks to the treatment of the dehydrated sludge at a low-temperature dryer, the valorization of all potential sources (waste energy recovery, solar energy, heat pumps, etc.), and the production of biomethane for resale by reinjection into the network, the site produces enough energy to supply 1,000 homes.

During COP 26 (the 2021 UN Climate Change Conference of the Parties), Veolia Group CEO, Antoine Frérot, presented three solutions — the circular economy, methane capture, battery recycling — and what he expects from COP26 to accelerate ecological transformation. Also discussed is how the world will not achieve carbon neutrality without increasing research and development efforts. As part of this, the role of drinking water and sanitation services was highlighted as an example of climate change mitigation. In particular energy-positive wastewater treatment plants and specifically Cagnes-sur-Mer, were highlighted since they can produce more energy than they consume.

Innovation focuses on high-recovery reverse osmosis to conserve water

Veolia Water Technologies' Design Centre is a dedicated resource within the company focused on accelerating innovation. Robert Koch, focused on technical development across industrial applications, shares news of a state-of-the-art reverse osmosis technology that offers a 98 percent water recovery rate.

How would you describe the Design Centre?

"We are a dedicated team of innovators focused on building the technologies of the future to meet our customers' needs. We have a bird's eye view and take the best of Veolia methods and know-how to share and develop the very best ideas. Our ultimate goal is to strengthen our product-market fit and deliver customer value in our product development process."

Where does reuse sit on the Design Centre's innovation list?

"Reuse was a primary focus for Veolia, even before the Design Centre's creation in September 2019. Recycling and reuse are fundamental to how we resource the world. Previously, when I was in a customer-focused role, this was always a conversation we had with our clients from both an environmental and financial perspective. We have worked hand-in-hand with many clients to develop best practices. The Design Centre is the next step to take customer feedback on repeated challenges to solve them on a global scale."

The latest reuse innovation is CaptuRO™, please can we get an overview?

"This is a game-changer for multiple industrial markets. CaptuRO is a high recovery reverse osmosis (RO) technology that has been designed specifically to extract purified water from industrial, brackish and wastewater sources. This means we can supply our clients with the highest permeate water recovery, up to 98 percent, across numerous applications."

What market is CaptuRO best suited to?

"We have our first commercial project for this technology in the United States working with a pulp and paper client; however, this technology truly is versatile. My colleagues in North America developed and validated the technology through intensive pilot testing. Now, working together, we are taking it to the next level to make it available globally. From food and beverage to chemical, petrochemical and healthcare, it is a perfect fit for all general manufacturing. From pre treatment to wastewater reuse across all applications we can recover water at an extremely high rate. For our customers, this means they can lessen their reliance on the municipal water network to help ensure business continuity, while also reducing overall water stress."

What is so unique about CaptuRO?

"Firstly, it's a semi-batch process that enables us to get such a high reuse rate. We systematically employ separate system volume containers upstream of the membranes to ensure that concentration turn-times are optimum. This enables concentrated salts such as silica and calcium sulfate to be purged from the system before they have time to precipitate. This allows the CaptuRO to run at higher water recovery rates while minimizing the potential for membrane scaling and fouling. Secondly, the technology minimizes the volume of brine generated, resulting in savings in liquid waste disposal costs. Along with this goes electrical energy savings and the potential to further optimize the use of antiscalants. Last but not least, the semi-batch process automatically adapts to changes in salt concentration in effluent reclaim applications, allowing it to run continuously at an optimum recovery rate."

What was the customer need that drove this innovation?

"The customer pain point was really about saving water, in recent years it really has become blue gold. Many of our customers were relying on municipal water which comes with a high price tag and there can be a lot of risk in terms of supply. Our customers needed to maintain operations, with the same amount of water resources but from alternative sources and at a lower cost and this is our solution."

What excites you the most about this innovation?

"It's what we've all been waiting for. The water reuse potential is huge so this innovation will protect local water resources and reduce water pollution discharges. It will also help all our customers who need to vastly reduce their water consumption, often driven by a corporate environmental initiative or by a regulatory requirement."

What is next for CaptuRO?

"I see a bright future. We would like to see this become one of our standard products since both the need and demand are there. After all, reverse osmosis has become a commodity, we cannot meet our water needs without it. The potential as pretreatment of thermal brine concentration processes is already on the radar of our HPD® evaporation and crystallization technologies team who works with clients on large-scale, highly integrated process solutions."

CaptuRo is a high recovery reverse osmosis technology and a game-changer for industrial markets.

Water sustainability in the pulp and paper industry

Although freshwater use by the global pulp and paper sector has decreased 90 percent in the last 30 years, the industry is still an intensive water consumer. Water reuse is now acknowledged widely as the silver bullet to help reduce water intake and water waste and one Canadian giant shows us how it's possible.

Despite several advances in technology, the paper industry remains one of the world's largest consumers of water as every ton of paper produced requires approximately 54 cubic meters of water.

As the pulp and paper market continues to grow, we must ensure water resources are reused.

This is because water is used in almost every step of the manufacturing process. As a result, historically, pulp and paper mills have always produced large volumes of wastewater and residual sludge waste, presenting a number of issues in relation to wastewater treatment, discharge and sludge disposal.

Owing to this, for the last three decades, a large focus has been put on creating treatment technologies geared towards water reuse and resource recovery. Today, thanks to innovation, the industry has several viable solutions to facilitate wastewater management, recycling and recovery.

A major producer of pulp and paper products based in eastern Canada was ahead of the curve. Understanding not only the business benefits of reducing its water intake, the company also puts a large emphasis on reducing its environmental impact and they have invested in water reduction and reuse technologies since the early 2000s.

One of the company's main production mills in Canada utilizes the thermomechanical pulp (TMP) process — a high-yield, energy and resource-efficient technology for splitting larger wood chips into individual papermaking fibers — to produce around 1,000 tons per day of pulp from 100 percent softwood.

Even though it was already energy-efficient, the management also wanted to reduce water usage by 6,000 cubic meters per day in summer and 8,000 cubic meters per day

This project allowed the client to realize considerable savings. It had an internal payback of less than one year based on energy savings.

in winter by cleaning and reusing certain process water streams. Specifically, this included their vacuum seal water containing white fiber by combining it with raw freshwater make-up.

Starting work with the aim to reduce raw water demand, improve process water quality, recover thermal energy and reduce wastewater flow, the Veolia Water Technologies team installed two Actiflo® package plants to treat wastewater from the vacuum pump seals.

"When we arrived the customer was heating fresh river water, using it once and discharging it, only to intake new river water and repeat the heating process. This was energy-intensive and wasteful, and we saw numerous reuse opportunities to meet their water sustainability targets while lowering energy consumption and costs," explains Veolia Water Technologies' David Oliphant, Vice President of business development in the heavy industry sector for Canada.

Wastewater from the mill's vacuum pump seal water was treated through Actiflo clarification units and then blended with a small percentage of raw river water to produce high-quality water for use in their paper production.

Oliphant adds: *"The ballasted clarification process produces purified water at a rate of 772 cubic meters per hour and, owing to only a small amount of water intake, we were saving over 90 percent of the energy usually used reheating river water for use in the mill."*

"Vacuum pump seal wastewater from the pump has a turbidity of around 600-800 NTU, and the water treatment system will transform it, without filtration, to water with a turbidity of less than 1.5 NTU," explains Oliphant. *"This project allowed the client to realize considerable savings and quick return on investment by reusing the already heated water in their processes. We understand that the entire project had an internal payback of less than one year based on energy savings."*

Thanks to innovation, the industry has several viable solutions to facilitate wastewater management, recycling and recovery.

Many of the progressive companies in the pulp and paper industry have long been investing in water treatment and reuse technologies. *"Not only are companies acting to meet increasing local and global regulations and best practices but, in general, I find the industry recognizes the growing importance in corporate and environmental responsibility,"* adds Oliphant.

The global demand for market pulp has increased from an estimated 42.8 million metric tons in 2005 to approximately 58.9 million metric tons in 2018. And, it's predicted to surpass 66 million metric tons by 2023.

Oliphant concludes: *"As the industry continues to grow, we must ensure that water resources are used in an environmentally conscious way, reusing water as much as possible to minimize the use of freshwater. Implementing evaporator condensate purification systems and reuse processes are great ways to lower water intake volumes and reduce loads on effluent treatment. Thankfully, more and more pulp and paper companies are following this approach."*

Recycling polluted industrial wastewater

Cristina Del Piccolo, Veolia Water Technologies' Process and Research and Development Manager, discusses the current industrial wastewater management sector and how we must tackle new-age pollution with innovation.

Based in Italy, Del Piccolo has been with the company since 2002 and is responsible for the technical department within one of the company's technology-focused business units. Her work is underpinned by EVALED™ evaporation technologies that recycle polluted industrial wastewater, helping global customers across healthcare, pharmaceutical and automotive markets reap environmental, economic and financial benefits. Here she shares with us her thoughts.

What is the current state of industrial wastewater recycling?

"In terms of regulation, if we're talking about developed countries, we are all more or less on the same page. However, of course, some countries are doing better than others and some countries need to do more. Many of the businesses we see leading the way are those in countries with access to fewer resources overall, so they need to recover more water to ensure their business continuity. The good news is, there are a lot of industries that pay attention, not just to respect the regulations — which is essential — but who go further to proactively protect the environment.

In terms of what these regulations and companies are focused on, today there is a sufficient focus on all known major pollutants and contributions; however, this is evolving. In the last few decades, we have developed so much in terms of drugs and industrial chemicals so research is ongoing into new pollutants. As a result, our knowledge is constantly growing, such as awareness of endocrine disruptors which are gaining an increasing amount of attention with the authorities, and so regulations are constantly in review as the 'current state' is better understood."

How much of a focus is water reuse in the industrial sector?

"There is a very large focus on reuse but also in finding other ways to think about wastewater as a resource. One way for sure is evaporation and crystallization technologies which recover until the very last drop. Evaporation is starting to be considered not only as the ultimate treatment step to achieve zero liquid discharge plants but it can also be applied inside the production line. In doing so, wastewater streams can be reused inside the production process itself. Evaporation can transform wastewater into a new stream for which alternative options are possible right up until recovery as a new resource. The success of this is dependent on the company, their industry, their utilities and the water quality grade needed. However, what is now widely understood is that there is a resource and so, together, we think about a way to use this. Reuse requires creativity but we are getting there."

What are the main benefits these "new" resources bring to the industrial sector?

"There are many. Following evaporation and crystallization — where everything is recovered — you're left with a final residue which is the lowest volume you can achieve. This means all potential resources have been captured but the benefits don't stop there. In terms of waste management, the residue occupies less space and so results in lower transportation and disposal costs. Not forgetting a vastly reduced CO_2 footprint."

What is the biggest challenge facing the industrial wastewater sector?

"Pollutants that are not easily treated by conventional technologies. Many conventional technologies, such as those developed to treat traditional markets like the food and beverage industry and their biodegradable compounds, were developed years ago. Pollution then was different from what we have now owing to the new chemicals and drugs that industries use in manufacturing, or new metals, which come from new industrial processes and new products. Furthermore, our general understanding of all these contaminants is much better and we pay attention to a much longer list that requires different treatment approaches. This is where innovation is key so we can keep up with requirements, not only in terms of pollutant change but increased regulations."

How is the industry addressing these new-age pollutants?

"The treatment of pollution at the source is an important topic. The idea is to tackle pollution where the concentrations are much higher and flows are reduced, straight out of the factory, as opposed to in the municipal wastewater system once they've dispersed. Yes, this treatment is done in the municipal system but technically speaking, we can face the two situations in completely different ways with two different process lines best suited to the level of parts per million (ppm) of a compound in the wastewater stream. This will give us a much better treatment rate. It makes a lot of sense to try to segregate them. What is clear is that evaporation is a very refined technology, especially for APIs — the very big and complex molecules — as a separation technology."

What does the future of industrial wastewater recycling and reuse look like to you?

"We will continue to push towards reduction of the water until it is a constant requirement. This will be underpinned by the technologies we now have, and we must continue to invest in order to make it easier to recover water with higher efficiency and reduced OPEX. Until very recently, if customers wanted to recover all their water, the process line that they needed to put in place was normally complex and costly — both in terms of CAPEX and OPEX. But technology is bridging this gap and making it much more accessible to small to medium companies, not just industrial giants."

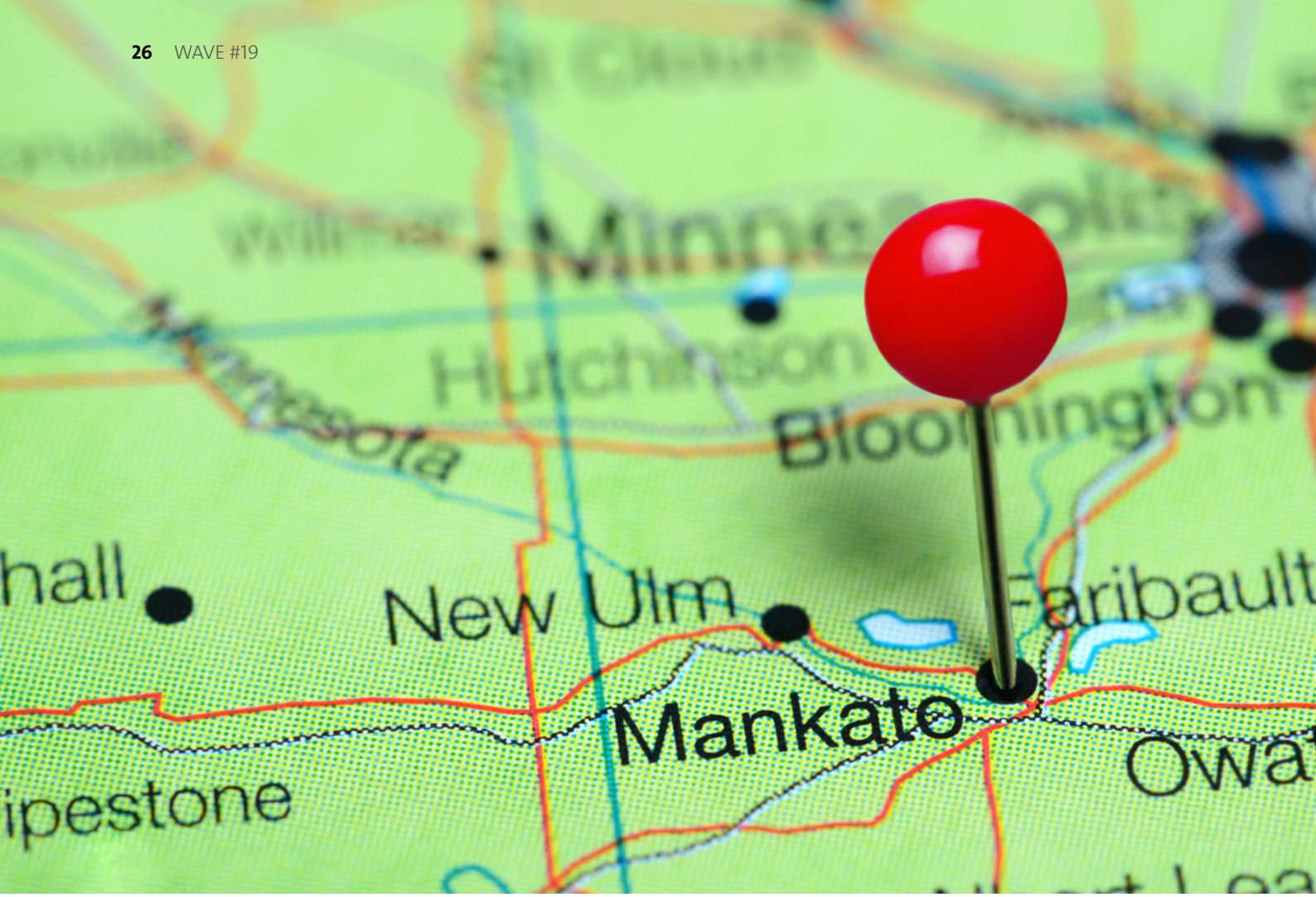
EVALED™ - Evaporation technologies

- Low energy consumption
- Recycling of high-quality distillate from heavily polluted wastewater
- High separation level
- Ideal to achieve Zero Liquid Discharge (ZLD) in combination with Reverse Osmosis (RO) plants.
- Three types of models (series):

  Evaled PC™
  Vacuum heat pump evaporation (150 kWh/ton)

  Evaled AC™
  Hot/cold water vacuum evaporators (cogeneration)

  Evaled RV™
  MVR evaporation (30-50 kWh/ton)



Blue Earth County uses water to meet local power needs

In saving its natural water supply and monetary expenses, the city was able to turn waste into a resource.

Mankato is a growing city with a population of approximately 45,000.

Blue Earth County is located in the heart of southern Minnesota, USA, and was given this nickname because of its many rivers, streams and lakes — it's also based on the translation of an old Dakota (Native American) word "Mahkato" meaning "Greenish blue earth."

Mankato is a growing city in Blue Earth County with a population of approximately 45,000. The local municipality took action to protect their local water resources by investing in well-established water reclamation technologies to conserve resources, generate power and create an income for the city.

Power generation draws heavily on water resources. In fact, the energy sector is responsible for 10 percent of global water withdrawals, second only to agriculture. This is mainly for plant operation and cooling as well as in the production of fossil and biofuels.

In addition to water's importance to power production, energy is also vital to providing freshwater needed to power systems that collect, transport, distribute and treat it. Each resource is thus interdependent on — and vulnerable to — the other. In recognition of the vulnerability of water, the City of

With the system, the city avoids taking water from its local surface and groundwater supplies.

Mankato looked towards water reuse to answer their local power facility needs' to conserve water through reclamation, recycling and reuse, and also ensure their power supply.

A pretreatment strategy was the approach applied and the city installed a new water reclamation facility (WRF) to treat effluent from its wastewater treatment plant (WWTP), which now supplies the water for the cooling tower of their electrical generation plant.

This strategy centers on a two-stage treatment process using a combination of Actiflo® and Hydrotech™ Discfilter processes.

The Actiflo clarification system utilizes the combination of coagulation, flocculation and sedimentation, using micro sand as a seed for floc formation. The micro sand provides a surface area that enhances flocculation and acts as a ballast or weight. This first stage was designed to provide phosphorus removal for all of the WWTP's current and future needs.

The second stage provides additional filtration to meet the California Title 22 water reuse requirements, which focuses on suspended solids and effluent turbidity reduction.

With the system, the city avoids taking water from its local surface and groundwater supplies to the power facility in order to accommodate the plant's needs. Not only does this free up more water for residential use but annual savings for the city from the process changes are estimated at 680 million gallons of water and $1.5 million in potable water costs.

This water reuse project was the first of its kind in the state of Minnesota and one of the first in the nation. The Minnesota chapter of the American Public Works Association gave the Mankato facility its Project of the Year award following the treatment process upgrade, and it was also honored with a Minnesota Government Reaching Environmental Achievements Together (MnGREAT) award.

Combo of innovative technolog Denmark's sustainable goals

As Denmark continues to earn top sustainability rankings, discover how the latest developments in sewage sludge treatments are helping the country's wastewater utility companies become Climate Neutral Certified by 2030.

gies supports

Denmark ranked top in the global Environmental Performance Index (EPI) for 2020 and is often seen as the leading country when it comes to climate change action. One of the country's biggest accomplishments is reducing its CO_2 emissions by over 50 percent since peaking in 1996.

"The fact that Denmark is now number one on an index as celebrated and influential as the EPI is a testament to the fact that even a small country is capable of great change. We want to be a global source of inspiration and hopefully influence others to follow the same path we have taken," said the Danish Minister for Climate, Energy and Utilities, Dan Jørgensen.

Billund generates three times the energy requirements of the plant.

As well as investing in offshore wind and constructing two energy islands with an initial capacity of 2GW each, Denmark also decided in 2020 that Danish wastewater utility companies must become 100 percent Climate Neutral Certified by 2030 — completely rethinking its resources.

A prime example of this in action is the Billund BioRefinery, a joint venture between Krüger A/S (a Veolia Water Technologies subsidiary), the municipality of Billund and its utility company Billund Vand og Energi A/S.

Yes, it treats the wastewater and organic waste of approximately 70,000 residents, but it's an innovative and complete sludge reduction solution that makes it special. This is the first full-scale plant of its sort in the world boasting highly effective continuous thermal hydrolysis.

Generating electricity and providing district heating, means the plant has received worldwide recognition.

This means it can anaerobically co-digest 4,535 metric tons of primarily domestic organic waste, together with the surplus activated sludge from the biological wastewater treatment process, per year — the same weight as 33 blue whales.

One of the key technologies that contributes to the success of the project is ANITA™ Mox, a Moving Bed Biofilm Reactor (MBBR) technology, which is highly effective at dealing with high nitrogen levels in rejected water.

High levels of nitrogen are a result of the continuous thermal hydrolysis in Billund and can be inhibitory and toxic to biological processes. To avoid such consequences, the MBBR technology was introduced to allow the treatment of difficult rejects efficiently and sustainably.

Today, nitrogen load in rejects is reduced by 80 to 90 percent before it reaches the mainstream. This is achieved with only 40 percent of the air that would be used when treated in classic nitrification or denitrification processes and without any additional source of carbon. On top of that, the amount of sludge produced in the process is reduced by 10 times. The MBBR carriers are a biofilm-based solution so very resilient to toxics and variations in the load.

The combination of technologies has resulted in less overall energy consumed, with no need for carbon, and less sludge produced. And the benefits for the utility and environment are significant operating cost savings and reduction in carbon footprint, not to mention the production of green energy from the wastewater sludge.

"I'm proud of supporting the production of more green energy from biogas production than the entire utility company can use in making electricity and heat for district heating. An important step in making Billund municipality a CO_2 neutral community." — Thomas Kruse Madsen, CEO, Billund Vand of Energi A/S at Billund Water and Energy.

Billund's reuse of sludge and biogas production generates about three times the energy requirements of the plant itself, with the surplus being exported to the grid.

Generating electricity and providing district heating, means the plant has received worldwide recognition for innovation and sustainability, including a distinction in the 2014 Global Water Awards for Water Reuse Project of the Year, a European Business Award for the Environment, and Denmark's Svend Auken Award for dedicated efforts in the environmental arena.

NOUGHT TO SUSTAINABLE IN 60 SECONDS

Water treatment and reuse technologies accelerate sustainability best practices for Latin America's automotive industry.

With access to approximately 31 percent of the world's freshwater resources, Latin America is technically the richest region in the world when it comes to freshwater availability per person. However, it regularly faces severe water access challenges.

A recent water use report found the fundamental reason for this is that much of Latin America's population and industrial activities are located in water-scarce regions. For example, 73 percent of Brazil's freshwater is found in the Amazon River Basin, yet only four percent of Brazil's population lives there. Likewise, in Mexico, more than 75 percent of the population lives in the central and northern regions, while 72 percent of the country's freshwater is in the south. And in Peru, 97.5 percent of the country's surface water is in the Peruvian Amazon basin, home to only 30 percent of the population.

As a result, countries throughout Latin America have developed detailed policies to address water scarcity including water recycling and reuse requirements. One target industry is the automotive sector, which produced approximately 7.3 million vehicles in 2020, representing seven percent of global production

During manufacturing, thousands of liters of water are used in almost all processes making car manufacturing a thirsty business.

The most water-intensive process is car painting where a metallic pretreatment is followed by a colored coating using either a power or an electrodeposition bath also known as an E-coat — when the car is fully submerged in water through which an electronic current passes — to prevent rusting.

Local regulations require all companies that use this process to treat their wastewater. This means automotive manufacturers need to meet strict discharge effluents within the maximum permissible limits for sedimentable solids, total suspended solids, oils and fats, heavy metals and effluents from the metal finishing process.

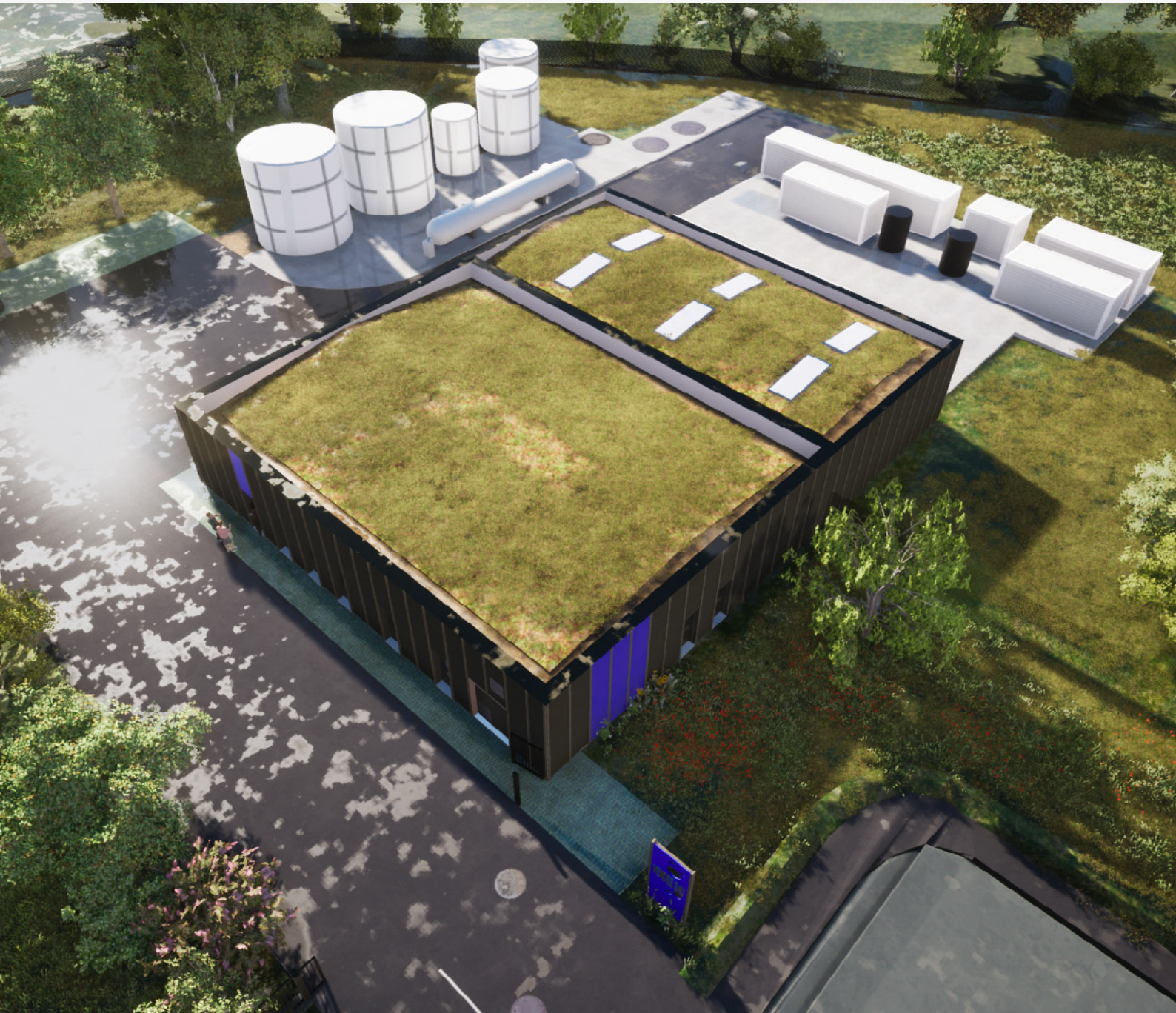
The treatment of wastewater discharges from this type of industrial activity uses basic principles such as collecting water, adjusting the pH by adding sulfuric acid or caustic soda and mechanical stirring.

Technologies such as UFlex™, Filtraflo™, Sirion™ and WAPOL™ help put the automotive sector on the sustainable highway. They make it possible to combine pretreatments to achieve adequate water qualities for reuse within production processes as opposed to the water being washed away. This reduces the need to intake freshwater, helping to alleviate pressure on the region's limited water supplies, while also reducing costs.

As more and more of the world faces acute water scarcity issues, water recycling and reuse are becoming legally binding necessities as well as essential tools for ensuring business continuity.

Aware of this, many businesses in the Latin American automotive sector have already switched lanes and are focusing on long-term, sustainable solutions.

Water reuse secures drinking water supplies in France



Known for its long coastline and sandy beaches, Vendée is now putting surface water augmentation on the map too. A first for France and Europe, the Jourdain Program will reuse treated wastewater for indirect drinking water production.

Located on the western coast of France, Vendée is one of France's most popular holiday destinations owing to its beautiful coastline, historic towns and picturesque villages nestled in idyllic countryside. However, the region has faced increasing water shortages during hotter months, adding additional strain on tourism, wider industry and residents alike.

For the past 20 years, Vendée has been confronted with severe water droughts. In fact, several conventional investments had been already instated by Vendée Eau — the non-profit public body in charge of water supply — including a very effective water-saving program. Nevertheless, the region was still struggling to make the 50 million cubic meters of drinking water produced per year meet its needs as demand continues to rise.

Additionally, the authorities knew they also needed to counteract the impacts of climate change since the water supply of Vendée is highly dependent on surface water which is more at risk of increased evaporation and convection. Indeed, as a direct result of climate change, projections showed this put an additional 100,000 inhabitants at risk of drinking water shortages during very dry years.

And so, Vendée Eau needed to act... and this is exactly what they did.

Taking inspiration from neighboring countries, Belgium, Spain and Germany who were reusing water for aquifer recharge, Vendée Eau wanted to take this a step further and started investigating IPR for surface water augmentation.

"Considering the large volume of treated wastewater available but then discharged directly in the ocean from a nearby non-coastal touristic zone, indirect potable reuse (IPR) was deemed very interesting to explore," explains Jérôme Bortoli, Head of Vendée Eau.

The intended reuse scheme in Vendée aims to partly refill the Jaunay reservoir with reclaimed water from the wastewater treatment plants of Les Sables d'Olonne, located 20 km away. *"This solution could provide an additional volume of up to two million cubic meters of drinking water; this is half of the storage capacity of the Jaunay reservoir,"* explains Bortoli.

The main challenge Vendée Eau faced was that while other countries in Europe have used reclaimed water for aquifer recharge, there is no such reference in France and currently no regulatory framework for surface water augmentation nor for IPR.

Vendée Eau needed to act... and this is exactly what they did.

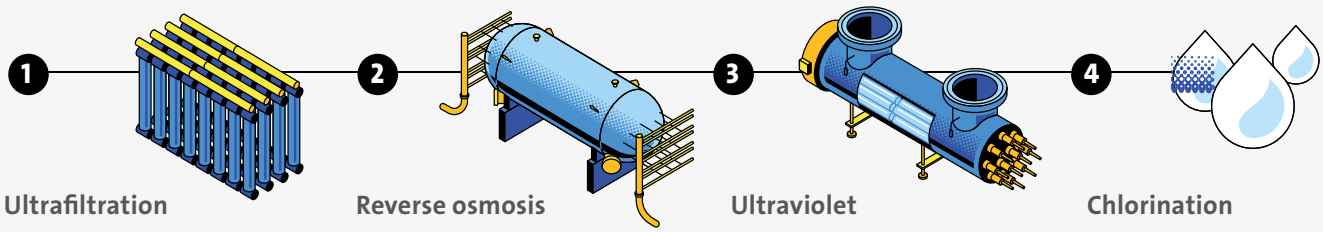
Bortoli continues: *"The practice of indirect potable reuse is not yet covered by the current French — or European — regulation that only authorizes uses for irrigation purposes. This means Jourdain will be the first of its kind in Europe for surface water augmentation and, as such, is carried out by the collective as an open demonstrator for experimentation."*

The Jourdain Program is made up of several infrastructures including a tertiary treatment unit, a 25 km recycled water pipeline, engineered landscaped and wetland area and Vendée Eau has set up a regional governance system.

"The objective is to build the installations and then to acutely monitor the system in operation for three to five years, before deciding whether or not to go for the full-scale program," adds Bortoli.

The Jourdain Program now has to demonstrate and guarantee that IPR will lead to limited impacts, compliant with all water use: recreational activities and drinking water production.

Jérôme Bortoli



Multi-barriers for the Jourdain program

Furthermore and beyond technical aspects, governance and social issues are prominent. And so, Vendée Eau has launched coordinated actions to raise enforcement, confidence and mobilization at a large scale of stakeholders who need to be involved, from local communities and direct customers of drinking water to national institutions and health services.

This innovative and ambitious program will make it possible to recreate the water cycle in a planned and controlled manner, in order to guarantee the security of the drinking water supply for the people of Vendée.

Vendée Eau began discussions in December 2019 and on July 9, 2021, the contract for the construction of the Jourdain refining unit was signed in La Roche sur Yon, in the presence of Jacky Dallet, President of Vendée Eau, Martin Gutton, Director General of the Water Agency, Antoine Frérot, Chairman and CEO of Veolia Group and climatologist Jean Jouzel.

The Jourdain Program will soon be a reality as the first step is under construction: the tertiary treatment unit designed by Veolia Water Technologies.

Vendée Eau is running trials on water reuse as part of its Jourdain Program. This process — reusing treated wastewater by pumping it into waterways upstream of dams in areas that suffer from water shortages — is a first for Europe. Currently, under construction, testing will start in 2023 with full production scheduled for 2026. The technology at the heart of this is the Barrel™ an ultrafiltration and low-pressure reverse osmosis vessel designed by Veolia Water Technologies that contains 200 membrane elements, ultraviolet disinfection and chlorination.

Pascal Pluyaud, Director OTV West Central Caribbean - Veolia Water Technologies:
"The tertiary treatment unit being used as part of the Jourdain Program addresses a critical need: the reuse of wastewater through one of our latest innovations, the Barrel. This project, through its refining unit, aims not only to provide a reliable source of drinking water for the future but also to reduce the environmental footprint of our customers. And all this, while generating profitability and growth potential for the whole Veolia Group, is a very good example of our multifaceted performance."

The world's largest disc filter installation reduces dependency on the Nile

What does the world's longest moustache, oldest person ever to have lived and Veolia Water Technologies' Hydrotech Discfilter have in common? They are all Guinness World Record holders.

Guinness World Records, the global authority on record-breaking achievements since 1955, has recognized Hydrotech's disc filter installation in Egypt as the largest in the world.

The Bahr El-Baqar wastewater treatment plant opened in September 2021 to tackle one of the biggest challenges facing the country: water scarcity. Without the Bahr El-Baqar plant, Egypt's rapidly growing population and expanding economy would struggle to secure enough water to sustain itself since it was relying on one source: the River Nile.

Traditionally, the Nile was seen as the passageway between life and death; however, in recent years, it has taken on a new role as the backbone of Egypt's industrial and agricultural sector as well as the primary source of drinking water resulting in severe water scarcity.

"Any alteration to Nile flows could make a huge difference. Every two percent drop of water affects one million people," states Randa Aboul Hosn of the United Nations Development Programme.

To help reduce dependency on the Nile, and ensure water resources are sustainably managed, the Bahr El-Baqar plant treats 5,000,000 cubic meters of wastewater per day — equivalent to the water of one hundred and forty million showers.

Veolia's team supplied the plant with the record-breaking, 120 disc filters to recover and recycle the wastewater by removing organic compounds, bacteria and other harmful elements so it can be used for irrigation in the Sinai governorate.

"Scarce availability to clean water is a global problem. Disc filters make wastewater reuse for irrigation possible. This is important in ensuring that all people can have access to clean drinking water in the future while at the same time fighting global hunger," adds Peter Wiktorsson, Project Manager at Veolia Water Technologies.

The Bahr El-Baqar plant disc filter installation is by far the biggest in the world, both in the number of filters supplied and total filtration area. This helps reduce the environmental impact of the plant and reduce water intake from the Nile overall.

In June 2021, the plant started to treat water for reuse in agriculture to assure the possibility to grow crops in a normally dry area. The Hydrotech Discfilters are installed to capture suspended solids and therefore help secure the required water quality.

Alongside the world's tallest dog and fastest women's marathon runner, this flagship disc filter reference is firmly placed in the Guinness World Records' database.

Guinness World Records recognizes disc filter installation in Egypt as the largest in the world.

Securing water production in a water-scarce world

Business continuity is under threat from water scarcity misconceptions. In the wake of increasing demand but growing concerns over water availability, Mark Dyson, Vice President of Veolia's mobile water business, explains how mobile water services, particularly technologies enabling water reuse, are proving critical for business stability.

It is a common misconception that water scarcity only affects the planet's drier regions. Yet drought is now widespread, and by the end of the century, all but a handful of countries will experience it in some form.

The European Commission has estimated that at least 11 percent of Europe's population and 17 percent of its territory have been affected by water scarcity to date. According to a special report on drought — published in June 2021 by the UN Office for Disaster Risk Reduction — at least 1.5 billion people have been directly affected by drought this century, and the economic cost has been estimated at $124 billion.

A Swiss study predicts that like other parts of the world, Europe will be drastically different by 2050. London's climate may be more like Barcelona today. Madrid will be more like Marrakech. On the other side of the Atlantic, just a few years after California celebrated the end of its seven-year drought in 2019, the state is now facing another. This comes as the result of 2021 being the second driest year in history. In fact, nearly half of the U.S. is experiencing moderate to exceptional drought conditions.

As well as causing humanitarian crises, the growing scarcity of freshwater due to rising water demands and a changing climate presents a major risk to manufacturing businesses. The World Bank predicts that global GDP growth rates will fall six percent by the middle of the century as a result of increased competition for water. This would result in costs of $2.5 billion for companies at the mercy of increased water scarcity.

Water issues are becoming highly material factors affecting the growth and profitability of companies. They create material, physical, regulatory and reputational risks.

The main challenges faced by the industry — concerning water — are those of securing adequate supply for what is a water-intensive process and ensuring that contamination of water sources is addressed where it occurs. Where the water resource has diminished, a worsening of water quality has normally followed because there is less water to dilute pollutants. In addition, saltwater increasingly intrudes into coastal aquifers.

Climate change will almost certainly exacerbate these adverse impacts in the future, with more frequent and severe droughts expected all over the world. To circumvent these water-related problems, companies are implementing water conservation strategies, examining water reclaim and reuse opportunities, re-engineering their water-using processes and investigating alternative water sources.

Emergency provision of temporary water treatment is well established and mobile water services are well placed to meet these urgent requirements. A temporary water treatment system is a perfect solution in an emergency and can sustain a continuous supply of treated water for all unanticipated scenarios, such as coping with short-term seasonal or unexpected changes to a facility's raw water supply. Mobile water services can be brought in to ensure that production or business processes can continue and avoid costly downtime.

As well as humanitarian crises, climate change presents a major risk to business.

Longer-term asset rental is also now an attractive alternative to high upfront investment in permanent water treatment technology across many sectors. Tightening CAPEX budgets, an emphasis on business continuity and a desire for flexible, affordable water management, have all generated a demand for mobile water services, which offer a cost-effective, alternative solution providing emergency relief and fulfilling temporary water requirements.

All around the world, operators across several industries have already worked with

temporary water treatment service providers to provide a flexible solution to issues arising from water scarcity and feedwater changes. Typical applications include treatment of high chloride and high conductivity, suspended solids, high microbiological, high organics, and alternative feed supplies.

The recycling and reuse of so-called waste or spent water is a growing and evolving opportunity as more and more industries are challenging the economic and environmental feasibility of being more efficient and sustainable.

Well-published statistics clearly show that the amount of spent water being reused is minimal compared to the overall volume produced. This valuable resource can no longer be wasted. As the demand for fresh makeup water grows and the resource becomes scarcer, the need to develop a reliable and secure source of recycled water is ever more important, whether for continuous or intermittent use.

Intermittent or environmental constraints requiring mobile water services.

Mobile water services can be an integral part of a more circular economy by offering short-term or multi-year rental solutions that can be used for proof of concept; such solutions can achieve fast results without the need for long studies and evaluations, usually synonymous with significant investments. This flexibility allows industrial facilities to learn while using and benefit while trialing different water reuse technologies and innovations on a full-scale scope, be it for intermittent or more permanent challenges.

Such services can substitute the need for fresh make up water and help recover valuable resources — such as energy or trace resources — within spent water. The amount of wastewater produced can be drastically reduced, improving the operation's water footprint and helping with environmental compliance.

SWEET SAVINGS

A confectionary company needed to reduce and recover the amount of sugar discharged to the drain. Their goal was to reuse and recycle it and to produce treated water to prevent salt crystallization of their conveyor systems as part of their manufacturing process.

Our team offered a tank and pump to collect the sugary solution along with a reverse osmosis system. The sugar solution was concentrated in the conventional reject line and recirculated back for process use. The permeate was recovered and used to rinse the conveyor belts, preventing the build-up of sugar and operational issues.

In addition to reducing the amount of sugar discharged to drain, the customer benefited from energy savings in warming the sugar solution and the costs associated with fresh sugar makeup and fresh makeup water. The maintenance frequency of the production process was also extended, allowing the customer to reduce production downtime.

Mobile water services are a strong ally to utilities and industrial manufacturers facing the challenge of water scarcity. A distinct shift in outlook is necessary to help companies to transition from being vulnerable to a shortfall of water, to being fully prepared in the face of this pressing issue.

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