

wave

Insights from Veolia Water Technologies



**Creating more value for the
Food & Beverage market**



ACTIFLO® Pack

Standardized high-performance clarification units

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WATER TECHNOLOGIES

Built upon the proven success of Veolia Water Technologies' patented Actiflo® high-rate clarification process, a new fully standardized packaged option is now available. Veolia's Actiflo® Pack is ideal for the treatment of all types of water including industrial process water, wastewater and reuse applications.

- Cost effective, pre-engineered & pre-assembled high-rate clarification technology
- Extremely compact design with unit footprint ranging from 3 m² to 60 m²
- Wide capacity range: 2 to 2,500 m³/h
- Easy retrofit into existing civil structures, with potential for significant civil costs savings
- Operational flexibility and stability: no impact on treatment efficiency during sudden flow or raw water quality fluctuations

www.veoliawatertechnologies.com/actiflo

Resourcing the world



Creating more value for our customers

Water is the main component in the food & beverage market. All the industries in the market (dairies, breweries, etc.) have to deal with this resource and considering the many constraints imposed by the authorities and by the industry itself, this is a real challenge.

The quality of the water has to be impeccable, as health and safety issues are primordial. Manufacturers must avoid contamination that could come from air supply, water supply, raw materials or process equipment. At the same time, food & beverage companies have to be able to adapt to changes in the market, enter a new market, launch a new product or adapt existing products for a new country as quickly as possible.

To deal with all these challenges, we need to think on a global level: **global solutions bring safety, leverage and economic savings**. The food & beverage companies, together with their water & wastewater treatment partners, have to analyse the value chain from start to finish – not only manufacturing needs but also upstream (e.g., agriculture needs) and downstream (e.g., end customers' expectations) needs. This market approach brings more value and has a **better impact on the environment**.

Veolia Water Technologies (VWT) provides solutions to the problems faced by the food & beverage industry in terms of water by **providing ingredient (production) water and utility water (steam and cooling water)** and by treating wastewater. On top of this, VWT provides solutions for optimizing resources and equipment for energy, water and commodity savings. **Energy is saved** by converting waste and wastewater to energy, providing electricity or heat for the plants. **Water is saved** by providing solutions to treat water which can then be reused in the plants. Finally, **waste is transformed** into valuable by-products, such as fertilizer, which can be reused or sold.

These solutions can be easily implemented, thanks to our standard products range and mobile solutions (dedicated to reverse osmosis, clarification, softening, etc., applications).

Throughout this magazine you can discover the solutions and services we have already provided to clients, helping them to optimize their business, equipment and resources. We hope you will find ideas and solutions to address your own challenges. VWT will always be by your side if you need advice and expertise regarding water or wastewater treatment.

AVOID
CONTAMINATION

WATER &
WASTEWATER
EXPERTISE



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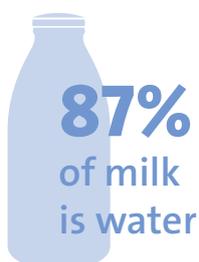
Food & Beverage overview

Brand reputation, water scarcity and stricter regulation are among the pressures driving food and beverage companies to be better water stewards.

Building pressures

Last year, 15 major food and beverage companies received letters from a group of global investors urging them to better manage water resources. The letters targeted companies identified in a report by the NGO Ceres, “Feeding Ourselves Thirsty,” as having poor risk disclosure and management practices with regard to water risks. Signing the letter were North American and European institutional investors responsible for managing \$2.6 trillion in assets.

The campaign reflects one of the growing pressures on the food and beverage industry. Water crises were ranked as a top global risk at the 2015 World Economic Forum. According to the United Nations, the food sector uses 70% of the world’s freshwater supplies and is particularly vulnerable to the problem of dwindling water supplies due to its reliance on the resource as a direct ingredient and an input to agricultural commodity production.



These and other forces are fueling growing expenditures in water

technology by food and beverage companies, with investment estimated to grow to \$6 billion by 2020.

The most important drivers fueling the growth:

- **Water scarcity and environmental protection:** rising global demand for water is increasing water stress in many regions. Growing public concern about water consumption and pollution has resulted in increasingly stringent regulatory controls;
- **Reputational risk:** valuable company brands are vulnerable to damage as stakeholders challenge their water policies and practices and actions like Ceres letter multiply;
- **Operational risk:** water scarcity and stricter regulations can directly hamper the operations of food and beverage producers due to their high level of water usage;
- **Demand growth in emerging markets:** the expanding middle and upper classes in emerging markets is increasing demand for branded processed food and drink. Companies are investing in water technology to ensure the safety and

reliability of their products and to avoid conflict with host communities over water resources;

- **Improving technology:** opportunities to recover energy and materials and to reuse water for processing are making water technology investment increasingly cost effective and even profitable.

Market characteristics

The size of the global food and beverage market is estimated at \$15 trillion and projected to increase to \$20-25 trillion by 2030. Opportunities for water technologies to serve the industry are myriad but complex. Water and wastewater technology needs are



highly specific due to the vast diversity of food and beverage products, processes and plants throughout the world. This presents a challenge to gaining widespread adoption of water technologies at even the subsector level, such as dairies, breweries, meat processing.

Adoption of new technologies is a slow process within the industry as a result of the high risks associated with food safety and hygiene. Food and beverage companies, conscious of the risks to their product and corporate brands, require ample proof of the benefits and lack of negative impacts provided by innovative technologies or solutions, particularly when there is direct interaction with the products.

As pressures mount on food and beverage companies with regard to their water

consumption, new opportunities are opening in **process water technologies**. Companies worldwide are seeking solutions to improve the water efficiency of their processes and to ensure reliable sources of clean water needed in their operations. **Increasingly, wastewater streams are being treated to enable water to be reused within plants.**

Energy recovery is also a significant driver within the industry. Companies are adopting energy efficient technologies such as anaerobic digestion that bring additional value by generating renewable energy in the form of biogas.

Additional opportunities for value added **materials recovery** include bio-plastics production, microbial fuel cells and nutrients recovery for bio-products, such as fertilizer.

Increasingly stringent regulations are another major force in wastewater technology investment. This includes a number of developing countries that are significantly strengthening their regulations, imposing stricter limits on wastewater discharges and increasing the costs. This is creating additional opportunities for pretreatment technologies.

Sustainability, water efficiency and value recovery are real challenges for the food and beverage market. Water companies like Veolia Water Technologies provide the solutions. ●

TAKE UP
SEVERAL
CHALLENGES



\$20-25 trillion projected 2030 global F&B market

9,263 trillion kcal projected 2030 annual global food consumption
(+23% increase since 2012)

\$6.0 billion projected 2020 F&B capital expenditure on water technology
(+6.7% CAGR* since 2011)

70% portion of world's freshwater supplies used by the food sector

5 billion projected 2020 global middle class population
(+150% increase since 2009)

+40% projected 2050 increase in demand for water

+70% projected 2050 increase in demand for food

70% projected 2050 portion of the world population living in cities

65% projected 2030 portion of the world's middle class living in the Asia Pacific region

51.6% portion of EU** food and drink industry revenues from SMEs***
(2011 data: €524 billion)

99.1% portion of EU food and drink industry companies that are SMEs

*Compound Annual Growth Rate

**European Union

***Small and Medium-sized Enterprises



Danone

Goal: zero net carbon in 2050



DANONE

Danone and Veolia recently formed an innovative alliance in view of optimizing natural resources management. The partnership covers all aspects of the water cycle, waste management, sustainable agriculture and energy efficiency.

"At Danone we have three strategic resources: milk, water and plastic. We want to be able to manage these resources in a circular way, through recycling and leaving the smallest possible environmental footprint," summarizes Pascal de Petrini, Executive Vice President of Strategic Resource Cycles at Danone.

Danone's goal is to halve its carbon emissions by 2030 and become carbon neutral by 2050.

This partnership concerns Danone's 170+ factories and their environment located all over the world, within its five divisions: Fresh Products, Early Life Nutrition (ELN), Waters, Medical Nutrition and Africa.

The project will be deployed gradually: 10-15 sites will be studied yearly, concrete solutions for improvement will be identified, and pilots will be initiated. The aim is to find solutions that are adapted to the sites' need and that can be replicated to the rest of Danone's facilities.

According to Laurent Panzani, Global Director of Food & Beverage

at Veolia, *"our goal is to unite all the Veolia expertise in order to help the Danone teams to achieve the ambitious goals they have fixed. VWT's technological expertise combined with the global offer from Veolia will foster innovative solutions to contribute to a successful performance at the Danone sites (lower energy & water consumption, better valorization of all waste types) and to also benefit all those associated with the site ecosystem upstream and downstream (raw materials suppliers, farmers, consumers, communities nearby residents, etc.)."*

For Bruno Valla, VP Alliance Deployment at Veolia *"it's more than just a business partnership; with Danone we share the same values in wanting to create and develop circular economies around industries and municipalities. These common and strong values act as an incentive to further optimize the resources sustainability. Ultimately, Danone should reach its environmental goals faster with the benefit of our technologies and expertise. At the same time, we will enhance the circular economy ecosystems by supporting social & economic initiatives with our organization and network."*

VWT supports the success of the alliance thanks to its technological expertise in the food & beverage industry and its global coverage. VWT has already implemented

many solutions worldwide helping industrial clients to better manage the water resource, such as "Zero liquid discharge" systems, reclaim solutions, cow water recovery systems, production of biogas from wastewater effluent, etc.

On top of this, VWT will support Danone in the industrialization of its water treatment so that they may be applied to different countries. In working on these joint projects with Danone, VWT fully exploits its ability to offer standardized solutions thanks to its unrivalled technological portfolio and geographical coverage, with local subsidiaries able to offer their expertise to the Danone sites located close to them.

"It's very motivating working with the Danone teams on global solutions. There is a real drive from the client to care about the water resource, and go beyond the traditional market expectations. We started with some audits at Danone Early Life Nutrition sites in order to optimize the consumption in their current or future plants and our recommendations are suitable for rehabilitating existing equipment or setting up a reuse solution," says Audrey Bachelay, Business Development Manager at VWT, Markets & Offers Development department. ●

Mars

Creation of a sustainable wastewater treatment plant

The challenge

Mars strives to have a complete sustainable production in the year 2040 (Sustainable In one Generation program). Through the installation of the anaerobic Memthane® treatment plant in Veghel (The Netherlands), Mars makes significant progress in the achievement of its sustainability targets at their largest chocolate processing facility in the world.

Veolia's solution

VWT will supply the most appropriate anaerobic wastewater treatment technology. The solution differentiates by achieving more than 99% removal in a one stage anaerobic process. In the Memthane reactor the wastewater from Mars is biologically treated and converted into high calorific biogas. The treated effluent and biomass are separated by means of ultra-filtration

units. The biomass is returned to the reactor and the final effluent is discharged to the sewer system. Complete operation and maintenance of the wastewater treatment plant is also planned.

Benefits for Mars:

- Most compact solution and lowest operational costs in comparison to other treatment routes
- Net carbon footprint reduction of more than 150 Ton CO₂/year
- Maximization of renewable energy production, up to 10% of gas consumption
- More than 99% reduction of pollution equivalents
- Complete outsourcing of operations



150 tons of
CO₂ avoided
annually

Up to more
than 10%
energy savings

Reduction
on sewer
cost 97%

Today, the Mars family of Associates is 80,000 strong in 78 countries around the world. Mars makes a lot more than just chocolate. Mars has six distinct and different businesses - Petcare, Chocolate, Wrigley, Food, Drinks and Symbioscience - which have helped the company reach billions of consumers and achieve more than \$33 billion in global sales. From selling PEDIGREE® dog food in New Zealand to planting SEEDS OF CHANGE® in South Africa, Mars reaches out to nearly every corner of the globe.

Bacchus

Veolia Water Technologies secures key partnership in China

Leading Alcopop manufacturer becomes Veolia's anaerobic technology reference in Chinese food and beverage market

Veolia Water Technologies China is proud to announce its latest contract with Shanghai Bacchus Limited Company (Bacchus), which will see Veolia design and build full turnkey

wastewater treatment plants for two of Bacchus's new greenfield factories in Tianjin and Chengdu, China. The plants will integrate several of Veolia's innovative technologies – including the Biothane® Advanced Upflow

Anaerobic Sludge Blanket (UASB), AnoxKaldnes™ Biological Activated Sludge™ (BAS), as well as tertiary and sludge treatments.

Established in 2003, Bacchus manufactures the popular RIO® Alcopop series, and is wholly committed to developing, producing, and expanding its leading product to meet market demand. Upon project completion, both the Tianjin and Chengdu factories will join Bacchus's existing production facility in Shanghai to boost the company's production capacity to meet growing domestic demand.

Due to the nature of the Food & Beverage industry, wastewater generated from processing

operations contains high concentrations of biological oxygen demand (BOD), chemical oxygen demand (COD), and suspended solids. To mitigate Bacchus's



wastewater challenges, both projects feature Veolia's high-performing anaerobic reactor, the Biothane Advanced® UASB.

Renowned for its high organic loading capacity and superior sludge retention characteristics, the Biothane Advanced® UASB reactor is particularly suitable for the treatment of food and beverage-type effluents, ensuring that local regulatory standards for wastewater discharge are met. In addition, the compact solution supports biogas production, which serves as an alternate energy source, maximizing renewable energy utilization for Bacchus.

James Peng, Solutions Director, Veolia Water Technologies in China, concluded, "As a leading global provider of innovative water and wastewater solutions, Veolia's knowledge of local discharge limits has benefitted our clients, who have had to mitigate wastewater challenges in an increasingly environmentally conscious market. This is our first partnership with Bacchus in China. Our suite of water and wastewater

solutions offers maximum technical advantages for our clients, and we look forward to recommending our anaerobic technologies to more Food & Beverage manufacturers operating in this region." ●



Jack Link's

Creating environmentally sustainable waste/wastewater treatment system



THE CHALLENGE

Jack Link's, a leading protein snack producer, was in need of a water treatment solution at its facility in Alpena, South Dakota. Jack Link's previous wastewater treatment system consisted of a Dissolved Air Flotation (DAF) system for FOG (Fats, Oils, & Grease) and TSS reduction. Effluent from the system was discharged directly to the sewer system, and the city municipal treatment plant was becoming overloaded as a result of the facility's production increases and high BOD loads.

THE SOLUTION

Veolia Water Technologies partnered with Jack Link's to develop a process that would solve the facility's high BOD discharge issue, while simultaneously creating biogas as a byproduct to reduce the plant's energy costs.

Veolia's treatment process utilizes Memthane® Anaerobic Membrane Bioreactor (AnMBR) technology combined with a Sulfothane™ Biogas Desulfurization System. Memthane pairs anaerobic biological treatment with ultrafiltration (UF) membranes to create an industry-leading anaerobic membrane bioreactor system. The bioreactor converts the plant's waste into a

methane-rich biogas, while UF membranes create a high-quality effluent that is discharged into the municipal sewer system.

Biogas from the Memthane system is then treated by Veolia's Sulfothane system. This treatment step removes sulfur compounds from the biogas, which are highly corrosive and can damage downstream equipment. The scrubbed biogas is then sent to a Combined Heat and Power (CHP) Generator, creating onsite electricity and offsetting energy costs.

THE RESULT

The Memthane and Sulfothane systems have exceeded performance and client expectations. Final permeate discharge from the Memthane system averaged less than 100 ppm BOD for greater than 98% BOD removal rates. Membrane operation during the first 24 months of operation was stable, with flux rates ranging from 9 to 18 l/mh.

The Sulfothane system was able to reduce the biogas's H_2S levels from 6,000-8,500 ppm to less than 10 ppm, which is well below the generator's manufacturer specifications.

Due to sustained process stability and consistent high quality effluent, the city treatment plant operation has improved greatly.

ENERGY POSITIVE WASTE/WASTEWATER TREATMENT PLANT

The system is not just energy efficient, it is also energy positive when operating at full flow. The biogas byproduct currently produced in the anaerobic reactor generates more electricity than the system consumes. The result is a fast return on investment for the capital purchase. ●

ElPozo Alimentación

a remarkable example of environmental sustainability

Based in the province of Murcia in the southeast of Spain, ElPozo Alimentación is a Spanish company with a 60-year track record in the market. Today, ElPozo meat products reach a market of over one billion potential clients in more than 80 countries, making it one of the leading companies in the sector, both in Spain and internationally. Year after year, ElPozo has increased its market share and in 2014 it was the brand with the highest consumption figures in Spain, with a turnover of around €950 million.

whilst embodying the company's commitment to the environment.

Water partners since 2003.
From process water, wastewater and sludge treatment to energy efficiency and water reuse.

In wastewater...

In 2003, VWT was awarded a turnkey project for the Industrial Wastewater Treatment Plant (WWTP) at ElPozo Alimentación's production facility in Alhama de Murcia. The industrial WWTP was designed for a treatment capacity of 6,000 m³/day and 23,880 kg COD/day, a pollution load corresponding to a population equivalent of 200,000 inhabitants. The treatment process consists of an activated sludge facility including the BIO-DENIPHO™ technology for the removal of organic matter, phosphorus and nitrogen.

...in process water...

In 2005, VWT supplied two reverse osmosis units with a total capacity of 4,000 m³/day for the production of water to feed the steam boiler and the evaporative condensers, as well as for other uses at the factory. Since these units went into operation, VWT has also been entrusted with the provision of technical assistance and Hydrex® chemical products (antiscalants, products for plant cleaning and maintenance). At the end of 2015, VWT was awarded a further contract to supply a 2,000 m³/day reverse osmosis unit to cover additional production requirements.



ElPozo Alimentación is firmly committed to the environment and sustainable development. Proof of this commitment is the company's investment of over €11.5 million in a number of wastewater treatment initiatives and projects aimed at reducing emissions through energy recovery.

Veolia Water Technologies (VWT) has provided a response to these water treatment needs by offering sustainable, efficient technological solutions that increase process performance



...for sludge treatment...

In 2011, ElPozo Alimentación once again placed its trust in VWT for the remodeling of the wastewater pretreatment to deal with higher organic loading resulting from the increase in the activity production, which went from 8,000 to 12,000 pigs processed per day. The work also included enlarging the sludge line through the construction of two 3,050 m³ anaerobic digesters and the installation of a cogeneration system for the production of 800 kW of electricity for self-consumption at the WWTP and 400 kW of thermal energy to heat the sludge during the digestion process, without the need for any other fuel. The digesters also enable a reduction of 45% in sludge volumes, with consequent cost savings in sludge treatment and final disposal.

... and for energy valorisation

At the end of 2014, with the aim of maximizing the use of the biogas produced in the anaerobic digesters, VWT undertook the task of modifying the gas line at the industrial WWTP to enable the excess biogas produced at the plant to be exploited. Some of the biogas is used to heat the sludge in the digesters and the remainder is sent to a

new boiler to generate 5,000 kg/h of steam. The scope of the contract also encompassed extending the piping network, and installing a new gas flare as well as a new biogas desulphurization unit including VWT's Sulfothane™ technology, as a preventive measure to protect the facilities against corrosion.

Towards a circular economy

In addition to energy valorization – and consequently, a reduction of the carbon footprint of the factory - ElPozo Alimentación and VWT have also undertaken a number of water reuse initiatives. These actions have enabled the reduction of water consumption per pig processed, achieving one of the lowest ratio sector in Europe.

Veolia Water Technologies has become the leading partner for companies which, like ElPozo Alimentación, are committed to sustainable development. VWT offers such companies solutions ranging from the treatment of process water, wastewater and sludge to solutions aimed at reducing water consumption and increasing energy efficiency, in order to promote and work towards a circular economy. ●

Nestlé

Zero H₂O = added value for dairy plant

As part of its global commitment to preserve water resources, Nestlé turned to Veolia Water Technologies to develop a solution to reduce water consumption at its Lagos de Moreno plant in Mexico. The country's population growth in recent decades has put increasing stress on groundwater resources. The state of Jalisco, where the plant is located, is one of the areas where the water scarcity problem is particularly acute.

The Lagos de Moreno plant is comprised of three units that produce ice cream, cereals and powdered milk for infant formula and requires 1.6 million liters of water per day, equivalent to the daily water consumption of 6,400 people.

WATER USAGE
REDUCED
BY 78%

"Nestlé is focused on creating a positive environmental impact," says Nestlé engineer Nuria Navarrete. "We have set a target to reduce water usage per ton of finished product by 25% as part of our commitment to conserve water resources. We asked Veolia to provide a solution that would enable us to recover water from our process in order to avoid using deep well water in a high hydrological stress region of Mexico."

The zero solutions solution

In response, Veolia added new technologies to treat the effluent from Nestlé's wastewater treatment plant so that it could be reused for non-food production applications such as cooling, cleaning and industrial uses. The effluent is composed of condensate recovered from the evaporation of dairy products, or "cow water," as well as discharges from "clean in place" sanitization of processing equipment.



A polishing system featuring Veolia's Aquantis membrane bioreactor treats the effluent to produce a filtrate virtually free of solids. A further reverse osmosis treatment step retains dissolved solids and salts to drinking-water quality levels. A final step involves capturing and reusing residual wastewater in cooling towers and other services within the factory, reducing the factory's water withdrawal to zero. The project, called "Cero Agua" (zero water) by Nestlé, enables the treated water to be reused for non-food production applications, eliminating the plant's need for external water resources.

"The Veolia-supplied water recycling technology purifies water in a tertiary treatment of our wastewater treatment plant," says Nuria Navarrete. "The water quality allows us to use it in services that do not have direct contact with the product, such as cooling towers, patio washing stations, fountains and lavatories. By developing this Cero Agua project as well as other initiatives, we have reduced our 2015 water usage in Mexico by 78% compared to 2010."

Going global

Nestlé's success in implementing zero-water dairy production in Mexico offers hope for improved stewardship of a fragile natural resource. The project has contributed to Nestlé's success in reducing water consumption globally by one third during the past 10 years, even while global production has increased.

Nestlé's experience with the Cero Agua project provides valuable insights for

industrial water conservation strategies according to Nuria Navarrete. *"Including a recycling tertiary treatment in wastewater treatment plants today has become a viable solution for many industries to increase their profit and diminish their ecological footprint. Technology costs are now more competitive and chemicals for treatment and spare parts are also available in more sites with shorter delivery times."*

For Nestlé, the Jalisco Cero Agua project is one of more than 370 initiatives the company is undertaking in its factories around the world that are helping to conserve water. A world-first for the dairy products industry, the zero-water technology is now being rolled out at other Nestlé plants worldwide, starting with dairy factories in water-stressed areas of South Africa, Pakistan, India and China.



In 2015, Nestlé's Cero Agua project won the Corporate Water Stewardship award at the 2015 Global Water Awards, held during the Global Water Summit in Athens. *"Twelve years ago, we were told that this couldn't be done, due to cost implications, water quality issues and the technical complexity involved,"* said Jim Knill, Nestlé's head of dairy operations. *"But we've shown that the technology works – now we want to apply it elsewhere."* ●

TARGET:

Zero water discharge

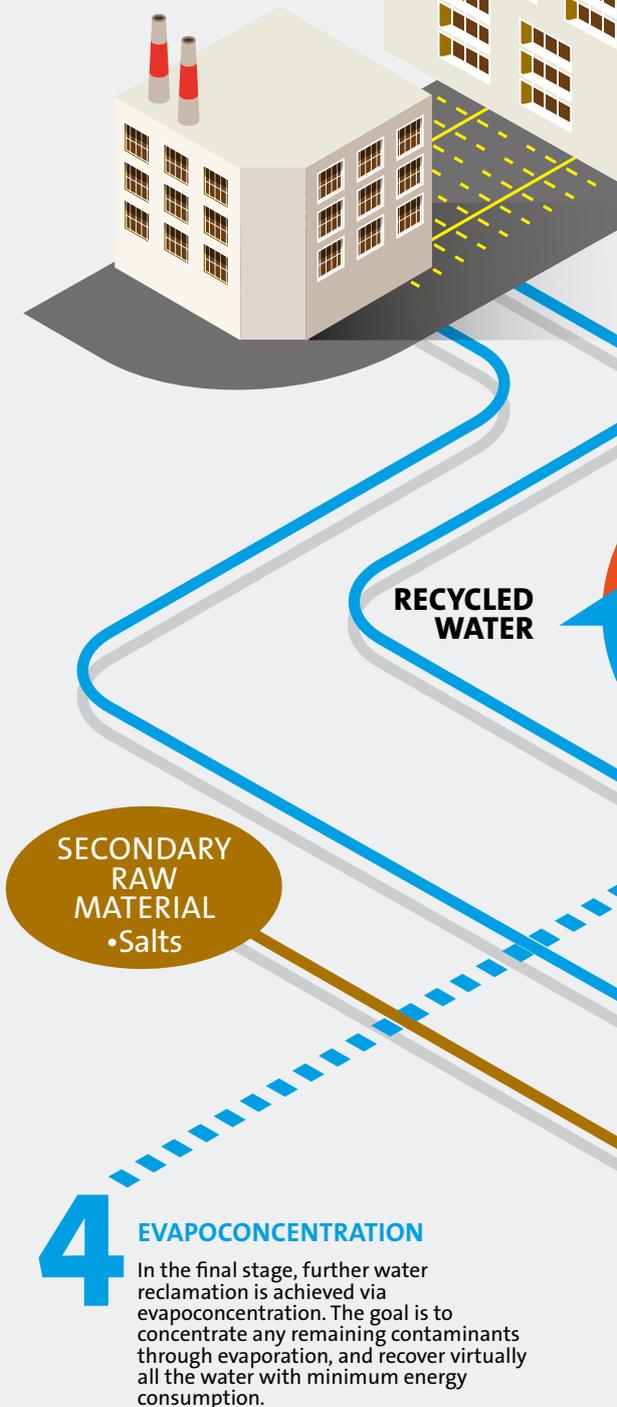
Zero Liquid Discharge technology aims to reuse wastewater in a system. This technology has a bright future especially in regions around the globe where water reuse is mandatory.

A closed loop water cycle:

this is the principle of **Zero Liquid Discharge** – or **ZLD** – technology. A simple principle, but a complex technology. Water remains in a closed loop in the factory, where it is gradually rid of all of its contaminants and is of high enough quality to be reused in the industrial facility's process. There are four decontamination processes required to achieve this: physicochemical pretreatment, biological treatment, filtration and, finally, evapoconcentration (see opposite). Certain pollutants are purified and reused in the process. *"ZLD technology has applications across multiple industries including oil and gas, automotive, food and beverage, pharmaceutical, and others,"* states Dionisio Visintin, Marketing Manager of Veolia Water Technologies Italia's Solutions division. *"At the outset, this technology was geared toward large manufacturing and industrial complexes, but this is now no longer the case."*

So why utilize this sophisticated technology when it would be simpler to treat and discharge water using traditional wastewater treatment technology? *"ZLD technology is critical when the surrounding environment is fragile and cannot withstand even the discharge of treated wastewater effluent,"* points out Visintin. *"ZLD also offers another major advantage: since no effluent is discharged, water legislation need not be taken into account. Last but not least, it sometimes allows you to avoid post-treatment."* Another scenario in which **ZLD** is a must: in regions where water is scarce, its reuse may be required by law. This is the case, for example, in California, which has been struck by drought for over a year and where all businesses are required to "close the loop." Ever mindful of sustainability, most industries are now looking to reduce their environmental impact, especially their water consumption. ●

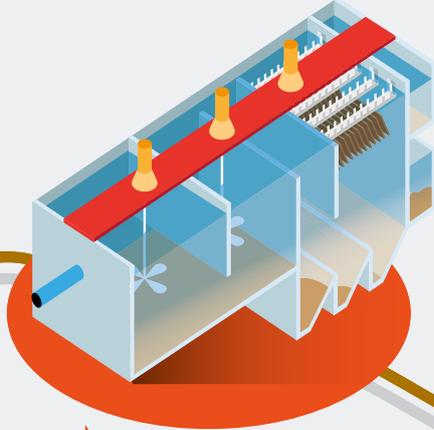
Zero liquid discharge in four steps



1

PHYSICOCHEMICAL PRETREATMENT

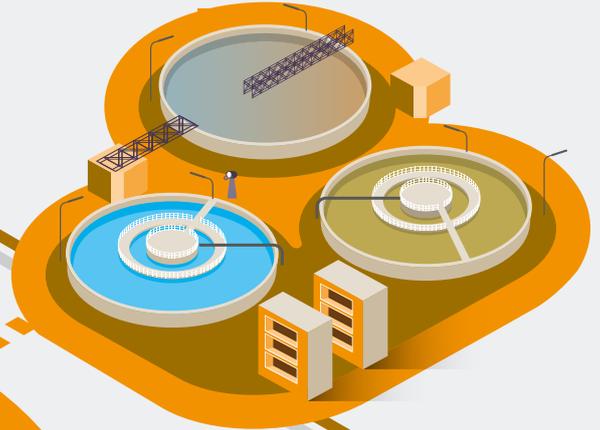
In the first step, materials such as sand and oils – along with other contaminants including heavy metals, fluorides and gypsum – are removed. Veolia offers a comprehensive range of processes specific to particular contaminants including coagulation, precipitation, decanting and filtration.



2

BIOLOGICAL TREATMENT

Next, microorganisms are put to work to remove organic contaminants, which results in the byproduct of “solids” and CO₂. Fluidized bed bioreactors, membrane bioreactors, and sequencing batch bioreactors can be used to optimize the biological processes.



WASTE WATER

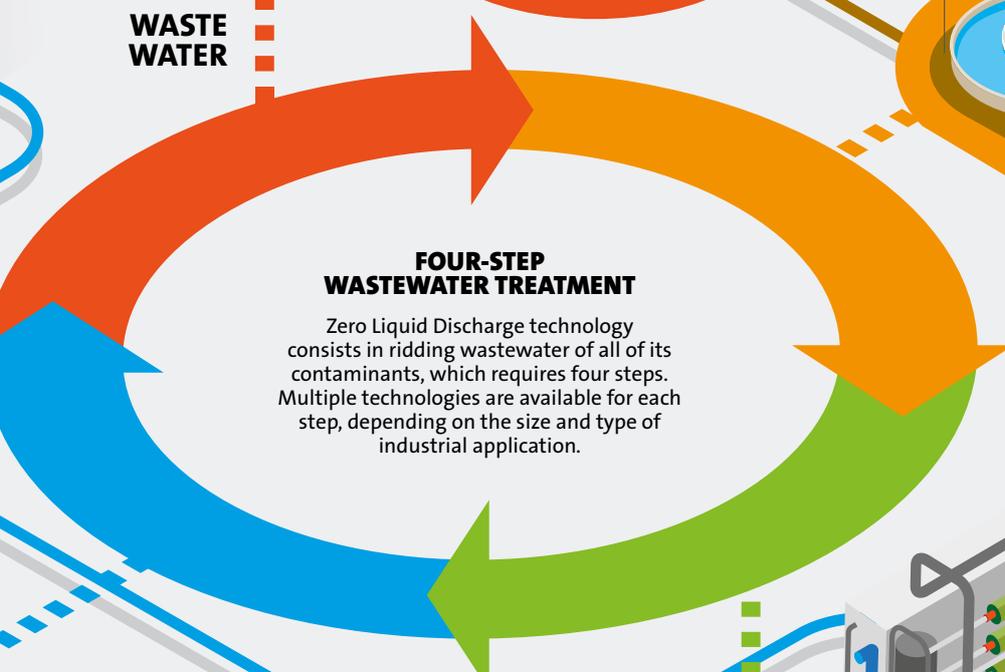
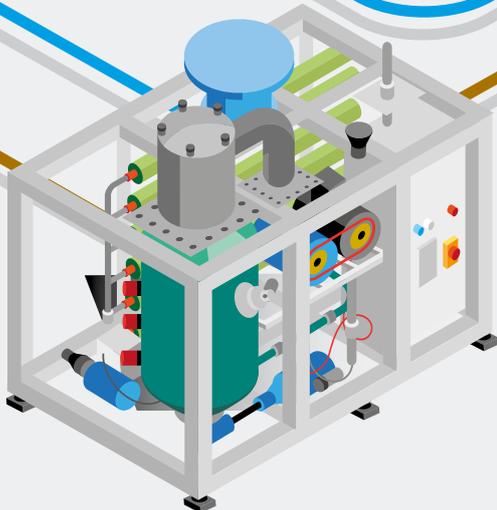
FOUR-STEP WASTEWATER TREATMENT

Zero Liquid Discharge technology consists in ridding wastewater of all of its contaminants, which requires four steps. Multiple technologies are available for each step, depending on the size and type of industrial application.

3

MEMBRANE FILTRATION

Dissolved contaminants have been eliminated by biological treatment, but suspended contaminants remain. They are removed using various filtration technologies, including granular media filters (sand, activated carbon, etc.), microfiltration (membrane technology) and ultrafiltration membrane technology capable of removing bacteria and viruses as well as large organic molecules.



Dongsuh Food

Improvement of the performance and the safety of the Dongsuh food facilities thanks to the HYDREX™ range of water treatment chemicals and associated services

Dongsuh Food was founded in May 1968 and has been producing Maxwell House instant coffee since 1970. Their main business is the manufacture and sale of food & beverages and agricultural products. The company is headquartered in Seoul, Mapo-gu Dongsuh building, with plants located in Bupyeong, Changwon and Jincheon.

The wastewater treatment within the manufacturing process is organized as follows: coffee process – 2 lines (500 m³/day & 1,800 m³/day); prima process: 500 m³/day.

The challenges

The Dongsuh Food team needed to use chemicals in wastewater treatment which optimize both operational and economic aspects. At the same time they had to reduce air pollutant emissions during sludge incineration

The Solution

- Based on jar-test results on the produced wastewater, the chemical Hydrex was chosen
- Chemical consumption was reduced through precision control and accurate dosing

Veolia Water Technologies proposed the most suitable chemical program based on the test results, and now provides Dongsuh Foods with the Hydrex-6135, 6310, 6752 chemicals for their wastewater treatment process.

Benefits

- Cost reduction
- Reduced chemical consumption
- Improved flocculation efficiency
- Reduced energy consumption
- Regulatory compliance

Process Description





Did you know that HYDREX™ covers all your water treatment chemical needs?

Veolia Water Technologies provides a **full range of water treatment additives** but also **associated services** (expertise, audit, quick laboratory analysis, technical assistance, emergency responses, etc.). You can also take advantage of our AquaVista™ **monitoring** tools and on-line scanners; as well as **equipment** such as tanks, dosing systems, etc. If you need water treatment chemical assistance, Hydrex™ has the solution.



Boiler Water Treatment Products	➤	HYDREX 1000 SERIES
Cooling Water Treatment Products	➤	HYDREX 2000 SERIES
Drinking Water Treatment Products	➤	HYDREX 3000 SERIES
Membrane Treatment Products	➤	HYDREX 4000 SERIES
Maintenance and Cleaning Products	➤	HYDREX 5000 SERIES
Wastewater Treatment Products	➤	HYDREX 6000 SERIES
Biocides Products	➤	HYDREX 7000 SERIES
Industrial Application Products	➤	HYDREX 8000 SERIES
Thermal Desalination, bulk chemicals & Others	➤	HYDREX 9000 SERIES

◀ AquaVista - Level 3:
manage your automated control and monitoring system via your smartphone

Namyslow Brewery

Veolia to design and build a new, energy-neutral wastewater treatment plant in Poland

Veolia Water Technologies will supply a new state-of-the-art anaerobic-aerobic wastewater treatment plant to Namyslow Brewery Ltd. The signed turnkey contract includes the design, construction and commissioning of the plant.

The new wastewater treatment plant will provide Namyslow Brewery with a highly-effective treatment system coupled with energy efficiency. Proven anaerobic processes were selected to maximize the biogas production and convert it into energy. The energy will be used to power the wastewater treatment plant, covering operating costs and bringing additional profits to the brewery.

Veolia's technological approach made it possible to reuse the wastewater as a resource for energy production and thereby lower the plant's operating costs. The sustainable solution is based on Veolia's Biobed® Advanced EGSB, a highly effective second generation anaerobic reactor using granular sludge technology, and on aerobic reactor AnoxKaldnes™ MBBR (Moving Bed Biofilm Reactor). A dissolved air flotation system ensuring the required discharge parameters was also included at the wastewater polishing stage. These processes were selected after conducting an analysis of the sewage produced by the brewery.

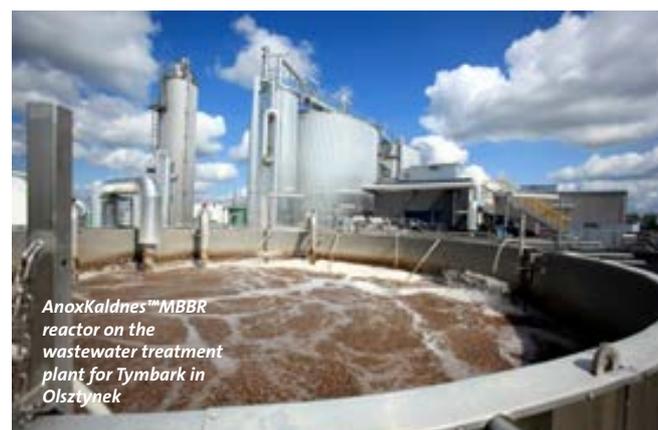
Dariusz Jasak, CEO of Veolia Water Technologies in Poland, said: "We put forth

our most innovative proprietary technologies to help Namyslow Brewery achieve their goal of having a highly-effective treatment system coupled with energy efficiency. We are confident that this new plant will allow Namyslow Brewery to reduce their operating costs and improve their environmental footprint." ●

WASTEWATER
TO ENERGY



View of the EGSB anaerobic reactor - Wastewater treatment plant for Tymbark in Olsztyniek



AnoxKaldnes™ MBBR reactor on the wastewater treatment plant for Tymbark in Olsztyniek

NEW!**The improved discfilter model HSF2200-1C**

The unit has been developed based on feedback from our clients and reflects the actual market needs.

New advantages:

- Capacity up to 200 l/s
- 10-15% higher capacity per m² of filter area
- 14-21% smaller footprint compared to the HSF2200-1F
- Minimized maintenance needs
- Lower CAPEX and OPEX cost
- Flexibility in material of construction



Hydrotech Discfilter

The ideal filtration system for fine solids removal

The **HYDROTECH DISCFILTER** is a mechanical and self-cleaning filter that offers a large filter area in a small footprint.

APPLICATIONS

- Ideal for “retro-fit” projects in existing basins

PERFORMANCES

- Reduces effluent phosphorus to < 0.1 mg/L
- Up to 75% smaller than sand filters
- Up to 20% smaller than other cloth filters.
- Energy reduced by 15% and footprint by 25%
- The only system to be delivered as an assembled unit
- O&M is simple and reduces operating costs

BENEFITS

- Small Physical and Carbon Footprint
- Straight-forward Controls
- Simple Operation and Maintenance
- Ease of Installation (Package Design)
- Low Backwash Water Usage & Energy Efficient
- Title 22 Approved
- Continuous Operation

Minimizing microbial risk in the beverage industry through hygienic design

When producing any food or drink it is important to make every effort to minimize microbial risk, and make products for human consumption as safe as possible. Any microbial contamination is taken extremely seriously, and can result in costly product recalls in response to fears for human health. In addition to the serious health risks from certain bacterial species, contamination with less harmful bacteria can result in the spoilage of beverages, altering their quality and flavor. Manufacturers must therefore address the possibility of contamination, which may originate from the air supply, water supply, raw materials and process equipment.

Water in the beverage industry

The source of the drinking water used in production can influence the taste, appearance and overall quality of the final product. Hard water contains an increased presence of calcium and magnesium salts, which are particularly detrimental to soft drink production as they can cause alterations to pH, and affect microbiological stability and taste. **Soft water** is therefore recommended for use in soft drinks, and techniques exist that can remove water hardness and therefore the effects of these ions. The most widely used of these is **reverse osmosis (RO)**, which is often the first step of a detailed water treatment programme for soft drink production. Another important stage of the

water treatment process is the **removal of chlorine residues**, which is achieved using a carbon filter. It is vital that chlorine be removed during water treatment as it can cause flavor defects. However, once it is removed, there should be extra considerations with regard to microbial contamination, as chlorine is often used as a disinfectant. Water involved in the production of beverages also undergoes various filtration steps to remove any particulates and residual impurities.



Importantly, the equipment used to carry out this water treatment must also play a role in minimizing microbial risk. Manufacturers should consider adopting hygienically designed water treatment systems. These systems can be easily cleaned, maintained and monitored to ensure that high water quality is sustained throughout the manufacturing process. With hygienic design, the different **filters (e.g. media and carbon filters, RO and ultrafiltration systems) are optimized to prevent external impurities** from entering the system, and to offer reliable cleaning and disinfection while allowing continuous monitoring. Hygienic design principles range from cleaning in place and sterilisation in place (CIP/SIP) technologies to optimized water flow that **avoids stagnant water and dead-legs**, which are those areas within piping that have poor flow and are difficult to clean. In addition, these systems provide **maximum system availability** due to longer cleaning intervals as well as **economical operation**, while still ensuring

the highest product quality and safety. With the adoption of such hygienically designed water treatment systems, manufacturers can future-proof their plants for upcoming legislation.

Disinfectants are used across the beverage industry to help minimize contamination by microorganisms. Making use of hygienically designed water systems helps to **minimize the use of disinfectants**, as well as provide extra protection against microbial contamination. Another important issue with the use of disinfectants is the presence of disinfection by-products. Some of these are classified as endocrine disrupting chemicals (EDC's), which can interfere with the endocrine system and cause cancerous tumors and abnormal development.

PurBev®

To combat some of the problems associated with disinfection, while still minimizing microbial risk. ●



PurBev® reverse osmosis system

BENEFITS

- **Optimum product quality and product safety** by minimizing microbiological risks
- **Maximum system availability** thanks to longer cleaning intervals and maintenance cycles
- **Economical operation** based on high system efficiency and decreased need of cleaning supplies
- **Low maintenance and service costs** due to fewer components which are easily accessible
- **Lower OPEX** due to chemical, water and energy savings
- **Sustainability:** Longer lifetime and lower lifecycle costs (low TCO)

Associated British Foods

Veolia supplies in-house wastewater technologies

Turnkey project maximizes treatment flow within limited land space.

Veolia Water Solutions & Technologies (Thailand) Ltd has built a partnership with Associated British Foods (Thailand) Ltd, where Veolia provides the multinational food manufacturer with a full turnkey wastewater treatment plant. This project integrates several of Veolia's innovative technologies – including its Dissolved Air Flotation (DAF), Biothane® Upflow Anaerobic Sludge Blanket (UASB), AnoxKaldnes™ Biological Activated Sludge™ (BAS), and Hydrotech™ Drumfilter – within ABF's Ovaltine manufacturing plant in Samutprakarn, Bangkok. With this end to end wastewater package, ABF will be able to handle its wastewater treatment needs onsite, catering to both existing and future flow requirements projected for the next decade.

Michael Poonpipat, Project Business Development Director, VWT Thailand, said, *“Working with ABF shows how we can effectively provide a full range of wastewater solutions from start to end. Our experience in the food and beverage industry has equipped us with the know-how to mitigate the client's concerns, and we are confident of meeting their project expectations.”*

The challenge

Faced with the challenge of designing a wastewater treatment plant located within the client's space constrained manufacturing grounds, Veolia recommended key technologies that could effectively treat their wastewater volumes and COD loads. Poonpipat shared, *“We had to be creative in designing a compact yet robust wastewater treatment plant that could handle a high flow rate within a limited space. One of the most attractive features of Veolia's water and wastewater solutions is its compact design, which takes into account space constraints that clients face without compromising on performance.”*

The technologies

Apart from its efficient design, Veolia's Dissolved Air Flotation (DAF) unit pretreats the raw wastewater, removing fat, oil, and grease (FOG) before the Biothane® UASB anaerobic treatment process. The UASB anaerobic system then converts COD present in the conditioned wastewater into biogas. Veolia's AnoxKaldnes™ BAS™, a combination of Moving Bed Biofilm Reactor (MBBR) technology with conventional activated sludge (AS), is next applied to promote a stable and more efficient activated sludge process with improved sludge settling characteristics. The effluent then enters a second DAF clarifier unit for biological sludge

A FULL
RANGE OF
WASTEWATER
SOLUTIONS

ANOXKALDNES™ MBBR

Leading edge biological treatment

APPLICATIONS

- For new plants, especially those requiring a small footprint and easy operation
- For BOD/COD and nitrogen removal
- As a high loading system in front of existing biological treatment - roughing reactor

PERFORMANCES

- Durable and stable process with high removal efficiency at higher loading rates
- A high level of flexibility allows for optimized solutions
- High tolerance to load variations & toxics
- Worldwide experience with > 800 reference plants

BENEFITS

- Increases the treatment capacity of existing installations
- Small footprint
- Fast start-up and recovery

The MBBR Pack provides all the advantages of a conventional MBBR system, in a standard prefabricated package with a Plug & Play function that is easy to install.

Veolia's MBBR Pack is an effective and reliable solution, even contending with wide swings in the volumes of wastewater to be treated and the carbon and nitrogen-based pollutants to be eliminated. Its small footprint, quick delivery and plug-and-play installation and commissioning translate to a reduction in civil engineering and infrastructure costs while ensuring continuity of sanitation services during works. Its modular design makes for easy transportation and expansion. Bundling with various Veolia pre or post-treatment processes allows for the MBBR PACK to perfectly address the needs and quality objectives of each client.

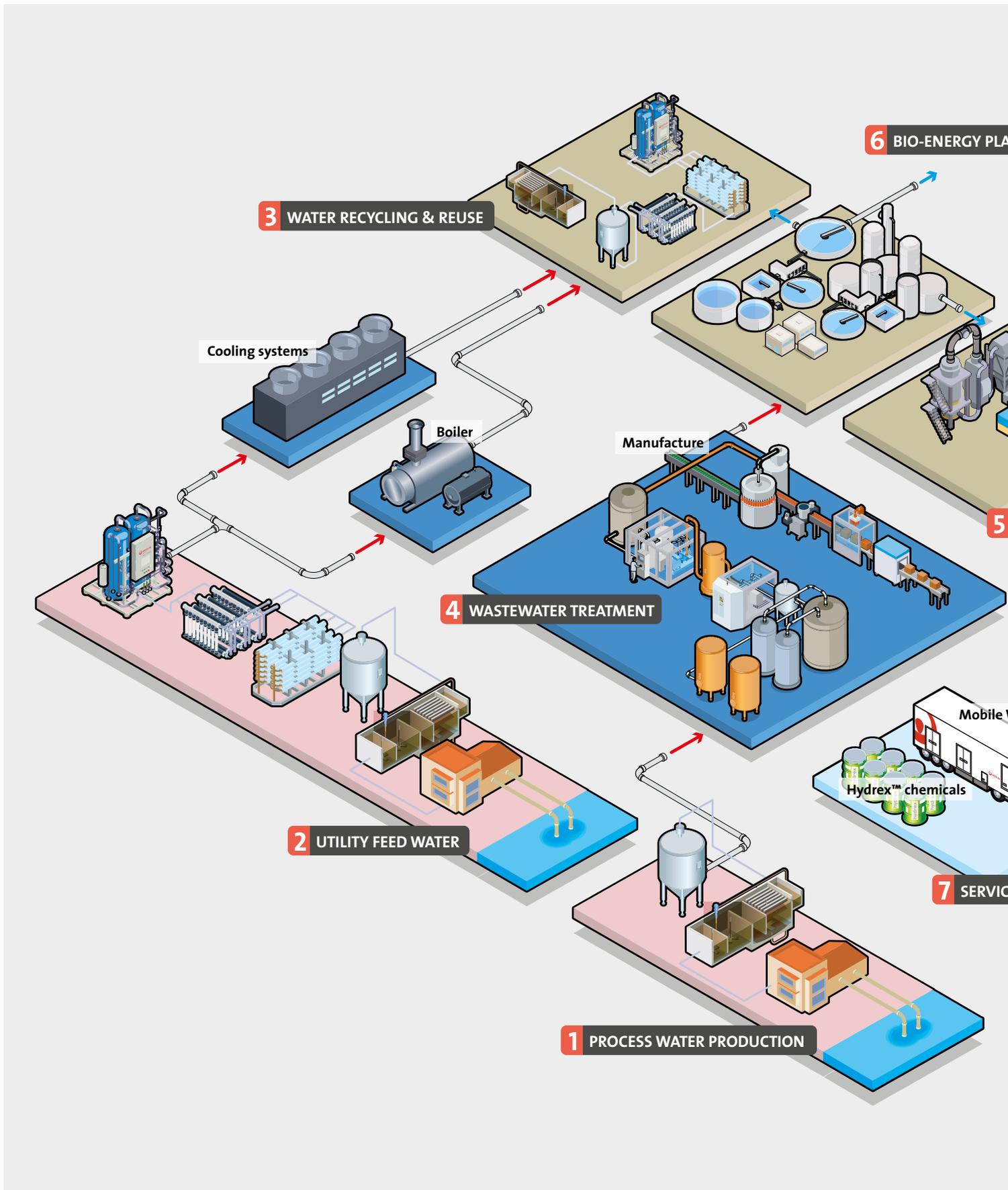
separation, before the Hydrotech™ Drumfilter system separates the remaining particles from the wastewater.

Turn wastewater to energy

As companies become more aware of their environmental footprint, manufacturers are now actively seeking to employ sustainable business practices. Through Veolia's recommended suite of wastewater solutions, the client can obtain biogas in the process of treating its wastewater, which becomes an alternative energy source for heating boiler systems that are used in manufacturing ABF's products.

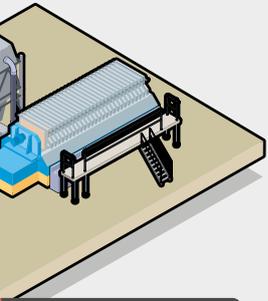
Michel Otten, Technical Director, Asia Industrial, Veolia Water Technologies, concluded, *"This project with ABF carries great significance for Veolia as it showcases our ability across disciplines, from conducting preliminary market studies, to recommending targeted engineered solutions, and finally to constructing the wastewater treatment plant. It reaffirms Veolia's leading position as a professional water and wastewater solutions supplier, and also as a trusted design-and-build partner for manufacturers across different markets. Veolia looks forward to working closely with ABF to ensure flawless project execution for a successful handover in June 2016."* ●

We design and implement standard and custom



Optimized solutions for the food & beverage market

ANT



SLUDGE TREATMENT

Water Solutions



ES

INGREDIENT (PRODUCTION) WATER

Water used in food production processes needs a safe and continuous supply. Veolia's technologies ensure that your ingredient water is produced reliably, cost effectively, and meets the highest quality standards that your operation demands.

WATER RECYCLING & REUSE

Food production is a water-intensive industry. Veolia understands this and is able to help clients meet water reduction goals and minimize their environmental impact by implementing technologies that convert wastewater effluent into water that can be reused elsewhere in the plant.

UTILITY WATER

Food and Beverage manufacturers rely upon their utility operations to provide reliable steam and cooling water to support their production needs. Veolia's equipment and chemical technologies cost effectively produce the type of water your utilities need to ensure steam quality, heat exchange efficiency and environmental compliance.

NUTRIENT RECOVERY

Veolia's sustainable approach to water can transform waste into valuable by-products, such as fertilizer, that can be reused or sold.

SERVICES

- Digital offer: collection and management of your data's equipment
- Laboratory Service / Testing
- Bench-Scale Tests
- Pilot Tests
- Studies & Evaluations
- Design Engineering
- System Integration
- Construction & Project Management
- Start-Up / Commissioning
- Aftermarket Parts / Service
- Full-Time On-Site System Operations
- Remote Monitoring / Automation
- Deionization Products
- Water treatment chemical

WASTEWATER

Veolia is experienced in helping clients reduce their financial exposure and comply with discharge requirements and stringent environmental regulations.

ANAEROBIC DIGESTION

Convert Waste & Wastewater to Energy

Anaerobic treatment technologies offer a dual benefit for food and beverage facilities. They simultaneously treat a wide range of waste and wastewater streams while creating energy-rich biogas as a byproduct that can be used to produce "green" electricity or heat.

Flexibility and adaptability to the customer's needs:

a configurable standard product range

Veolia Water Technologies offers unique and the best designs for each water treatment technology dedicated to the food & beverage industry, including clarifiers, flotators, settlers, multimedia filters, reverse osmosis units, softeners, ion exchange deionizers, MBR, MBBR, ..

quality of our service is optimal and the interventions are faster. In addition each Veolia standardized product comes with a list of spare parts and consumables available in stock on the Veolia logistics sites with **quick delivery times.**

FASTER ACCESS

Veolia standard systems are manufactured in Veolia's manufacturing sites to strict quality standards, and using the best materials. Products are tested before shipment. Our skid-mounted units can be containerized and are **easily transportable by road, sea and air-freight.** They have short-lead-times as critical components are always **in stock.** Veolia standard systems are delivered with installation instructions allowing **a quick and secured start-up.** Standardization can **reduce the time for pre-commissioning** a plant by **up to 70%!** Standard Systems come with performance guarantees.

The offer includes **standard models with a list of options, easily customizable** by our modularity Veolia engineering team with little need for design adjustment:

- Comprehensive range of stand-alone products or products that can be combined to meet all water treatment applications from utility water production, water as an ingredient, drinking water and treated water re-use.
- A total water solution including equipment, chemicals, related consumables and spares list, with service contracts.
- Standard systems based upon equipment that are repeatable everywhere.
- Robust in design
- Fast delivery & commissioning, delivered ready-to-operate.

EASY INSTALLATION & OPERATIONS

The **after-sales services** for Veolia standardized systems is easy thanks to the repeatability of the work carried out by our Veolia service technicians. Therefore the

RAPIDE STRATA™ – Short Cycle Regeneration Ion Exchange Deionizer

The high performance range of Rapide Strata two-bed or three-bed units produce high purity water for beverage industry, boiler make-up, cooling water and ingredient water. The unique design offers savings of up to 40% on operational and wastewater costs compared to conventional deionization systems.

- Flow rates from 2.5 to 60 m³/hr
- 7 standard models available in different versions according to American and European standards and depending on water quality requirements: Rapide Strata and Rapide Strata+
- Standard regeneration in 35-45 minutes



SIRION™ MEGA – High Flux and Low Energy Reverse Osmosis system

The Sirion Mega systems are fully standardized solutions developed for pure water production and water re-use applications. Completely flexible, they offer modular skid and membrane configurations with low operating costs.

- Capacity from 5 to 139 m³/hr (22 gpm to 612 gpm)
- 10 standard models available according to American and European standards



ACTIFLO™ PACK ACP2 – High Performance Clarifier

Veolia Water Technologies has developed and patented Actiflo™ which is today recognized as the most universal and the highest performing clarification process in the market. The Actiflo process offers a great Process stability thanks to the use of microsand that buffers the effect of raw water flow or load variations.

In order to stay on the cutting edge, Veolia Water Technologies has extensively standardized the Actiflo in a range of package plants to comply with various customer expectations:

- Systems that can be delivered, installed and commissioned very quickly
- High level of local services based on reliable, efficient and modular solutions
- Cost-effective products
- The Actiflo Pack ACP2 range now includes eight models suitable for flow rates from 300 m³/d to 43 000 m³/d, depending on the application. ●

LOW
TECHNICAL
RISKS



MadTree Brewing

Craft brewer to incorporate Veolia's Sirion™ Mega technology to produce high purity water

MAINTAIN
PRODUCT
QUALITY

Fast growing and critically acclaimed Cincinnati craft brewer MadTree Brewing has chosen Veolia Water Technologies' Sirion Mega technology solution to ensure water quality control as the brewer undergoes a planned expansion.

The 100 GPM (gallons per minute) RO unit produces high purity water, removing up to 97% of dissolved inorganic and more than 99% of large dissolved organic material, colloids and particles—providing consistent water quality for MadTree's beer production process. Any excess output from the RO will be directed to the boiler as water make-up thereby further delivering increased water & energy efficiency in operations.

Currently producing approximately 25,000 barrels of beer a year, the brewery expansion will increase production to 35,000 barrels annually. Furthermore there is enough room to support future growth by adding potential capacity to boost output to 180,000 barrels.

According to co-founder Jeff Hunt, maintaining product quality was the brewer's over-riding objective when it contemplated expanding production to meet increased customer demand. *"Since water makes up 95% of beer, water quality plays an important part influencing our beer's flavor profile. As we planned for our new, expanded production facility it was critical to us to be able to control the incoming water of our brewing process to insure we maintained*

consistent quality and taste of the beers. As such, we didn't want a standard RO unit."

Hunt continued: *"What we found most appealing about Veolia's RO technology was its ability to provide feedback, which will allow us to fine-tune the incoming water as needed to be able to produce the high quality of beers our customers expect. Moving ahead we are fortunate to be able to call upon Veolia's industry experience and technological expertise to help make sure we maintain the high quality standards that have fueled our growth."*

As part of the largest water company in the world, Veolia Water Technologies enjoys a commanding presence in the beer brewing industry with more than 150 – and growing – brewery customers globally. Veolia's more than 350 proprietary technologies support its solutions and service value across the entire spectrum of the brewing process – from product & process water, to water recycling and wastewater solutions.

"We've seen the explosive growth in the craft brewing sector of the market, particularly in the U.S.," said Ted Lawson, Marketing Director for Veolia Water Technologies, "and we recognize the growing needs these brewers have for improving both process water and wastewater treatment. We are committed to leveraging our technical knowledge and experience to add value by helping emerging brewers grow and succeed." ●

Premier Foods

A mobile solution for the UK's best-loved sweet pickle

In the early hours of the morning, a major fire hit Premier Foods' the UK's largest food producer plant of Branston pickle in Bury St Edmunds (28 million jars sold annually). For twelve hours 150 fire-fighters from Suffolk and neighboring counties tackled the blaze at the only

factory producing Branston pickle. It was an emergency of national proportions; creating panic that England was about to lose what the Daily Mail called "a national treasure". The fire devastated the factory and forced production to be shut down, threatening shortages before Christmas.

The requirement

To get production moving again and to meet the seasonal demand, Premier Foods hired in a temporary boiler to provide the steam for production needs such as cooking and pasteurization. However, boilers need softened water, and the softeners had been lost in the fire along with the boilers. A new water softening plant to supply 30m³/h was urgently required.

The solution

Premier Foods turned to Veolia Water Technologies who provided one of its Mobile Water Services units to be on site ready to supply the temporary boiler with softened water. The Mobile Water Services softening unit is a complete water softening plant – tanks, pumps, controls and triplex ion exchange softener – installed in a standard 40' shipping container. Once exhausted, the complete trailer is returned to Veolia Water Technologies' central regeneration facility, which means zero discharge on site and no problems of handling or disposal of regenerant chemicals. On-site chemical systems can be completely isolated whilst maintenance or repair work is carried out.

The result

The system was so successful that Premier Foods ordered a second unit which was on site within ten days. The two Mobile Water Services units supplied the site for nine months until Premier Foods' new boiler-house was commissioned. And one trailer was retained for a further three months until the new plant had passed inspection. ●



Creating Value

through Leading Anaerobic Technology

Process effluents from the Food and Beverage sector are characterized by highly biodegradable components with a high calorific value. Anaerobic technology plays a key role in the effluent treatment and resource recovery from these industrial effluent streams.

Biothane is Veolia's technology centre for anaerobic technologies and is one of the world's leading companies in the field of biological treatment of industrial wastewater.

The principle of anaerobic solutions is the utilization of anaerobic bacteria (biomass) to convert organic pollutants or COD (Chemical Oxygen Demand) into biogas without the presence of oxygen.

Particularly adapted to treat medium to high strength wastewater, most of the degraded organic material will be converted into methane, while only a small fraction is used for biomass production. Produced biomass is a resource

that can be sold, at least for the granular sludge based technologies like Biobed® Advanced EGSB and Biothane Advanced UASB. This is not the case for aerobic treatment processes, which rely on energy-intensive aeration to oxidize organic material, while generating a large quantity of waste biomass which has to be disposed off.

“ Anaerobic proven to be most appropriate in view of Total Cost of Ownership and Sustainability ”

Biogas can be used for steam and / or electricity generation. Oil or gas fuel can be (partly) replaced by biogas, resulting in operational cost saving.

There are many different types of anaerobic processes. Combining this with the uniqueness of each effluent, specific site conditions

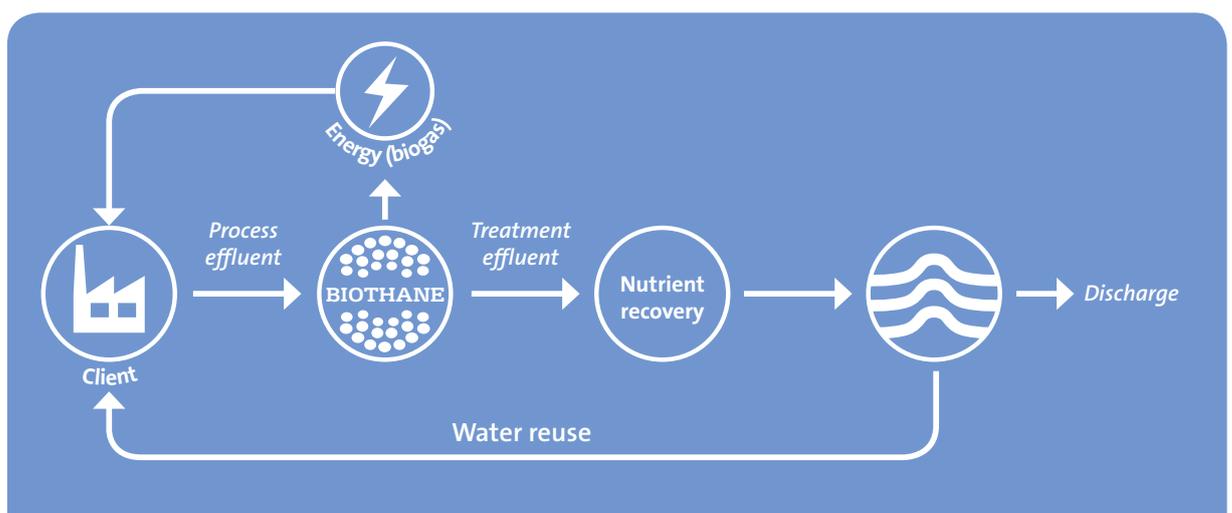
and specific requirements, such as future expansion or energy and/or water recovery makes the selection of the optimal treatment technology important.

Anaerobic technology applied for brewery

In order to increase its current beer production capacity, the **Paulaner brewery** (Munich, Germany) decided to expand and relocate their brewery. The nature of brewery effluent is most suitable for anaerobic treatment.

This project had a key constraint in terms of available space and the effluent treatment plant had to be installed in a building.

Compact, robust, high efficiency, Biobed Advanced. The system is a granular biomass type of treatment process. The granular biomass consists of different bacteria which convert the available organic fraction in the wastewater into valuable biogas. In top of the reactors, patented 3-phase Biobed





Advanced settlers are installed, which separate the biomass from the final effluent and the biogas. The system is designed for 2,800 m³/day of wastewater and produces more than 9,000 Nm³biogas per day (approx 2.8 MW).

Complete resourcing of waste and effluent streams

One of the world's leading confectionary and pet food producers asked Veolia to provide a solution for the treatment of production **water effluents** and **waste streams**. The solution had to meet sustainable targets to **maximize green energy recovery** and **water re-use**, have no impact on the environment and achieve river discharge conditions. The available footprint was limited.

The process concept selected is based on **Memthane technology**. Memthane combines anaerobic digestion technology with ultra-filtration membranes. The membrane acts as a filter and is a 100% physical separation of anaerobic biomass. Memthane treats process effluent and food waste fractions in one anaerobic treatment process, is compact and achieves high removal efficiencies (> 99%). The biogas is applied in a Combined Heat Power (CHP) unit, producing 2 MW of heat

equivalent to 1 MW of electricity. The Memthane effluent is post-treated by Veolia's Anitamox process. The application of this technology saved more than 10% in additional energy production. The final stage of the plant is the polishing of a small aerobic post-treatment, by means of the Biosep process. It combines the aerobic treatment with Ultra Filtration membranes. Approximately 67% of the effluent is discharged into the river and 33% is re-used after an upgrade through Veolia's Reverse Osmosis technology.

SMART plant operation

To increase the ease, reliability and effectiveness of the operation of an anaerobic treatment plant, **Biogas Manager Control® SMART** technology for anaerobic wastewater treatment has been developed. The technology provides a new dimension in operating anaerobic granular wastewater treatment process through 24/7 real-time control. This allows for **minimal** physical operational attendance. This technology consists of a carefully designed instrumentation and control package. **It measures online quality parameters: water flow, COD reduction, biogas production and biomass quality**. The system is provided with automated 24/7

back up service - 365 days per year. This innovation is expected to change the regular operation of biological wastewater treatment plants into automated **self-regulating** plants, which are monitored remotely. ●

Summary

Biothane has more than 600 references in the field of industrial effluent treatment. The Biothane anaerobic technologies prove to have added value through:

- Compact & Small foot print solutions
- Production of a green energy source
- Low operational cost
- Nutrient recovery
- High removal efficiency
- Minimizing Carbon -and Water footprint at site

To select the most appropriate process, Veolia develops design studies to roadmap treatment routes for the sustainable treatment of present process effluents, aiming to optimize energy production and close water cycles. These studies are based on full scale expertise and support by tests executed at Biothane laboratories or Pilot Plants on site.



Paulaner brewery

Environmentally friendly wastewater treatment

The Paulaner brewery is one of the best-known German breweries, with a long tradition of the finest Munich art of brewing. The annual production exceeds 2 million hectoliters. The popularity of Paulaner beer has always extended beyond the city limits of Munich, both nationally and internationally. Paulaner beer is enjoyed in more than 70 countries worldwide.

The challenge

Due to the increasing popularity of Paulaner beer the existing production site Nockherberg in the center of Munich reached its limits. In order to secure ample capacities for future growth, Paulaner decided to move the production to Munich-Langwied. The new site has sufficient space as well as excellent connections to the highway. The new brewery had to be built with an emphasis on modern and environmentally friendly brewery technology as well as an energy and emission-optimized infrastructure.

The solution

The beer production process generates organically loaded wastewater streams which are easily biodegradable. With conventional biological treatment, biological degradation is

achieved by using aerobic organisms. These, however, need to be fed with oxygen, resulting in high operating costs and CO₂ emissions.

Paulaner selected an environmentally friendly anaerobic treatment. The degradation process does not need oxygen, so the energy consumption is considerably reduced. Another advantage is the production of energy-rich biogas, which can be used on site in the boiler house.



To ensure a high level of operational reliability for their future wastewater treatment, Paulaner chose the proven Biobed® system supplied by Aquantis, a German subsidiary of the leading Veolia Water Technologies group. ●

Key Figures

- **Wastewater volume:**
2,800 m³/d
- **Load:**
23,500 kg COD/d
- **Biogas production:**
385 Nm³/h

Biosep™

An aerobic biological treatment for wastewater treatment and water reclaim

An innovative solution developed by Veolia Water Technologies, Biosep™ combines two proven technologies:

- Biological treatment using activated sludge
- Membrane filtration

Biosep™ produces very high quality water, fully compliant with the highest standards for water reuse for irrigation, industrial and municipal applications.

With more than 120 references worldwide, Biosep™ is recommended for:

- Significant reduction of carbon, nitrogen and phosphorus pollution
- High and simultaneous removal of bacteria depending on the treated water, completed by downstream disinfection.

Biosep™ is sold under the **Neosep™** trademark in Japan, the United States, Australia and New Zealand. ●



Biosep™ Pack - new standard membrane filtration units

- > Flow rates from 4 to 110 m³/hr
- > Flexible and modular solutions, manufacturing in-house in the Veolia workshops
- > Guaranteed performances identical to those of the conventional Biosep™ process

Biosep™ Pack is added to a biological aeration tank. The membrane bioreactor replaces the traditional settling system and separates perfectly the purifying biomass from the treated effluent through microfiltration. The microfiltered water is of excellent bacteriological quality and removal of TSS is guaranteed at any time. Flow rates from 4 to 110 m³/hr.

Applications

- > Small or medium sized industrial effluent treatment plants (800 to 10,000 PE)
- > Temporary solutions during refurbishment or upgrade work



Not just milk-and-water

New technologies create a stir in dairies

As global demand for milk, cheese, yogurt and other dairy products continues to grow, cost and energy management concerns are driving the introduction of new technologies in dairies to optimize and control costs of water usage.

In dairy plants, water usage is one of the major costs in the processing of milk which is both a direct product and a primary raw material used to manufacture numerous products for consumption. On the ingredient side, water is used in applications close to the final product, as wash water for Cleaning in Place (CIP) to sanitize processing equipment, for heating milk and milk products and as cooling water. On average, producing one kilo of dairy product requires 2-4 liters of water.

Even greater volumes of wastewater -- up to 14 liters per kg of dairy product -- are produced from processing steps, cooling towers, boiler purges and cleaning operations, which are often loaded with organics, fats, oil, grease and suspended solids.

Growing demand, but price pressure remains

Dairy producers are intensifying their focus on improving production and energy efficiencies, even while there is strong growth in global markets. Annual growth of 1 to 3% in the mature markets of North America and Europe is being driven largely by demand for value added products from health conscious consumers.

Growth rates are even higher in emerging market countries where increasing numbers of people are consuming ever-greater

quantities of milk, cheese and yogurt. Demand is rising for greenfield projects to provide local dairy production in these regions, with 60% of the world's new capacity development occurring in Asia alone between 2005 and 2011.

At the same time, price volatility, higher production costs, competitive pressures and environmental concerns are causing producers to seek further cost and efficiency savings, while ensuring that quality and hygiene standards are maintained.

Water saving technologies

Of the forces shaping the modernization of the dairy industry, water usage, energy costs and recovery of lost products are the key drivers of change. Less prominent but still important is the need for standardization, operational and service improvement and sustainability commitments.

In seeking improvements across all of these areas, producers are increasingly turning to experts in the optimization of water use and wastewater treatment like Veolia Water Technologies.

To help plants meet their water requirements, Veolia ensures continuous water supply that complies with state-of-the-art hygienic standards and regulatory requirements

for wastewater treatment. Applications of water saving technologies that optimize usage and treat water at the source through refreshment of internal process water -- and recovery of valuable products -- are enabling producers to significantly reduce their external water consumption needs.

Keeping the “Cow Water”

Recovery of condensate from evaporation of dairy products, or “Cow Water,” for reuse is a growing market with the potential for rapid return on investment. The benefits of condensate recovery, using hygienic RO systems, can be two-fold with savings in water consumption as well as in the recovery of heat energy. Vapor condensate can be used in numerous areas of the plant including boiler and cooling tower feed water, CIP water, reconstitution of powdered products and cheese curd wash water.

Condensate is a good source of heat energy, offering significant savings in heating costs by recovering the energy for purposes such as pre-heating product or boiler feed water. In recovering the steam condensate for boilers and steam distribution systems, operating costs, chemical use and boiler makeup water requirements can be significantly reduced. A condensate return system also reduces energy costs as the already hot condensate requires less energy to reheat.

Producers seeking to upgrade secondary effluent for reuse as utility water for cooling or boilers, as well as CIP water, soil and vehicle cleaning, toilet flushing and irrigation are turning to Veolia for turnkey or standardized solutions, depending on the complexity of the reuse scheme.

Technology array

For wastewater, Veolia offers a wide array of technologies to treat wastewater aerobically (such as MBBR, MBR, SBR or more conventional activated sludge), as well as to produce energy and biogas out of anaerobic treatment of high organic load effluent. Conventional and advanced granular technologies such as Veolia’s Biobed®

Advanced reactor can be integrated on-site. Other standardized technologies, such as Biobed® Modular Plants, MBBR and Biosep™ MBR, can be quickly deployed onsite with a minimal footprint.

For example, to treat the high strength effluents generated by cheese and whey production, Veolia’s innovative Memthane® Anaerobic MBR is a perfect fit, using cross-flow ultrafiltration membranes to achieve high COD/SS/FOG removal efficiencies for the treatment of streams.

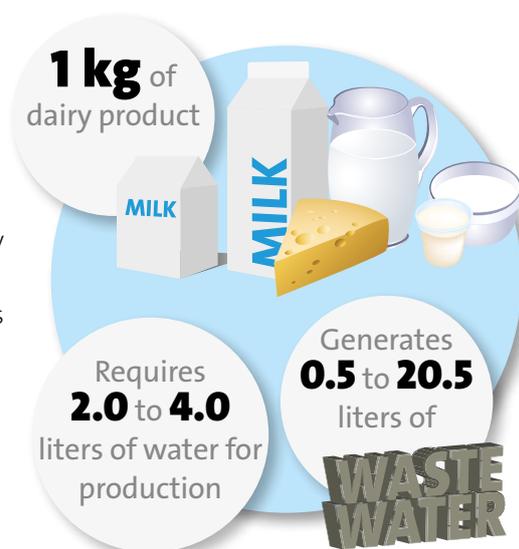
Inside job

As the player offering the largest amount of differentiating technologies, Veolia plays a leading role in emerging markets where its innovative technologies, proven through years of operating experience around the world, provide a ready response to greenfield project needs.

However, it is in mature markets that the company’s offer is evolving most rapidly. The successful results achieved through technologies like Memthane® are opening new opportunities to go deeper inside customers’ upstream production processes.

Another example is yogurt production. Use of membrane technologies has been shown to enable recovery of 1-2% of the production lost when rinse milk was flushed to wastewater during batch process production. In helping customers extract this additional value, Veolia is contributing to the dairy’s improved production process efficiency -- and increased profitability.

With its full scope of in-house capabilities and its locally-deployed teams throughout the world, Veolia is well-placed to help its dairy customers respond to rising global demand with products that are healthy, plentiful... and more profitable. ●



Woodlands Dairy

Anaerobic Resource Recovery Facility

Woodlands Dairy, 1000+ people, is one of the largest manufacturers of UHT milk in South Africa, marketed under the brand FIRST CHOICE®. Woodlands Dairy is a local, Eastern Cape processor of farm fresh milk, who produces and packages high quality dairy products. Dairy farming methods should not only have a minimal impact on the environment but should also be animal friendly and boost public support for dairy farming.

The challenge

Veolia Water Technologies South Africa (Pty) Ltd was awarded the contract by Woodlands Dairy (Pty) Ltd to provide a viable processing solution for their growing process effluent stream. The facility contains a milk sterilisation and packaging plant as well as a cheese factory. All process effluent is sent to a combined effluent sump.

The Solution

Veolia Water Technologies proposed a resource recovery plant (RRP) capable of processing 1.5 MLD, which will later be upgraded to 2 MLD. The RRP will make use of Biothane's state of the art Memthane® technology, capable of removing >95% of effluent COD.

A piloting study was performed to provide an effluent specific treatment facility, ensuring product performance and client satisfaction. ●

Effluent specifications

Feed rate	1500 m ³ /d
pH	12
TCOD	10 g/l
COD load	15 t/day

Key Figures

- **High COD loading: ~15 ton COD/day**
- **Growing effluent demand**
- **Long-chain organics present in effluent**
- **Achieving plant effluent concentrations below municipal standards**
- **> 95% conversion**

Robert Wiseman Dairies

Reducing water consumption for a higher economic value and a lower carbon footprint

One of the major costs in milk processing is water: 1.3 liters of water is needed for every one liter of milk processed. On top of this, 4.2g of chemical oxygen demand (COD) is produced from every liter of milk processed, which is then discharged into wastewater.

Robert Wiseman decided to optimize its water and wastewater use by aiming to reduce water consumption across its dairy network by 25% over a five year period.

The project was started in their main dairy plant located in Bridgwater, which processes 125 million liters of milk per day.

Veolia Water Technologies (VWT) is supporting Robert Wiseman's project by providing a Dissolved Air Flotation (DAF) system and a membrane bioreactor (MBR) to reduce COD. The quality of the discharged effluent more than meets the environmental requirements. In fact, the quality of the treated effluent was so good that Robert Wiseman wanted to reuse it.

VWT therefore proposed its reverse osmosis (RO) system: MegaRO™ to recycle the effluent in order to use it for the CIP (Cleaning in Place) system. The MegaRO technology uses a membrane to remove 99% of residual COD, dissolved salts and bacteria from the treated process wastewater, producing water of equal or better quality than the mains supply.

VWT was one of the early pioneers of MBRs, thanks to its Biosep process, and using this expertise VWT were able to feed the MBR effluent directly to the MegaRO system with no set-backs. Robert Wiseman became the first dairy industry business in

the UK to install a RO recycle system, enabling them to recover 200m³/day of process wastewater.

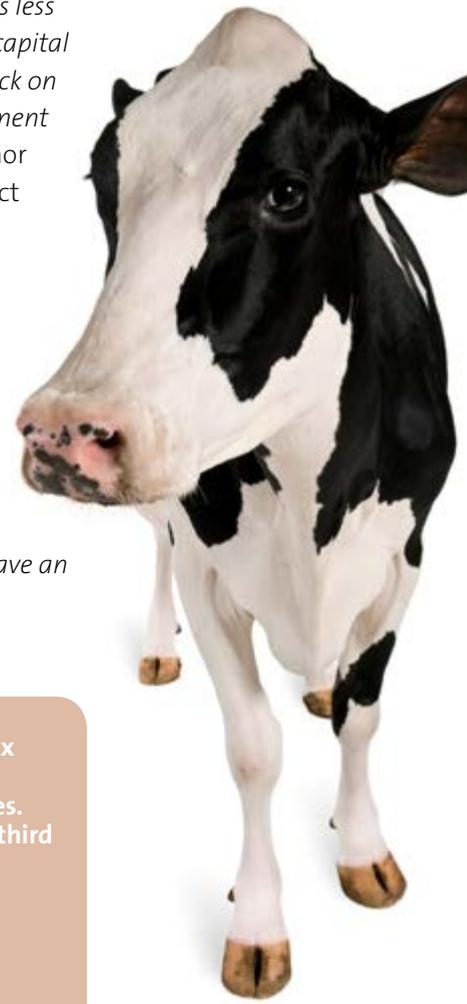
The reverse osmosis process is driven by pressure, but the MegaRO's low-pressure membranes and high-efficiency pumps make it one of the most energy efficient systems on the market. Low energy use means not only reduced carbon emissions but also low operating costs. Moreover, the quality of the waste concentrate stream from the MegaRO is still good enough for the effluent to be discharged directly into the drainage ditch.

"Because the operating cost of the MegaRO is low, the recovered water actually costs less than mains water even after including capital amortization. We expect to get a payback on the £130,000 (approx. €153,000) investment in about two and half years." said Eleanor Walton, Robert Wiseman Dairies' project manager.

Although the plant has only been in operation for six months, Walton had enough confidence to be talking to Veolia Water Technologies about a second plant to recycle another 80m³/day of wastewater. *"We also want to roll out this kind of technology to some of our other sites where they have an expensive sewer discharge"* she says. ●

DAIRY
RECYCLING
50% OF ITS
WASTEWATER

Robert Wiseman Dairies operates six dairies, 14 distribution depots and employs more than 4,700 employees. Robert Wiseman Dairies supplies a third of the UK's milk.



IDRAFLOT™

New generation flotation unit

Very compact, these units reach a high thickening and clarification grade allowing ultra-flotation with the highest removal efficiency on COD, suspended solids and fat. IDRAFLOT™ is a rectangular compact unit, easily transportable, manufactured entirely in stainless steel. It is provided with lamellar packs, to achieve high treatment capacity compared to its compact size, telescopic level adjustment to optimize the sludge extraction with dry matter up to 8%.

IDRAFLOT™ flotation units are protected by three patents. They are intended to assure a perfect mixing of the waste with saturated water and an uniform distribution of the water flow along the entire surface of the unit.

The saturation system warrants a complete and even saturation free from the formation of big bubbles.

The reactor allows to sample and optimize the desired parameters through a very simple adjustment of chemicals (coagulant/flocculant). ●

IDRAFLOT™ is suitable:

- As pretreatment upstream of a biological plant to remove biodegradable fats, suspended solids, fibres, etc. The efficiency is up to 98% with consequent COD drop of between 70% - 80%.
- As a clarification plant downstream of a biological plant to remove light sludge particles not captured by secondary decanters.
- For tertiary treatment
- For sludge thickener
- For liquid/solid separation in industrial process plants (pulp & paper, wine, etc.), Idraflot™ is the best solution to potentiate surcharged or undersized plants.

Markets & Applications

- Dairy
- Slaughterhouses, meat, salami and fat processing
- Fishing industry
- Canneries
- Wine industry
- Soft drinks production



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Design: Veolia Water Technologies Graphic Design Team

Photo credits: Veolia photo library / Christophe Besson / Christophe Majani d'Inguimbert / Stephane Lavoue / Jean-Francois Pellegrin / Imag'in / R. Secco / Fotolia / iStock / Image Club

Cover: Veolia photo library / Stephane Lavoue

Printing: AlphaGraphics



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