

PLANET

#October 2018

A close-up photograph of two hands cupped together, holding a large amount of bright blue, irregularly shaped plastic granules. The granules are falling from the hands, creating a sense of motion. The background is a solid, deep blue color.

Plastic recycling: a key link in the circular economy

Forum

What opportunities exist in the new plastics economy?

Frontline

Japan in the age of plastic recycling

Outfront

Plastic and oceans: the circular economy in action

Explainer

HDPE plastic is given a new lease of life in Dagenham (UK)

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A Hall dedicated to research into plastic sorting and recycling

Cover photo: Christophe Majani d'Inguibert

THE POST



Antoine Frérot
CEO of Veolia

June 26 Partnership between EDF and Veolia for dismantling nuclear plants and treating radioactive waste. During the World Nuclear Exhibition held in late June in Villepinte, I signed a partnership agreement with Jean-Bernard Lévy, CEO and Chairman of EDF, concerning two key issues in the nuclear industry at the nexus of major industrial, environmental and economic questions. Firstly, designing innovative solutions to access the core of uranium natural graphite gas reactors and then remove and extract their components under optimal safety and security conditions. They will be developed based on the robotics expertise fostered by Veolia and now used in Japan, Great Britain, the United States, Canada, etc. And secondly, devising vitrification solutions for low- and intermediate-level radioactive waste. These will be based on Veolia's proprietary GeoMelt® technology, which packages radioactive waste in a stable and durable glass matrix, thereby making it easier to transport and store. This cooperation, which demonstrates EDF and Veolia's shared ambition to treat the most sensitive waste, is set to deepen over the coming years.

August 1 Extremely solid half-yearly results. Veolia presented extremely solid results for the first half of 2018. These results are perfectly in keeping with the two pillars of its strategy: growth and efficiency. In terms of efficiency, our Group achieved savings of €148 M in line with its annual objective of €300 M. The business dynamic set in motion two years ago is going from strength to strength. Veolia's revenue rose 6% compared to the first half of 2017, reaching €12,565 M. This marks seven consecutive quarters of growth for the Group! Over the first six months of 2018, it has

generated particularly lively revenue growth in Latin America, Asia, the Pacific zone, and Northern Europe. Half of the revenue earned comes from our new areas of activity, such as the circular economy, energy efficiency, treating difficult pollution, dismantling and managing end-of-life industrial equipment. These areas of activity, which we have created, represent the new frontier of the environmental markets and the arena where the future of our Group and its municipal and industrial clients is taking shape.

September 17-21

Veolia's Occupational health and safety week: "Acting for a better future". Preventing professional risks and occupational health and safety are a constant priority concern for Veolia, everywhere our Group operates, at all times and in every sector of activity. Over and above our responsibility and the applicable laws and regulations, it is also one of the nine commitments made by Veolia in terms of sustainable development. For the past three years, our Group's annual Occupational health and safety week has been an opportunity to get all its members of staff to concretely engage with this major theme and foster a genuine culture of prevention in all its entities. All around the world, practical exercises, training sessions, conferences, workshops and events were organized on the ground to raise the awareness of as many people as possible to occupational health and safety issues. In a new development this year, a creative competition entitled "My commitment to the future" was aimed at our employees' children in all countries. This original initiative offered a means of involving families in our awareness-raising campaign.

CONTRIBUTORS



Editor-in-chief Romain Prudent

Communications Director, Veolia France

320 million metric tons of plastic are produced each year, i.e. almost 45 kg for each inhabitant of the planet. Omnipresent in our lives, plastic puts pressure on resources and generates both land and ocean pollution, which we are gradually realizing with each passing day. Plastic recycling represents a major environmental, industrial and social challenge. In this latest edition of Planet, Veolia — as a leader in plastic reprocessing — looks to drive the necessary thinking. What is the state of plastic recycling worldwide? Which solutions have proved their worth and which ones are coming to the fore? As the interview with B. Harambillet, L. Vallée and K.-H. Foerster makes clear, the answers are many, complex and collective, bringing together companies, the public authorities, associations and individual citizens. Thank you to all our Veolia colleagues and partners for sharing their everyday commitment in these pages. The battle has only just begun.

Also in this issue

Karl-H. Foerster

Appointed Executive Director of PlasticsEurope in October 2013, he previously held the post of CEO of the pharmaceutical group Neochimiki in Athens (Greece). A graduate of the universities of Würzburg (Germany) and Rhode Island (United States) and holder of an MBA, Karl-H. Foerster has been working in the chemicals and plastics industry for over thirty years.



Laurent Vallée

The General Secretary of Carrefour Group, who joined the group in 2017, has spent a large part of his career in the public sector. An ENA graduate, he also studied at Sciences Po Paris and ESSEC business school and began his career at the French Council of State. In his role as General Secretary, he heads up the Legal, Sustainability, Public Affairs and Audit divisions, along with the Carrefour Foundation.

Rob Opsomer

Lead, Systemic Initiatives - Ellen MacArthur Foundation

Rob leads the Foundation's Systemic Initiatives, which include the New Plastics Economy, Make Fashion Circular, and Cities and the Circular Economy for Food. Taking a global, cross-sectoral approach to material flows, these initiatives bring together organisations from across value chains to tackle systemic stalemates that cannot be overcome in isolation.



A Veolia publication (30, rue Madeleine-Vionnet – 93300 Aubervilliers – France)

Publication Director: Laurent Obadia. Editorial Director: Nathalie Cottard. Editorial direction: Clément Barry, Étienne Collomb, Caroline Geoffrois. Editor-in-Chief: Romain Prudent. Image content: Laure Duquesne, Gilles Hureau. With special contributions from: Phan Bai, Katia Crétois, Fanny Demulier, Feryel Gadhoum, Gavin Horwich, Sabine Kraus, Blandine Mann, Michael Mansuy, Mathilde Nithart, Frédéric Perrault, Martina Rauch, Carole Ribardiere, Amélie Rouvin, Justine Shui, Jonathan Smith. Copyright: October 2018. ISSN Number: 1761-4996. Veolia photo library: Copyright: Rodolphe Escher, Miquel Gonzalez/VU, Christophe Majani d'Inguimbert, François Moura/Andia, Nicolas Vercellino, Shin Takahashi, Jean-Marie Ramès, René Tanguy, Samuel Bollendorff/Fondation Tara Expéditions, Florence Briand/La Collection, Capa Pictures, CityTaps, Getty Images/National Geographic RF, Nicolas Gouhier/Groupe Carrefour, Kasper Jensen, Francis Latreille/Fondation Tara Expéditions, Thomas Louapre, Paulo Di Oliveira/SIPA/ARDEA/Caters News, Sander de Wilde/Plastics Europe, N.Sardet/Fondation Tara Expéditions, SYSTEMIQ, Jules Toulet, Getty Images/iStockphoto.

Published by Bords de Loir Art Director: Jean-Jacques Farré. Editorial team: Clément Barry, Anne Béchiri, Raphaëlle Cayla, Étienne Collomb, Cécile Martin, Paul Sanderson. Illustrations: Mariette Guigal. Coordination: Sylvie Roussel. Production Manager: Caroline Lagailarde. Printed by: Electrogezol. Packaging, sorting and mailing by Staci.



OCTOBER 29-30, 2018 - BALI (INDONESIA)

OUR OCEAN CONFERENCE OUR OCEANS, OUR LEGACY

THE OUR OCEAN CONFERENCE HAS BEEN BRINGING TOGETHER GOVERNMENTS, SCIENTISTS, AND REPRESENTATIVES FROM THE PRIVATE SECTOR AND CIVIL SOCIETY EVERY YEAR SINCE 2014. THEIR COMMON GOAL IS TO COLLECTIVELY PROTECT THE OCEANS BY IDENTIFYING INNOVATIVE SOLUTIONS AND THE MEANS TO IMPLEMENT THEM.



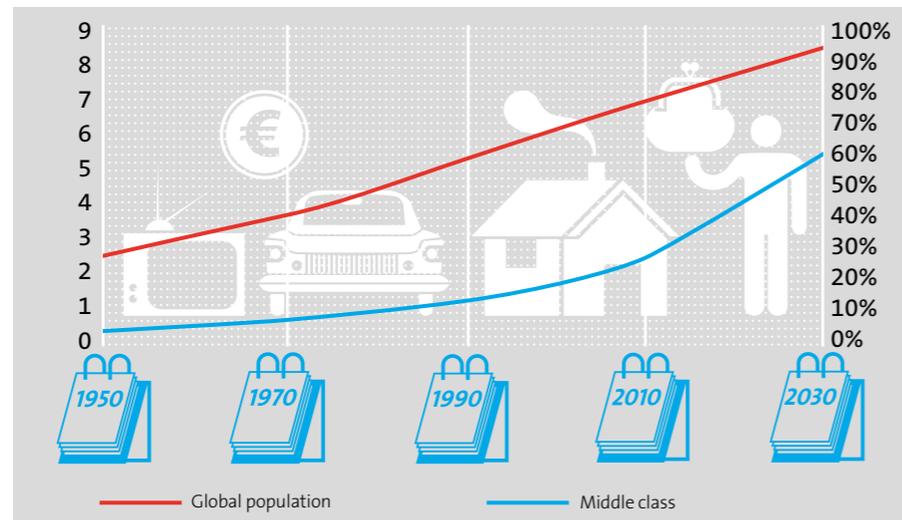
[HTTP://OUROCEAN2018.ORG/](http://ourocean2018.org/)

TRENDS



The success of the 10th International Water Week in Singapore

Organized by Singapore's National Water Agency, with the support of the World Cities Summit (WCS) and the CleanEnviro Summit Singapore (CESS), Singapore International Water Week (SIWW) was held from July 10 to 14, 2018. Over 24,000 water industry specialists, executives, researchers, business leaders, etc. from all over the globe met to share and co-create innovative solutions, discover the latest technologies and discuss the major challenges that they face in the world. Over the course of these four days, a host of projects were announced, amounting to 23 billion dollars in total. The highlights included the opening of the Singapore Water Exchange, a space dedicated to companies and players in the water value chain. The World Bank also announced the funding of 18 projects in Asia in 2019 and 2020, worth a total of 3.5 billion dollars. While the Indian state of Andhra Pradesh confirmed that it would be investing 8.4 billion dollars in water infrastructure by 2029.



The expansion of the middle classes* worldwide is a confirmed trend

From the late 2020s, they will represent over half of the world's population — a first — with an estimated population of over five billion. This development accelerated at the turn of the 21st century — one billion people in 1985 — doubling in 21 years and tripling six years later. The economic takeoff in Asian countries, especially China, is the main reason behind it.

*Categories of households whose income per capita ranges between 10 and 100 dollars per day, Homi Kharas, "The unprecedented expansion of the global middle class," 2017.

95% of the value of plastic packaging, estimated at 120 billion dollars per year, is lost after the first use.
Source: The New Climate Economy

99% of marine birds will have already ingested plastic by 2050.
Source: Cleanseas

3.5 billion people depend on the oceans for their livelihood.
Source: Sea Change - European Union

20 kg the average consumption of fish, per inhabitant per year, worldwide in 2016.
Source: Centre d'études stratégiques de la marine



The Scandinavians favor a vegetarian diet

According to the conclusions of a study published by Ernst & Young in July 2018, 24% of inhabitants of Nordic countries are planning to reduce their meat consumption over the next five years, and 34% of them intend to consume more vegetarian products over the same period. These food behavior changes are primarily motivated by health and environmental questions. In Sweden, approximately 30% of young people consume an increasing amount of plant-based food with the aim of reducing their environmental footprint. In Denmark, 8% of 18-35 year olds define themselves as "flexitarians": they choose to exclude meat from their meals a certain number of days each week. This new approach to dietary habits was introduced in 2004, when Danish chefs defined a ten-point philosophy known as the "New Nordic Food Manifesto." The aim of this initiative was to promote local, seasonal produce among the general public.

The EU is gearing into action to fight plastic pollution

In the light of the worrying increase in plastic pollution in seas, the European Commission is proposing new measures with a view to banning single-use plastic. They concern the ten most polluting plastic objects for Europe's seas and beaches, such as Q-tips, cutlery and plates, straws, swizzle sticks and balloon sticks. If the European Parliament and Council ratify this proposal in spring 2019, these objects will have to be made exclusively from more environmentally friendly materials. In this perspective, France announced measures last summer to combat plastic pollution. As of 2019, a bonus/penalty system will be applied to plastics. This could be as much as 10% of the price of the products concerned. A recycled plastic bottle will now be less expensive than a virgin plastic bottle. And from January 1, 2020, plastic beakers and plates will be banned.



“Museums preserve our past, recycling preserves our future.”

Theodor Wiesengrund Adorno, German philosopher (1903-1969).

INSIDE



FRANCE - INVIVO: A MORE CIRCULAR AGRICULTURE

The cooperation agreement signed between Veolia and the French agricultural cooperative group Invivo aims to develop the circular economy in the agricultural sector. Four themes are addressed: water resource management, reuse of treated wastewater for irrigation, urban agriculture, and digital solutions. The two groups, which are already working together to diagnose the risks of agricultural pollution and implement action plans in several drinking water catchment areas in northern France, are considering co-developing a viticulture irrigation project using treated wastewater.

FRANCE VEOLIA MAKES A DIFFERENCE IN BORDEAUX

Because its offer made the difference – ensuring a global vision of the water cycle, guaranteeing continuity and quality of service at the right price, paying more attention to asset management, raising user awareness about sanitation and fostering governance that brings together users and associations – Veolia has been chosen by Bordeaux Metropolis to manage its wastewater and rainwater for seven years, starting on January 1, 2019. The contract covers some 4,200 km of networks and six stations with a total treatment capacity of 1.15 million population equivalents (PE). One of the contract’s key elements is that a new governance of water – serving consumers – will be co-developed with the service’s current employees under the supervision of Bordeaux Metropolis.

Telex

Veolia participated in the **UN High-Level Policy Forum (HLPF) 2018** which focused on “Transformation toward Sustainable and Resilient Societies.” Pierre Victoria, Director of Sustainable Development at Veolia, presented the Group’s contributions to the Sustainable Development Goals during a session on “The added value of the private sector in policy dialogue.”



A seven-year energy performance contract has been signed between Abu Dhabi’s Water and Electricity Authority and Veolia’s subsidiary Enova, **which is a first in the United Arab Emirates**. Following renovation, the energy bill of four Ministry of Energy buildings will be reduced by 41%.



Veolia presented its solutions to address the world’s water challenges at several conferences and debates during World Water Week in Stockholm (August 26-31).

FRANCE

PHOTOVOLTAIC PANEL RECYCLING UP AND RUNNING

Veolia, PV Cycle, and the Syndicat des Énergies Renouvelables opened the first European plant dedicated to recycling end-of-life “crystalline silicon” PV panels in Rousset, France. To achieve a recycling rate of over 95%, the different materials composing them are separated, isolated, and recovered before being redirected to the various recycling channels. 2/3 of glass is recovered as clean cullet before being sent to the glass sector. After treatment, aluminum frames are sent to aluminum refineries, the plastic of junction boxes is used as fuel in cement plants, silicon is sent to precious metal sectors, and connection cables are crushed and sold in the form of copper shot. The plant has the capacity to treat 4,000 metric tons of material. In 2018, it is expected to treat 1,800 tons.

INSIDE

MICROPAYMENT OPENS ACCESS TO WATER IN NIGER

The Société d'exploitation des Eaux du Niger (SEEN), a Veolia subsidiary, has joined forces with the start-up Citytaps to provide 13,000 people in a district of Niamey safe access to drinking water. How? By installing 1,325 smart prepaid water meters. Households can prepay their water with mobile money, at any time, for any amount, benefiting from a very competitive rate to help them optimize their budget. In 2019, Veolia will be installing 15,000 new meters providing access to water for 135,000 people.



FIRST CARBON AND ENERGY FUND IRELAND CONTRACT

Just as the lower house of the Irish Parliament adopted a bill to stop public investment in polluting fossil fuels, Veolia won the first Carbon and Energy Fund Ireland contract. The 15-year energy efficiency and infrastructure project agreement will reduce Mater Misericordiae hospital's (600 beds) carbon footprint by 81,000 metric tons. To supply the energy needed to treat the hospital's 360,000 patients every year, Veolia will be providing a 2 MW combined heat and power plant, a new heating network for the entire campus, 1,500 m² of double glazing, and 3,000 lighting fixtures and controls.

Telex

The Veolia Foundation is supporting the Nanoé Développement association which is testing a new decentralized solar electrification model in Madagascar. This technology represents a revolution in the approach to access to energy in Africa.

Highly involved in work/study placements for young people who want to work in environment-related activities, Veolia has signed a partnership agreement with the Association Nationale des Apprentis de France (ANAF). 50% of the Group's apprentices join the Group at the end of their apprenticeship.

In India, Veolia now operates four industrial and hazardous waste management sites - a zero-liquid discharge industrial wastewater treatment plant, two hazardous waste landfills, and a hazardous waste incinerator - thereby becoming the market leader in Gujarat.

On September 11, 2018 in Cherbourg (France), Naval Group kicked off the deconstruction of five first-generation nuclear-powered ballistic-missile submarines (SSBN). After *Le Tonnant*, Veolia will have four periods of eighteen months to deconstruct another four submarines: *Le Terrible*, *Le Foudroyant*, *L'Indomptable*, and *L'Inflexible*. Recyclable materials from this operation - 87% - will be sorted and prepared for sale.



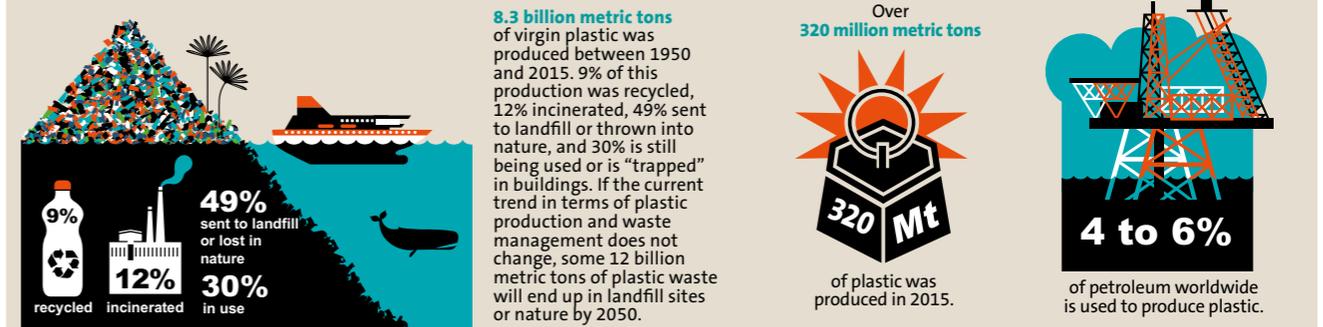
FRANCE VEOLIA AND EDF, NUCLEAR DECOMMISSIONING PARTNERS

At the 2018 World Nuclear Exhibition in Paris, Veolia - through its Nuclear Solutions business - and EDF signed a partnership agreement to decommission six natural uranium graphite gas reactors which EDF is currently decommissioning in France. Veolia will notably bring its expertise in robotics to the project for remote cutting and extraction of core components from reactors. The agreement also covers the vitrification of low- and intermediate-level waste. In this area, Veolia has developed GeoMelt® technology which packages waste in a glass matrix.

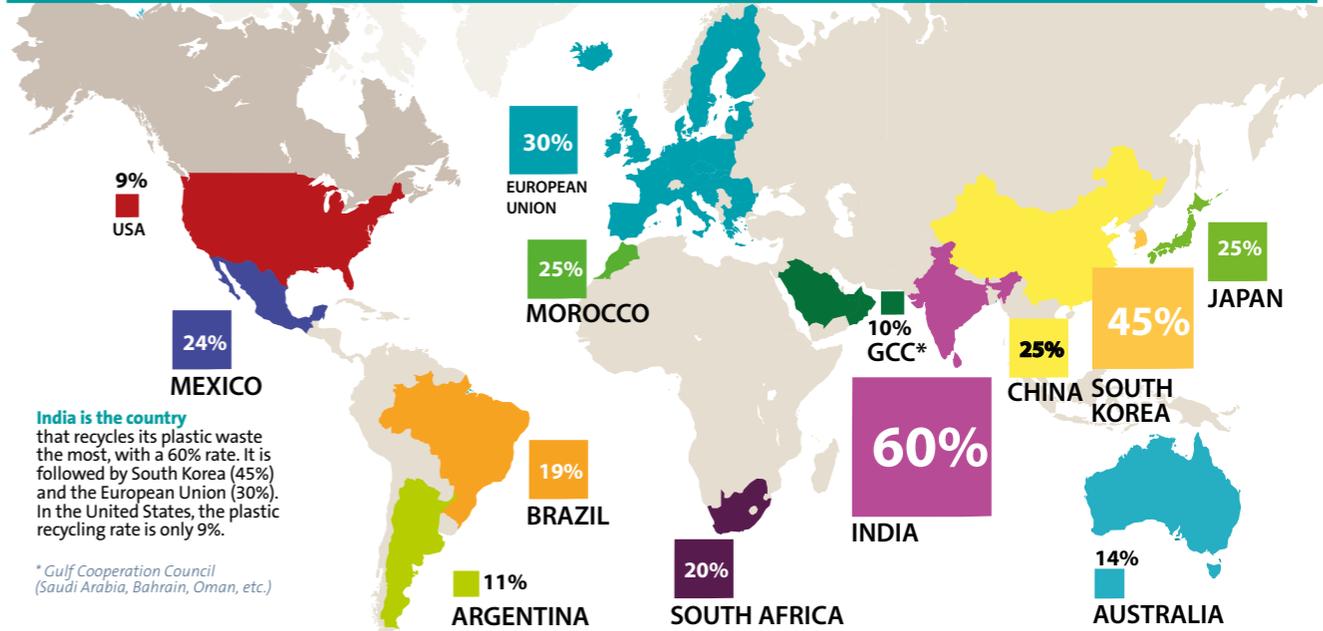
TOWARD A NEW USE OF PLASTIC

A world without plastic is unthinkable nowadays, given the extent to which this material has become part of our everyday lives. But in the space of sixty years, plastic has also become a significant source of pollution. What solutions can be implemented to meet this major environmental challenge?

PLASTIC PANORAMA



PLASTIC RECYCLING WORLDWIDE



SOLUTIONS EXIST



RECYCLING AND REGULATIONS: DIFFERENT APPROACHES, THE SAME TREND

The stiffening of recycling regulations is a universal trend. The European Union now offers its member states a strategic framework for them to recycle 55% of their plastic waste by 2030. In early 2018, China launched a national program requiring public institutions and companies in 46 cities to sort and separate their waste by 2020. In the United States, while there is no federal law requiring citizens to recycle, the states have their own legislation; they sometimes join forces with NGOs to set up recycling programs. In the same way, in Japan, local governments organize and promote waste sorting among inhabitants. As a result, a fifth of the plastic waste generated by this country can currently be recycled.

Sources: "Production, use, and fate of all plastics ever made," Roland Geyer, Jenna R. Jambeck and Kara Lavender Law - July 2017. "The New Plastics Economy," Ellen MacArthur Foundation report, 2017. Plastics Theme - Veolia - October 2017

What opportunities exist in the new plastics economy?

Bernard Harambillet, Karl-H. Foerster and Laurent Vallée debate the issue.

12/13



Bernard Harambillet
General Manager of the Waste Solutions business line, Veolia in France



Karl-H. Foerster
Executive Director of PlasticsEurope



Laurent Vallée
General Secretary of the Carrefour Group

The European Union has set ambitious targets for 2030¹ regarding the reuse and recycling of all plastic packaging. Given that the consumption of virgin material has been booming since the fifties, these objectives call for a major rethink of our consumption and production habits. Everyone — especially companies — has a role to play in bringing about this new plastics economy.

There is now a growing general awareness of plastic pollution. What role do you see yourself playing?

Bernard Harambillet: It's essential that this awareness is happening. But the most important thing remains action. At Veolia, especially within the Waste Solutions business line, the first task is limiting the production of waste, especially plastic waste. This is the advice we give our clients. We support them in their collection and sorting activities and are also involved in preparing recycled material to give it a new lease of life. More specifically, in 2018 we are developing innovative digital and participatory collection schemes that reward increasingly engaged citizens. We are focusing our efforts on strengthening our capacity to turn plastic into a secondary raw material and on creating circular economy loops with manufacturers, who are also getting increasingly involved.

Laurent Vallée: Plastic pollution is a collective issue. Together, as actors in the chain — plastic manufacturers and retailers, along with industrialists, reprocessors like Veolia, local authorities and individual citizens — we must all grasp the urgency of the situation regarding plastic on a global scale. As a retailer in this complex chain, our role is to respond to the expectations of our customers, who are becoming more aware at an ever

faster rate. We are therefore working actively with our suppliers, especially those for our own brands, so that they can offer us improved packaging that is recyclable or biodegradable. We are also taking advantage of our direct contact with customers to raise their awareness of packaging issues.

Karl-H. Foerster: Controlling the impact of plastic on the environment begins right at the start of the chain. This is why we are concentrating our efforts on potential plastic pellet loss arising from the sector's pre-production phase. We have also devised the Operation Clean Sweep® program to prevent plastic pellets from leaking during their handling by the different players in the plastics sector and disseminating into the aquatic environment. Antwerp was the first port in Europe to join this program, opening an advisory platform in 2017 devoted to the Zero Pellet Loss initiative. Plastic waste has no place in the environment, and ocean pollution is a planetary concern for which a global international solution must be found. This is why the European plastic manufacturers whom we represent have engaged in initiatives such as the Marine Litter Solutions program to reduce the effects of ocean pollution, in partnership with the World Plastics Council and the Global Plastics Alliance.

“Plastic waste has no place in the environment, and ocean pollution is a planetary concern for which a global international solution must be found.”

Karl-H. Foerster

...

••• **In this new context, which levers would make it possible to reform the plastics economy?**

L. V.: One of the key levers would be to incorporate the negative externalities of plastic, such as packaging, into the full cost of the end product. Incentive taxation is a major topic but difficult to implement. However, it could encourage the use of recycled plastic and alternative materials. Another lever is the necessary collaboration between the different players in the chain to innovate and convert a linear economy into a circular one.

K.-H. F.: To this end and to accelerate innovation toward more efficient chemical and mechanical recycling, we have set up three European platforms: Vinyl Circular Solutions (VCS), the Polyolefin Circular Economy Platform (PCEP) and Styrenics Circular Solutions (SCS). Each one concentrates on a specific plastic as there is no single solution. In addition, eco-design will also play a significant role in the sustainable use of resources. By working on plastic reuse and recycling, we will obtain better quality recycled plastic, which will thus enjoy wider use.

B. H.: The first lever is political. The announcement made to “move toward 100% recycled plastic in 2025” obviously represents an extremely ambitious policy goal for France, given that the current percentage is 22%, far behind the European average of 41%². In order to increase this rate, measures such as expanding the waste-sorting guidelines to all plastics are currently being applied. They would allow all French people to throw all plastic waste into the recycling bin, including waste that even the best recyclers wonder about, such as yoghurt pots and tubs. This extension, combined with the modernization of sorting centers, will make it possible to sort and therefore recycle more plastic. The second — and most important — lever is a demand shock. We must implement a real policy to boost demand for recycled plastic. Some fifty manufacturers have already made voluntary commitments, announcing that they will incorporate an additional 275,000 metric tons of recycled resins into their products by 2025. This would be on top of the 300,000 metric tons already incorporated.

“The most important is a demand shock. We must implement a real policy to boost demand for recycled plastic.”

Bernard Harambillet

This is a significant and encouraging commitment, but much more needs to be done regarding the 3.6 million metric tons of plastic put on the market each year in France.

In what way does this new economy represent a major environmental issue?

B. H.: Because it is becoming more circular, it responds to the urgency we face on a daily basis to limit the impact of our activities — operations, production and consumption — on the environment. I’m thinking of the millions of tons of plastic that are found in nature and pose a serious threat to our ecosystems, especially the marine environment. According to the UN, almost 320 million metric tons of plastic are produced worldwide each year and eight million tons end up in the oceans, which is equivalent to the weight of 800 Eiffel Towers. No one is indifferent to the increasing number of shocking images showing what we are doing to our planet’s flora and fauna.

K.-H. F.: This is a major challenge because, if the current trend continues, plastic production is set to quadruple by 2050 due to the increase in the world’s population. It is therefore urgent to find solutions.

What obstacles lie in the way of the emergence of a genuine circular plastics economy?

K.-H. F.: At present, there are significant disparities among the EU member states in terms of recycling infrastructure and the financial aid to modernize it. However, we need a strong engagement from the public authorities at every level — European, national and local — including the adoption of appropriate regulatory frameworks and adequate public investment. Inevitably, this context is slowing down progress regarding the collection rate of plastic products. 27.3% of plastic waste² is still being sent to landfill instead. Even if the situation is improving in many European countries, landfilling remains the first or second treatment option for plastic waste. We cannot leave it at that: PlasticsEurope supports the goal of “zero plastic to landfill” and 100% plastic waste recovery.



L. V.: Another obstacle is that we are lagging behind in terms of product eco-design — including packaging — and this eco-design must become more widespread. Soon manufacturers will no longer be able to launch a product on the market whose recyclability cannot be guaranteed or, more precisely, individual customers will no longer buy it. Thinking about a product’s effective recyclability before it goes on the market will become the rule.

B. H.: Exactly. Not thinking about a product’s recyclability until it becomes a waste item will no longer be an option. Things are changing: as demonstrated for instance by our research and development initiative to recycle and recover solar panels that contain plastic elements, undertaken in partnership with PV Cycle. All the same, the main stumbling block remains the demand for recycled plastic, which is currently much too low. It is particularly a question of reassuring manufacturers about the technical properties of recycled plastics and, as is true for all plastic, their possible impact on health.

Another major obstacle is plastic pollution’s international dimension: the solution does not depend on a single country. Veolia wants to deliver

“One of the key levers would be to incorporate the negative externalities of plastic, such as packaging, into the full cost of the end product.”

Laurent Vallée

solutions on a global scale, supporting both major manufacturers and local communities. On a Group level, our ambition is to create an industrial plastic recycling and recovery sector. In concrete terms for Veolia, the goal is to increase our plastic recycling revenue fivefold by 2025, from 200 million to one billion euros.

What measures are you encouraging to achieve the European goals for plastic?

B. H.: We are able to transform large amounts of plastic so that it can be reintegrated into production processes. The solution exists. However, if we take the French government’s target of 100% recycled and recovered plastic by 2025, it is essential to increase the collection of plastic waste, support the necessary investment in industrial facilities — around two billion euros — and define incentive economic mechanisms and the regulatory framework to support the competitiveness of recycled plastic.

K.-H. F.: Our organization has put forward the Plastics 2030 Voluntary Commitment, which includes both ambitious targets and initiatives to be implemented by 2030. This plan concentrates •••

An ambitious plastics strategy

The European Strategy for Plastics in a Circular Economy, adopted on January 16, 2018, looks to change the way in which plastic products are designed, manufactured, used and recycled in the EU. It calls for the adoption of standardized rules between all member states and emphasizes the need to limit the amount of plastic waste sent to landfill.



... on reducing plastic loss into the environment, improving resource efficiency, and increasing the circularity of plastic packaging. As previously mentioned, our aim is to achieve 100% reuse, recycling and/or recovery of all plastic packaging by 2040 for EU-28, along with Norway and Switzerland. With the ambition of reaching 60% reuse and recycling of plastic packaging by 2030.

L. V.: Carrefour is aiming to use 100% recyclable, reusable or compostable packaging for its products by 2025. This implies long-term discussions with our suppliers and partnership approaches with reprocessors like Veolia.

How are you supporting citizens, local authorities, industrialists and retailers in introducing practices and technologies that promote the circular use of plastic?

L. V.: In 2013, we introduced symbols on all Carrefour brand products. This has made it easier to read the information, allowing everyone to sort

“It is by pooling our resources and acting in synergy all along the value chain that we will successfully meet the plastic recycling challenge.”

Bernard Harambillet

their waste more easily, encouraging high-quality collection, and reducing the number of potentially recoverable products being sent to landfill.

B. H.: We are joining forces, for example, with start-ups that raise people’s awareness of plastic recycling issues. In this respect, we are partnering the start-up Yoyo, a collaborative platform that offers a waste-sorting reward to volunteers organized in a network. Its aim is to double the PET plastic recycling rate in France, which is currently under 35%, especially in major cities. During initial trials in Bordeaux and Lyon, the Yoyo community achieved waste-sorting performances twice as high as the national average. It is by pooling our resources and acting in synergy all along the value chain that we will successfully meet the plastic recycling challenge. ■

1. Source: A European Strategy for Plastics in a Circular Economy
<https://ec.europa.eu/transparency/regdoc/rep/1/2018/FR/COM-2018-28-F1-FR-MAIN-PART-1.PDF>
 2. Source: Plastics - the Facts 2017, PlasticsEurope

NOVEMBER 27-30, 2018 - LYON (FRANCE)

POLLUTEC 2018 TRADE SHOW

TOGETHER, LET'S KEEP
THE ENVIRONMENTAL WORLD TURNING

FOR FORTY YEARS, POLLUTEC HAS BEEN PROMOTING THE LATEST ADVANCES IN THE ENVIRONMENT AND ENERGY SERVICES SECTORS. THIS YEAR, THE TRADE SHOW IS HOSTING THE INTERNATIONAL SUMMIT FOR CITIES AND REGIONS DRIVING THE CIRCULAR ECONOMY. IT WILL ALSO WELCOME THE KEY PLAYERS ON THE ENVIRONMENTAL MARKETS IN BURKINA FASO, THIS YEAR'S GUEST OF HONOR COUNTRY.



[HTTP://WWW.POLLUTEC.COM/A-PROPOS/](http://www.pollutec.com/a-propos/)

event

In France, David has invented a machine that has improved his team's working conditions. Dick draws on his thirty years' experience at the Vroomshoop site in the Netherlands.

Above and beyond

Meeting Veolia employees from all over the world.

David Renaud

Manager of a sorting center
Châteaubernard
Charente - France

When he arrived at Veolia in 1996, David worked on the sorting line. Over the years, he has held several posts within the Group, becoming a sorting center manager. Now based at the Châteaubernard* center, he is responsible for waste — particularly plastics — that primarily comes from the region's cognac-producing houses. Mixed waste containers and bottle pallets hold no secrets for David and his team! Together, they carry out the meticulous daily task of sorting the different types of plastics present, the key to optimal waste recovery.

In this rigorous work, he can count on his four colleagues, some of whom have been alongside him for over twenty years. This teamwork and the resulting bond are essential in this profession, which may expose workers to the risk of musculoskeletal problems. Incidentally, this is one of David's hobby horses: "Helping my colleagues find solutions to improve their working conditions is also part of my responsibilities."

David's approach is supported and encouraged by the site's management, which has made occupational health and safety a priority. Convinced that going higher would raise standards, David developed a lift table in 2016. It brings a twofold improvement in comfort: considerably facilitating the work in terms of everyday tasks and improving the efficiency of the sorting operations on bottle pallets. Proud of his invention, he explains that "the pallet is now lifted on its own and each of its levels is positioned at an optimal height." After an experimentation and standardization phase, the prototype has become a certified machine that has rapidly "proven its worth," highlights David.

David acquired this sense of initiative and commitment to his job over the course of his professional career. He is no newcomer to the game: back in 2008, he distinguished himself in Veolia's "Déclic" competition. He received the participatory innovation award for inventing a process for improving the performance of an optical sorting machine in order to make operators' work a little bit easier. ■

* The Châteaubernard center processes a multitude of waste in addition to plastic (cardboard, paper, wood, metals, etc.).





Dick Kramer Freher
Chief Operations Officer
Vroomshoop plant -
The Netherlands

Dick Kramer Freher took up his duties at Veolia in 2017. Although he has worked in recycling for thirty years, this Dutch recycling enthusiast willingly admits that his vocation was a coincidence. While Dick was a law student in the late 1980s, he needed a part-time job. “I worked for a small company that was developing solutions to wash and sort plastic,” he reminisces. But, this short experience was decisive for him.

After his degree and a brief stint in a law firm, Dick’s new passion caught up with him. “A plastic recycling center offered me a job, and I immediately accepted...” Driven by the issue, Dick later created his own company to design and sell recycling plants and he would provide his extensive expertise, acquired all over the world, to large groups as a consultant. For fifteen years, he strived to make businesses more eco-responsible by raising awareness about recycling.

Throughout his career, Dick worked with AKG Kunststof Groep, a company based in Vroomshoop in the north of the Netherlands, taken over by Veolia in 2015. “At the time, it was the largest customer to which we could sell our raw material,” he recalls. As such, he had already had the opportunity to see the quality requirements and the innovative methods implemented on the site. All these factors prompted Dick to accept the position of COO a year ago.

With the support of his five-strong management team, Dick maintains daily exchanges with the 70 plant employees to optimize production, purchases, and sales. When he is not on site, he is looking for new technological and commercial solutions to enhance the plant’s performance. Since Dick’s arrival, the Vroomshoop site has been awarded ISO 9001 certification for the quality of its organization and management.

Today, Dick confidently performs his duties at Veolia. “My keywords are clear, direct, fast, and open communication. I wanted to develop a new way of working, challenging ourselves, and understanding our activity. We make very good compounds [Ed: secondary raw materials] but we need even better, different, and more profitable ones. The goal is to continually seek improvement and performance.” A very resourceful man... ■



Amiens

Waste recovery is an art in itself...

FRANCE

Recycling 75% of the packaging produced by households, including plastics, is the goal set by the French public authorities for 2022. With the acquisition of innovative facilities back in 2014, Veolia's sorting center for separate collections in Amiens has anticipated the demand and transformed the way in which materials are sorted and recycled.

In the eighties,

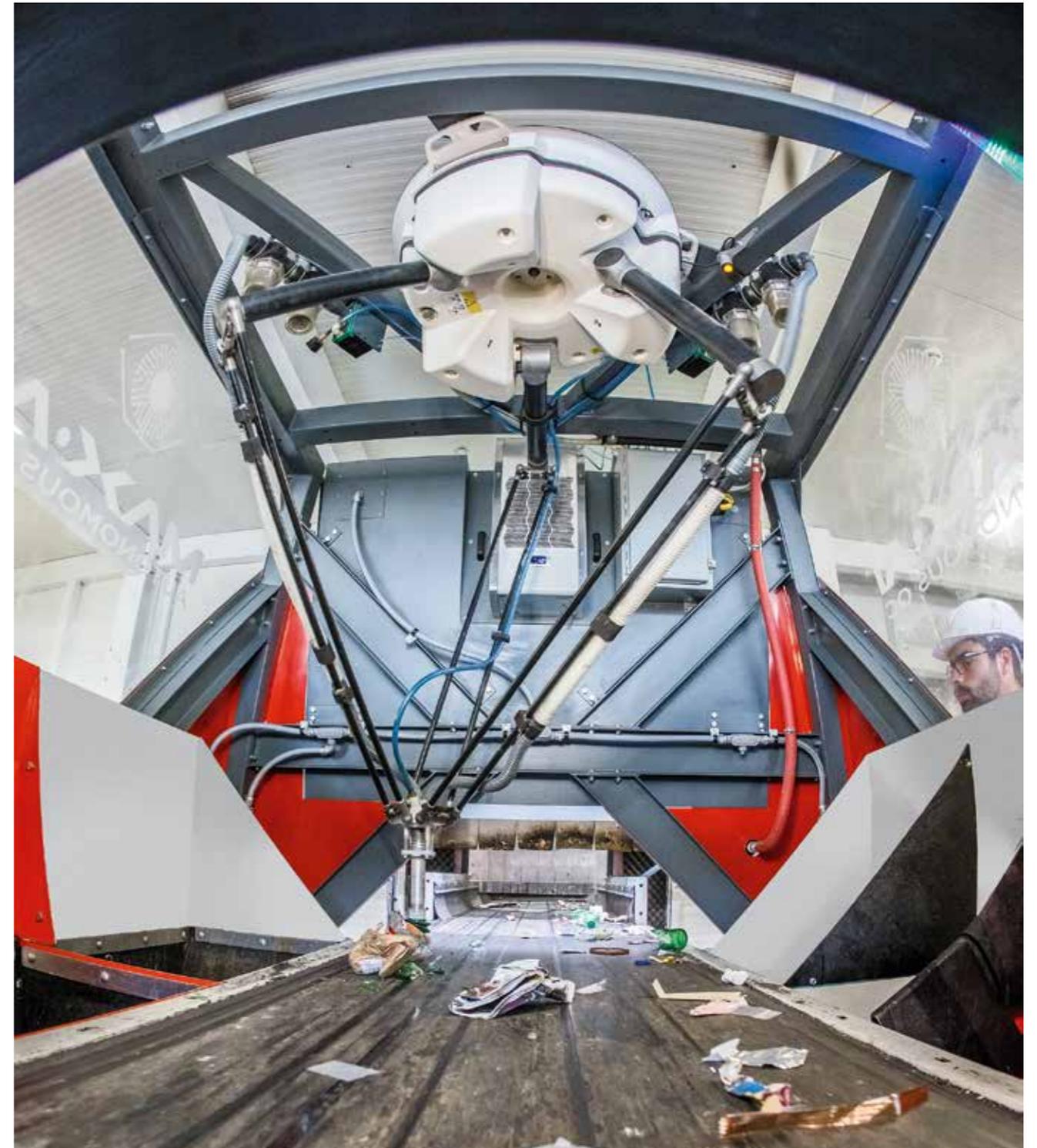
the increasing scarcity of natural resources and growing environmental awareness led to the creation of a real recycling industry. Sorting and recycling sectors were formed and took shape, thanks to the implementation of a national industrial and household waste management policy and the definition of objectives for waste recovery. Citizens, too, learned everyday recycling habits. Veolia has accompanied these developments with the automation of its industrial facilities. The Amiens sorting center* today recovers 85% of the packaging, paper and cardboard received.

The technological waste recovery revolution

Director of the Amiens center's Waste sorting and recovery operational unit, Philippe Herdhebaut has witnessed and participated in its modernization: "Back in 2006," he recalls, "the rise in the volume of waste

required disruptive technology in order to offer new sorting capacities. So we launched a complete renovation of the site, which was completed in 2013." With the gradual automation of the sorting lines and, more recently, the arrival in 2018 of Max-AI® – a robot equipped with an articulated arm and artificial intelligence (see boxed text p. 24), the Center is nowadays able to recover 85% of the total volume of waste from local authorities (jars, tubs, bottles, plastic bags and films, cans, cardboard, etc.). This performance goes far beyond the national target of 75% set by the public authorities. To answer the calls for proposals made in 2013 by Eco-emballages (which became Citeo in 2017), the site decided to accelerate its technological transition by entirely automating its sorting process. Relying on the Group's know-how, it acquired TSA2® (auto-adaptive sequential sorting) technology, which makes it possible to automatically sort all types of plastic resins according to their material and color. This optical process patented by Veolia has been ...

* The site encompasses two activities: sorting and packing separate household waste collections, and sorting industrial waste.



Issue at stake

› Sorting a wide variety of resins from plastic packaging requiring specific treatment.

Objective

› Recycle and recover over 75% of the waste packaging from separate household collections.

Veolia solution

› Optimize the recycling techniques by equipping sorting centers with technological innovations.

... combined with remotely operated sorting that allows remote quality control. “We used to recover three types of plastic resins at Amiens in 2013, and we are now up to six!” says Philippe Herdhebaut enthusiastically.

Training operators: the key to a successful transition

This technological change entailed an unprecedented evolution in the operators’ work. From the outset, restructuring the Amiens sorting center has been a human resources issue. Guidance and training were required for the operator-sorters in the move from manual sorting to its complete automation. This transition phase lasted two years in Amiens, “with the support of ergonomists and sociologists from the Group’s Research and Innovation department,” adds Philippe Herdhebaut. This support prevails throughout increasingly complex technological leaps: a former sorter becomes a quality controller capable of detecting machine errors. The maneuvers are safer, gradually carried out via a screen. And with the imminent arrival of a robot sorter on the site, the worker will continue their training to learn how to control this mechanical companion with artificial intelligence, which will play a decisive role in tomorrow’s sorting performance. ■

“Sorting your packaging better,” a civic experiment still underway...

The roll-out program launched by Citeo¹ in 2011 encompasses three phases designed to expand waste-sorting guidelines to all plastic packaging in France. The first phase, from 2012 to 2014, involved 3.7 million French people; between 2015 and 2016, 15.1 million people made this extremely important civic gesture; and between 2017 and 2022, the final phase will be aimed at 66 million French citizens².

1- Eco-emballages was renamed Citeo in 2017.
2- Source: Rapport d'étape de l'extension des consignes de tri, Citeo, 2017.



Marc Brunero,
Technical & Performance Division, Waste Solutions Business Line, Veolia in France

Max-AI®, the operator-sorter of the future

For over twenty years, Veolia has been devising innovative technologies for sorting its clients’ waste more effectively. Its key innovations include remotely operated sorting — refining the sorting using touchscreens — and auto-adaptive sequential sorting (TSA2®) — automated sorting of packaging according to its material and color. The Group is now integrating smart sorter robots into its industrial facilities. Veolia’s Technique and Performance division, which has been supporting the Group’s sorting centers in their technological evolution, is banking on artificial intelligence. The Max-AI® robot — a first in France and Europe — has been operational in Amiens since June 2018.

What does artificial intelligence bring to high-performance sorting?

The artificial intelligence robotics solution supplements the other cutting-edge solutions that we use in our sorting centers. It fits in well with our primary goal of continuing to simplify the sorters’ actions, which enhances occupational safety while boosting the material flow sorting performance. We must deal with ever more ambitious sorting demands. On the one hand, expanding the waste-sorting guidelines, which is key in increasing the amount of recycled materials, has meant that separate collections contain waste that is more soiled than before and therefore more difficult to sort. On the other hand, China’s ban on low-quality plastic waste is forcing us to improve sorting quality, while increasing our performance to ensure an outlet for the raw materials from recycling. Hence the interest in developing robots with artificial intelligence that are capable of making over 3,000 movements an hour to carefully sort waste.

In concrete terms, what does Max-AI® look like?

Max-AI® is the combination of an “eye,” a simple optical camera, and an “arm,” an articulated robot, controlled by a “brain,” a neural network implanted in a computer.

How are the two Max-AI® prototypes used by Veolia performing?

The installation of Max-AI® is a first in France and Europe. As the first models came from the United States, you have to teach it everything. In other words, we have to sufficiently enrich its database so that it

can carry out its tasks correctly in its new environment. We are in constant contact with the engineers who designed it and are developing the necessary applications. It is up to us to adapt this American robot to French norms and specifications. The first is in test configuration in the mechatronics area of the Hall in Mantes-La-Ville (see Futurist, p.50) to fine-tune its performance and check its future adaptation capacities in our different sorting centers. We decided to set up the second one in production at the Amiens sorting center to check its robustness over time.

Is Max-AI® versatile?

Reinforcing its versatility is an issue for the future. Today, it is only operational on one application: cardboard quality control. However, in the long term, it will doubtless be able to perform all of an operator’s tasks. Its current limits are linked to its learning curve: it must gradually learn to separate each type of waste better. It is precisely to optimize the robot’s function and accurately test its efficacy on different material flows that we are working on a second prototype with the Group’s Research & Innovation department.

Is the Max-AI® family going to be expanded?

These first experiments allow us to promote Max-AI®’s deployment in calls for tender concerning sorting centers for local authorities. This is the case in Nantes, where the Waste Solutions proposal was chosen by Nantes Metropolis & La Carene to design and build a new sorting center. We are going to set up two new Max-AI®’s there. They will be operational as of 2020.



THE AMIENS CENTER: KEY FIGURES

- **450,000** inhabitants served, including 38% in the Amiens Metropolis sector.
- **22,000 metric tons** of household waste treated each year.
- **25** employees, including **12** operators (sorters, team leaders, characterization workers and machine operators).
- And the introduction of innovative technical solutions (TSA2® and remotely operated sorting) in 2014 has led to:
 - **2.5** times more waste sorted per hour,
 - **6% more** household packaging recovered.



Philippe Herdhebaut,
Director of the Waste sorting and recovery operational unit, Amiens

The quality controller, a highly valued job...

“Our areas of activity use increasingly complex tools. With each innovative technology put in place, we improve working conditions, limiting the repetitive movements associated with manual sorting. This makes a major contribution to occupational risk prevention and staff health and safety. In 2013, the innovative technical solutions adopted — TSA2® auto-adaptive sequential sorting and remotely operated sorting — enabled us not only to boost productivity (see key figures boxed text above) but also make a decisive breakthrough with regard to sorters, radically transforming their professional practices. From now on, the sorter’s responsibility is to control the combined sorting equipment upstream and correct errors; they check the quality of the “finished product,” which is now a reusable good, strictly complying with the specifications defined by eco-friendly waste management bodies. These jobs now demand a greater sense of responsibility. Our goal is to transition the position of sorter to that of quality controller or even, in the future, quality engineer. Computerized monitoring of state-of-the-art tools also requires ongoing training to keep the skills of the staff in charge of their maintenance up to date. This is important to us, especially as good training bonds teams together.”



Bernburg

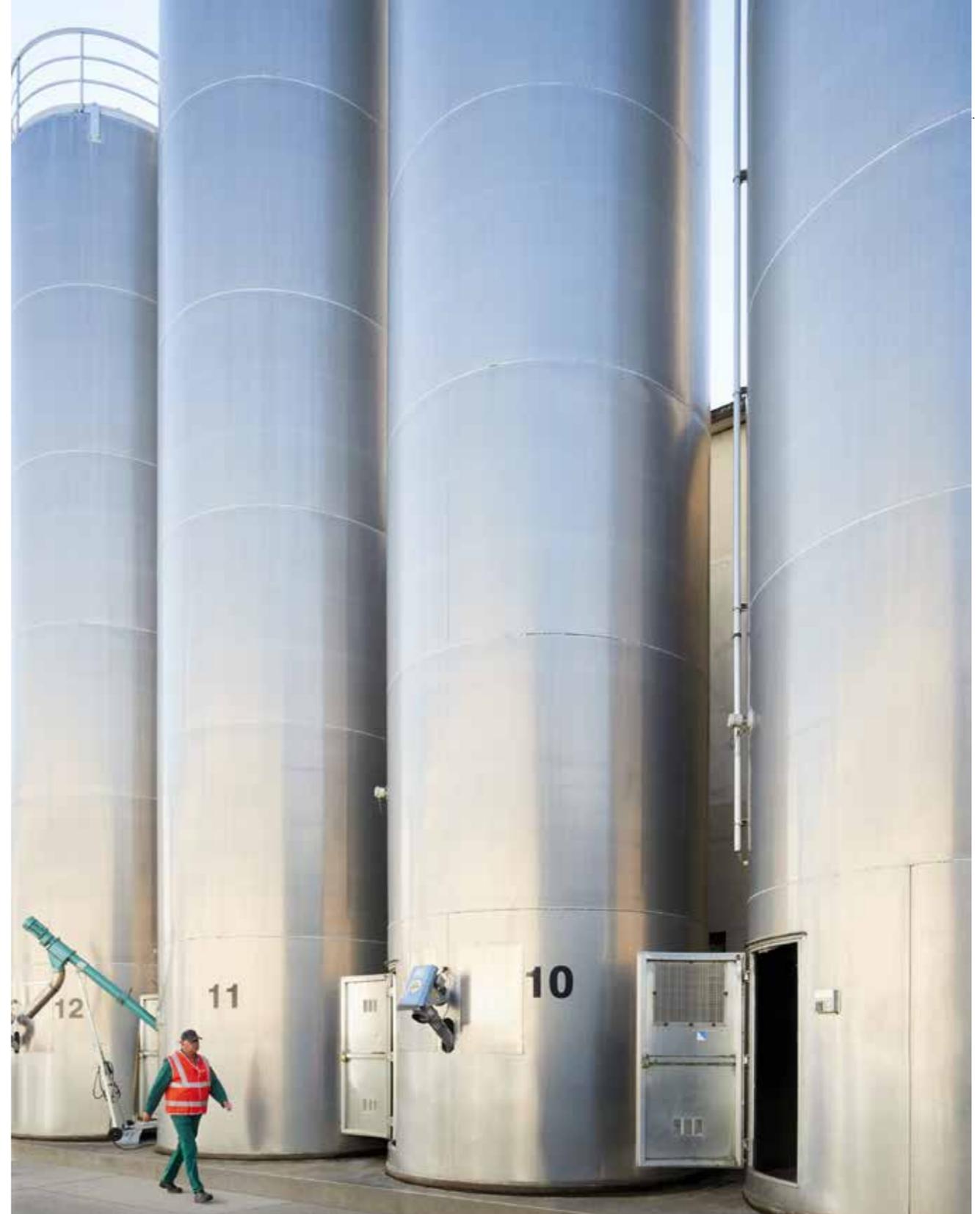
GERMANY

A hub for plastic recycling in Europe

Since January 1, 2018, China has closed its borders to paper and plastic waste imports. This decision has forced a rethink about the organization of the recycling industry worldwide, especially in Europe.

According to an American study¹

111 million metric tons of plastic that was set to have been exported to China by 2030 must find a new destination in the world for treatment. Of course, since China closed its doors, countries such as Malaysia, Vietnam, Thailand and Indonesia ...



Issue at stake

➤ The escalation in plastic production along with the closure of Chinese borders to plastic waste are increasing recycling needs in Europe.

Objective

➤ Turn this constraint into a business opportunity.

Veolia solution

➤ Develop the Group's activity in the field of plastic recycling, especially in Europe.

... have seen their plastic waste imports soar. However, these markets, which often have underdeveloped infrastructure, must limit imports in their turn or at the very least encourage importing countries to toughen their regulations.

A strong hand

China's decision is also an opportunity for the European recycling sector, which must adapt to this new state of play. This is the case in Germany, where Veolia is strengthening its plastic waste processing and recycling capacities. At its Rostock plant, the Group recycles one billion PET² bottles per year (cf. Planet November 2015). And Veolia's two sites in Bernburg — Multiport and MultiPet — respectively recycle 38,500 metric tons of HDPE³ and PP⁴ plastic packaging and 40,000 metric tons of PET bottles per year.

Thanks to the investment made over the past several years, Germany has become a hub for recycling materials from all across Europe. This strategy has proved particularly opportune since China's decision. "Germany is very well equipped for recycling," states Étienne Petit, General Manager of Veolia in Germany. "This is why we view the Chinese ban as a real opportunity."

This favorable context is reinforced by ambitious national regulations concerning packaging recovery that will come into effect on January 1, 2019. These regulations call for an increase in plastic recycling targets from 36% to 63% by 2022.

Materials from all across Europe

"The materials that we treat come from all across Europe," states Herbert Snell, Multiport and MultiPet's manager. "We recycle materials collected in Germany — via the national waste deposit system and household waste sorting — as well as France, Belgium, the UK, and many other countries. Two thirds of the materials that we treat come from household waste, the other third — which is managed by Multiport — comes from industrial waste." The Multiport plant recycles plastic designed to replace the virgin polymers utilized in particular to manufacture pipes. MultiPet produces PET flakes used



Étienne Petit,
General Manager of Veolia in Germany

Why we must simplify products

"European standardization is required in terms of eco-design, in order to create a plastic standard that is valid in every country.

In fact, the only materials that we know how to recycle today are simple single-layer plastics, especially PET and HDPE bottles, along with PP containers. Getting to grips with plastics made up of several chemical layers is much more complicated, both technically and economically.

Hence the idea of designing products according to their future use, with a view to not generating waste. In other words, if it is a plastic-based product, a monomer will preferably be chosen.

In this respect, states must go further and develop long-term strategies to harmonize product packaging and design. Germany is one of the most advanced countries in Europe in terms of recycling, but you still find too many products that are difficult to recycle there. So it is up to us to effectively manage the inflows in order to obtain high-quality outflows and thus contribute to the circular economy."

KEY DATA

A FEW FIGURES ON PLASTIC RECYCLING AT VEOLIA IN GERMANY

- **70,000 metric tons:** the volume of plastic waste recycled each year by Multiport and MultiPet
- **1 billion:** the number of bottles recycled each year in Rostock
- **180,000 metric tons:** the amount of CO₂ avoided through the recycling carried out on the Multiport, MultiPet and Rostock sites

to produce a wide variety of items, such as bottles, household linen, and fiber and plastic strapping.

"As demonstrated by the Rostock, Multiport and MultiPet facilities, recycling plastic materials on European soil is entirely possible," confirms Étienne Petit. "In other words, we can offer a solution to manufacturers established there. The closure of China's borders is also leading to an increase in the number of materials

available. We will therefore be able to develop recycling technologies that seemed economically unviable not so long ago, such as recycling LDPE⁵ waste. The solution is to continue to develop a circular economy in Germany and Europe." ■

1- University of Georgia (United States)
2- PET: polyethylene terephthalate (clear plastic water bottles)
3- HDPE: high-density polyethylene
4- PP: polypropylene
5- LDPE: low-density polyethylene





JAPAN

Ibaraki Honjo Kikukawa

The age of
plastic recycling

With a view to supporting the development of a global industrial plastic recycling and recovery sector, Veolia is strengthening its positions, especially in Asia. Since 2016, the Group has been operating three plastic recycling and recovery sites in Japan near Tokyo.



Issue at stake

› Construct a global industrial plastic recycling and recovery sector to offer an alternative to virgin material.

Objective

› Use Japan as a support base for Asia, as it is a country where the recycling rate is much higher than in Europe and a pioneer in terms of plastic waste regulations, with the 3Rs policy — Reduce, Reuse, Recycle — implemented in 2000.

Veolia solution

› Particularly through an offensive acquisition strategy, Veolia is looking to become the leader on the Japanese market in the plastic sorting, recycling and recovery sectors.

The Ecos Factory

and Green Loop plants are dedicated to sorting and the production of recycled plastic pellets, while Veolia's site in Ibaraki turns these pellets into high-quality compounds* (recycled raw material).

From sorting...

On the Ecos Factory and Green Loop sites in Honjo and Kikukawa respectively, Veolia sorts the plastic waste from the surrounding municipalities and turns it into top-quality pellets. The aim is to reduce the volume of waste and improve the quality of the plastics processed. Several types of polymers are recycled there: LDPE (low-density polyethylene), HDPE (high-density polyethylene), PS (polystyrene) and PP (polypropylene).

...to compounding

In Ibaraki, Veolia produces high-quality compounds for its clients in the plastics manufacturing sector using the plastic pellets provided by Ecos Factory and Green Loop. The pellets are mixed, combining the polymers according to specific percentages to create a compound that can be used as a raw material in the manufacture of new products. The Ibaraki site also works for the automobile industry. Its clients include the company Kojima, one of the leading plastic suppliers for Toyota. While Veolia's activity in Ibaraki is based on the free market associated with the plastics manufacturing industry, Ecos Factory and Green Loop's business model depends 80% on the highly regulated sorting market. This market is regulated by the Japan Containers and Packaging Recycling Association (JCPRA), which

Key figures for 2017

PRODUCTION CAPACITIES / ACTUAL PRODUCTION

- Ecos Factory:
36,600 metric tons per year / 25,590 tons
- Green Loop:
36,600 metric tons per year / 15,410 tons
- Veolia Ibaraki:
10,000 metric tons per year / 7,800 tons

is equivalent to the eco-friendly waste management body Citeo in France.

A promising outlook

In a highly fragmented Japanese recycled plastic market, Veolia's three sites stand out with their ability to meet the growing needs of their clients in terms of performance and post-completion monitoring. The three plants are equipped with optical sorting machines and are exemplary when it comes to water management and energy consumption optimization. Veolia's aim is to establish a lasting presence on the Japanese market. In barely two years, the Group has become a fully fledged player in the plastic recycling sector there. The future looks bright: Veolia is already number two in terms of market share on the sorting market. ■

**Compounding is an extrusion-pelletization process enabling a polymer (thermoplastic resin) to be melt blended with one or more additives. This process alters the physical, thermal, electrical or aesthetic characteristics of the plastic material. The end product is known as a compound or composite.*



Christophe Maquet,
Executive Vice President and Director - Energy, Waste and Industrial Water at Veolia in Japan

A pro-recycling culture and regulations

Veolia in Japan set up a Plastic Recycling department in 2016... What was the context for this initiative?

It's worth remembering that Veolia in Japan was created in 2002 with a single business line: managing municipal or even industrial water. 2014 saw the beginning of our development beyond the Water activities. First of all, with the growth of the Energy business through biomass projects, then with the opening of the waste market. Veolia's international positioning in the field of plastic recycling struck a chord in Japan, a country in which the recycling rate is much higher than in Europe. In 2016, Veolia acquired three companies in the same group to roll out this business line. Traditionally, Japan has prioritized two recycling methods: incineration and mechanical processing. The introduction of the 3Rs policy — Reduce, Reuse, Recycle — in 2000 went hand in hand with an extremely high waste collection rate, leading to a loss of market share for incineration. This was a great opportunity for Veolia, which could thus hope to see an automatic increase in the volume of material to be recycled in a strictly regulated market.

In addition to its industrial know-how, what can Veolia offer in this pioneering country?

There is a paradox in Japan when it comes to plastic consumption. The obsession with impeccable packaging means that almost everything is packaged — even

individual pieces of fruit — sometimes in several layers. This country, which is so focused on recycling and the 3Rs rule, cannot manage to get people to understand that you must consume less plastic from the outset. This change in attitude will not happen overnight! Given this context, education and awareness-raising among the population and public and private decision makers is one of Veolia's concerns. We are taking this approach, especially through our partnership with the Tara expedition, which has come to Japan twice. In 2017, Tara made a dozen stopovers in different ports around the country to meet the general public, particularly schoolchildren. At each port of call, Veolia organized on-board visits with local clients, partners and staff to raise their awareness about plastic pollution in the oceans.

What role does Japan play in terms of plastic waste management in the Asia zone?

A major role, especially as the high quality of its plastic raw material is widely recognized worldwide. There are significant plastic waste flows between Asian countries. However, in January 2018, the Chinese government announced the "Chinese ban," which prohibits plastic waste and sorted plastic of a certain quality from entering its territory. This has had a major impact on Japan, which must cope with a noticeable increase in the volume of plastic waste to be recycled within its borders.

Bangladesh

Plastic city

In the Islambagh area, a slum of 10,000 inhabitants has developed an entire economic activity based on plastic recycling. It is organized like a real industry: there are those who transport and those who sort and dry the plastic, those who melt it to produce a new material, and

those who produce new objects, along with supervisors, accounting officers, and even quality managers. The working conditions there are particularly difficult: the health and safety conditions are substandard, substantial amounts of waste litter the streets, earnings are less than

€2 a day and are not enough to lift workers out of extreme poverty, etc. Nonetheless, the momentum that has begun here may represent a seed of hope: when it is well supported, the informal sector can make a decisive contribution to meeting the plastic challenge.



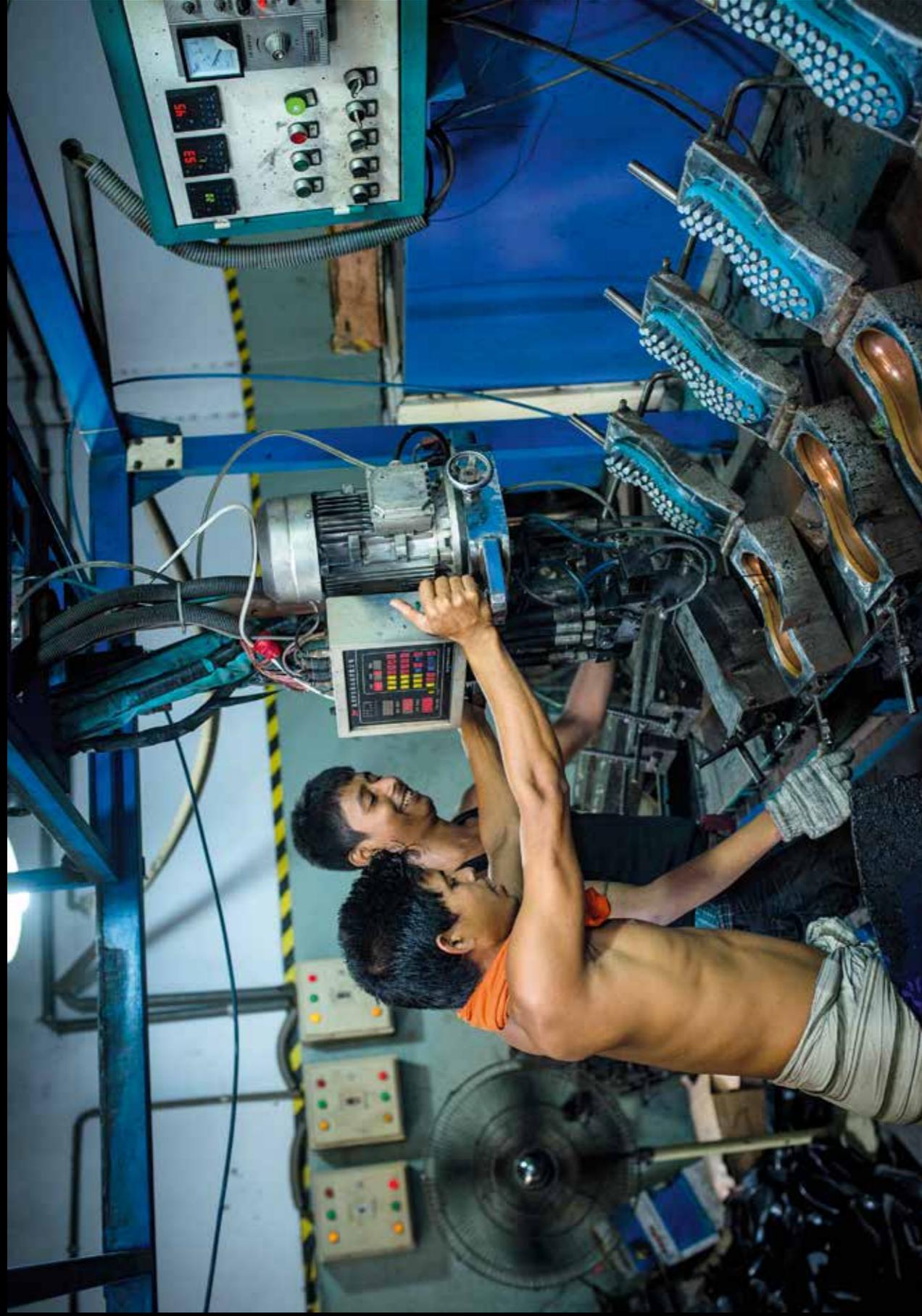
A whole family sorts dozens of kilos of plastic bottles per color. Each person is paid less than €2 per day.

Faruz and Refat spread out more than 50 kg of clear plastic that has been previously crushed and sorted. They will dry it and carefully remove any impurities.



A worker loads the previously sorted plastic into an oven. Once melted, the plastic will be expelled in the form of long hollow threads and then immediately cooled.

This workshop, which manufactures recycled shoe soles for the company Bata, has modern, high-performance machines imported from China.



The machine on the left cuts sandal bases in a layer of recycled two-tone plastic. Straps just need to be added to obtain sandals.

A man transports bags filled with sandals ready to be sold on Bangladeshi markets.



Shamin Ahamen is responsible for the production of soles for the company Bata. He ensures the quality of the soles produced by his 20 employees. **Musef** is the boss of several sorting and grinding centers. He employs over 50 people.



Jules Toulet, smitten with Bangladesh

Jules Toulet has been attracted to the Indian subcontinent from a very young age. He has made many reports there on social issues such as the impact of rising sea levels or the textile industry. While Jules is highly aware of environmental questions, it was entirely by chance that he discovered the slum of Islambagh while walking along the banks of

the Buriganga River. "I delved deeper with an interpreter and I found one surprise after another, discovering that a whole district survived on recycling," he remembers. More than 10,000 people work with plastic, many of them in hot conditions surrounded by toxic vapors, some with modern machines. The objects produced are destined for both the local market and export. Jules Toulet attempts to see things from a "humanist [perspective], while keeping my distance from the subjects.

I avoid the maudlin and the dramatic; I try to be both neutral and human." For this report, the photographer concentrated more than usual on the shot and post-production. "I varied my angles even more. And as many of the photos were taken inside, I always tried to ensure that there was enough light." The result is these beautiful chiaroscuro photos, in which the aesthetic effect nonetheless never overshadows the information.

Bio

At a very young age, Jules Toulet discovered a passion for photography during his first trip to Varanasi (formerly Benares) in India. He was 20 years old and became an independent reporter. At the same time, he works in a photo laboratory in Brussels, where he produces analog and digital prints, organizes exhibitions, etc. He is also a photojournalist for the Belgian press.



PLASTIC AND OCEANS
 THE CIRCULAR ECONOMY IN ACTION

Stopping pollution from land-based sources and transforming it into resources is a priority for Veolia. Because it provides 50% of our oxygen, absorbs 30% of CO₂ produced by human activities, and contains the greatest biodiversity of the planet, the ocean plays a major role in life on earth. Its pollution is a global emergency and everyone's concern (governments, manufacturers, communities, individuals). If nothing is done, by 2050 plastic in the oceans will weigh more than the fish that live in them.

Action is long overdue...

The UN estimates that 40% of the oceans are significantly impacted by human activities, including pollution, overfishing, and loss of coastal habitats. With regard to marine pollution, 80% is land-based and deposited by rivers or rainwater run-off. Global urbanization (over half of the global population lives in cities) and coastal development (40% of the population lives less than 60 km away from the coast) are also at cause. The facts speak for themselves: over 50% of wastewater is directly discharged into the sea without treatment and 80% of waste found in it is plastic. Hence the importance of prevention upstream, especially on land through collection and recycling and a fundamental change in our production and consumption patterns.

Global mobilization around the “seventh continent” of plastic

Internationally, the June 2018 G7 meeting in Canada resulted in five of the seven countries present signing a charter. The charter's goal is to recycle 100% of plastics by 2030 and develop alternatives to plastic packaging to limit the waste flowing into rivers and ul-

timately ending up in the oceans and seas.

In Europe, the Commission presented its plastic waste strategy (see Trends, page 7) in Brussels in January 2018 and proposed a series of concrete measures in May which included banning certain single-use products and the obligation to recycle, with the specific aim of limiting marine pollution. “Europe sets the goals, but it is up to us to implement concrete solutions. The main issue is still the collection of plastic waste,” states Laurent Auguste, Veolia Director of Development, Innovation, and Markets. “Of course, Extended Producer Responsibility (EPR)* is an essential measure, but manufacturers still have difficulty in being effective in this area. Today, collection is both a key element and the weak link in the accountability chain.”

“Protecting our seas and oceans” strategy

Ocean pollution is an old concern for Veolia, directly related to its wastewater and waste management businesses. To go a step further, the Group has adopted a strategy called “Protecting our seas and oceans: combating land-based pollution and transforming it into resources” which was unveiled on World Oceans Day on June 8, 2018. The main goal is to

- stop land-based pollution (waste-water and waste) from entering the seas and oceans. Veolia proposes to move from a linear economy logic to a circular logic, acting at the interface between land and sea and acting on pollution sources. The approach is organized in three complementary levels:
 - treat land-based pollution flows on the coastline and further upstream (clean the coastline, treat wastewater to limit discharges to the sea, etc.);
 - prevent marine pollution by designing prevention and dynamic flow management systems to increase city and regional resilience;
 - transform production and consumption modes to move toward a circular economy.

Collection, the weak link to strengthen

Projects to collect plastic waste at sea are increasing, such as navigator Yvan Bourgnon aboard *La Manta*, Boyan Slat's Ocean Cleanup program, and *Plastic Odyssey*, the ship that runs on plastic, supported by the Veolia Foundation. These are all good ideas, but they do not act on pollution sources. As Rob Opsomer, Systemic Initiatives Lead, Ellen MacArthur Foundation, explains, "to free our environment from plastics, we have to do more than clean up beaches or remove plastic from the ocean; we have to fundamentally rethink the way we make, use and re-use plastics so that they don't become waste in the first place."

It is therefore urgent to act in the field... especially in the many regions of the world that are not yet equipped with infrastructure to collect and treat waste. "In developing countries, where there is a huge amount of plastics in the oceans, waste collection is virtually nonexistent," notes Laurent Auguste. "And separate collection even less so. It is there-



Philippe Sébérac, Technical and Performance Director, Water, Veolia

"In order to treat microplastics, we first need to know how to characterize them."

What is microplastic?

There is no strict definition. As far as we are concerned, we treat anything from 0.1 micrometer (0.1 μm) to 5 millimeters. In other words, we go beyond the "micro." The true micro is actually between 0.1 μm and 1.2 μm for us, but the whole range of microplastics up to 5 mm can have an impact on health and the environment and must therefore be studied.

Where do they come from and what are they found in?

The main source of microplastics is the degradation of macroplastics in the environment. Although there are many possible origins of microplastics, the analytical tools to characterize them are neither locked nor stabilized today. There are no standardized elements to gain an overview of the extent of the problem and what is relevant to treat. A few indications are available. We know, for example, how much microplastic fiber a washing machine discharges, one of the big contributors in domestic use! But what about traffic or what happens to plastic fibers in the air when they fall into the water or on the ground?

Do we know how to treat them?

Veolia already has technological processes and expertise; so, yes, we know how to treat them! But, for any action to be economically

and ecologically effective, you need to know where and how to treat, and, unfortunately, we cannot use the same method in all environments and on all types of plastics. Therefore, the first stage is to characterize microplastics. This means knowing where they are, where they come from, what types of plastics they are made of, how to treat them, when, and so on. But the tool that can do this in a sufficiently detailed and precise manner has not been invented yet... So, we are working to understand how microplastics are distributed in the environment to better define where treatment should be done: at the source? on exiting the treatment plant? upstream of drinking water plants? a combination of all of the above?

What characterization methods do you use?

They differ according to the size of the plastic particles. As I said, we are working on a broad spectrum, up to half a centimeter. Qualitative characterization is also implemented. We must first identify the nature of the polymers involved, limiting ourselves to the most common, because their behavior is not quite the same. Another subject relates to additives used for different purposes, such as facilitating polymerization. They often have an impact on human health, such as endocrine disruption, which is the most common. Here we have a chemical "fingerprinting" tool

developed by Veolia's research center that allows us to analyze additives. However, we are not yet able to analyze fibers in a standardized and stabilized manner, and we cannot detect them at varying sizes either. And, for the moment, we cannot collect intercomparable results to define a strategy.

How can this research be developed?

The Group is currently involved in several research programs in France. We are working with labs in France and Denmark to characterize and quantify the nature, types of molecules involved, and size of microplastics. We are also studying the eco-toxicological impacts of microplastics on all types of plankton, microfauna, and some small fish. In partnership with a coastal community, we are currently testing a basin-wide characterization. After analyzing the flows entering the WWTP and which are released into the natural environment, we follow the evolution of all this on the coastal strip that feeds the pelagic zone. In short, we are looking for the answers to the following questions: which microplastics? Where are they produced? How are they disseminated in the environment? How do they interact with the water treatment system for drinking water and sanitation? Veolia ultimately hopes to develop, with its customers, a microplastics treatment strategy by 2020.



Tara, the watchman of ocean resources

The Tara Pacific expedition has been analyzing coral reefs and their fragile ecosystem since 2016 and has catalogued 117 million genes, half of which were previously unknown. In May 2018, after twenty-four months at sea and a few months before the end of a 100,000 km voyage, the expedition delivered its first results to Veolia's headquarters. The highlight of this campaign was the discovery, by DNA sequencing, of the microbiotic diversity of coral ecosystems, which indicates their state of health. On its voyage, the schooner crossed the North Pacific Gyre where the concentration of plastic is among the highest (Great Pacific Garbage Patch). The scientific team took the opportunity to study the new ecosystems created there, as well as the interactions between living organisms and microplastics.

The Tara Foundation schooner is both an awareness-raising tool and instrument for studying the oceans affected by climate change. It helps Veolia better understand and raise awareness on the need to protect the ocean. The next challenge for both partners will be in 2019 in Toulon where they will be studying microplastics in the Mediterranean Sea.



Lifting of the High Speed Net (HSN).



Maria Luiza Pedrotti, a plastics specialist at the Observatoire océanologique de Villefranche-sur-Mer, during collection from the High Speed Net (HSN)'s filter.



Sorting of samples.



Samples of microplastics



Rob Opsomer leads the Ellen MacArthur Foundation's systemic initiatives, including the New Plastics Economy program. **"Veolia on the frontline to find solutions to the plastics crisis"**

What is the New Plastics Economy initiative?

It aims to change the way plastic is produced, manufactured, and used. Plastic is a perfect illustration of our linear economy. Currently, out of all the plastic packaging produced, only 14% is collected for recycling and only 2% is actually processed into quality products. For the Ellen MacArthur Foundation, the issue of plastic is not so much an environmental problem as a truly economic problem.

What role should the recycling industry play in this new plastics economy?

It is best placed to invent technologies and means for sorting and recycling plastics that we currently do not know how to recycle. As an international company, Veolia has strong expertise in recycling and works with a large number of plastic producers. It is therefore on the frontline to find solutions to the plastics crisis we are facing.

Why did you launch a New Plastics Economy Innovation Prize in 2017?

We need to fundamentally rethink our production and consumption patterns. To do this, we need eco-designed materials and products and new business models based on the circular economy. Our two million US dollar prize is for everyone: individuals, entrepreneurs, researchers, inventors, small and large companies around the world, who can provide concrete solutions to reverse the trend and reduce the amount of plastic in the environment.

plastic waste deposits, and its international presence, which allows it to establish a global recycling platform. These two aspects are a plus for major brands and plastics companies which are very concerned about their environmental footprint and are also looking for viable solutions that can be developed locally before being replicated elsewhere. "Manufacturers have more difficulty in making an impact in a region and connecting with all the public and private stakeholders present," stresses Laurent Auguste. "We play a facilitating and 'structuring' role for the industry by helping the main private stakeholders in the value chain work together to develop and then implement the systems and solutions of tomorrow." This is a good way to fuel reflection on current (material flow management, development of the EPR model in other areas of the world, etc.) or future issues, such as a financial compensation system, like carbon quotas.

Increasingly responsible partnerships

"Sustainable management of natural resources by promoting the circular economy" is one of Veolia's nine commitments to sustainable development. "This commitment is an opportunity to create value for our customers and manage environmental risk," highlights Pierre Victoria, Veolia's Director of Sustainable Development. "It includes three areas: prevention of pollution, preservation of nat-

ural resources, and development of the circular economy, as well as the Group's strong involvement in biodiversity through various partnerships with IUCN, BiodiversiTerre, and, more recently, Act4Nature." This is why the Group has invested in several internal Research & Innovation programs on recycling processes (see Futurist p. 50) and microplastic characterization (cf. interview p. 44) in cooperation with outside laboratories and local communities. Veolia has contributed to scientific programs for many years through its Foundation and supports Tara Expeditions (cf. p. 45) and the Remora initiative to restore aquatic environments in Cap Sicié (southern France). Veolia is also a core partner in the New Plastics Economy initiative, led by the Ellen MacArthur Foundation, to develop production systems (see interview opposite). Finally, the Group participates in the work of the World Economic Forum, the WBCSD, and, in France, Enterprises for the Environment (EpE) and Comité 21 think tanks, which work, in particular, on changing production and consumption modes. Veolia believes that the worldwide mobilization of all the stakeholders in the value chain, down to the individual, will make it possible to eradicate the scourge of plastic in oceans. ■

*Included in French law since 1975, the principle of Extended Producer Responsibility (EPR) is that manufacturers, distributors (for own-brand products), and importers (which place products generating waste on the market) must manage, including financially, this waste. (Source: ADEME <https://www.ademe.fr/expertises/dechets/elements-contexte/fileres-a-responsabilite-elargie-producteurs-rep>)

... fore difficult to set ambitious goals under these conditions! A lot of background work needs to be done to structure sectors, with different models than those used in Western countries. Thus, the informal economy, a reality in some countries, such as India, can recover paper, cardboard, metals, and plastics with high added value, such as PET." However, developed countries are still a target because "plastic collection rates remain low despite the systems in place," continues Laurent Auguste. "Hence the Group's focus

on raising consumer awareness as they are key actors in the circular economy." **Toward a global plastics processing industry** Veolia has two very useful assets for the construction of a global plastics recycling and recovery industry: its very local presence, which allows it to be closer to



The STOP project

Putting a STOP to plastic pollution: zero waste goal

Over half of the plastic dumped into the oceans each year comes from South-East Asia. To help stem this phenomenon, Veolia is actively involved in the STOP project. Its aim is to establish a genuine plastics circular economy in this part of the world.

Muncar, Indonesia. In this town of 130,000 inhabitants, waste has taken over the whole area for years, transforming the picture-postcard landscape into an open landfill site. Established in fall 2017, the STOP project was rolled out on the ground in March 2018, in coordination with the local authorities, fishermen and schools. Its aim is to put in place an effective municipal waste management ecosystem: equip the town with collection trucks, provide households with recycling bins, compost organic waste, and integrate recyclable waste into existing plastics channels. To bring to life this project championed by the whole community, ten international experts — recycling specialists, sociologists and statisticians — provided their insight, especially in the areas of waste management and communication with the local populations.

From the outset, Veolia formulated a series of recommendations, particularly with regard to planning the technical choices for collection and sorting, along with the recycling methods to be prioritized. Today, the Group continues to support the program in its concrete application phase: its philosophy is to learn about the realities on the ground in order to acquire and develop know-how that could be applied on a larger scale elsewhere. Since September 2018, STOP has been rolled out across the entire Muncar region. "A third step will soon make it possible to extend the project to Indonesian cities with up to a million inhabitants," explains Phan Bai, a Business Developer in Veolia's Development, Innovation & Markets division, which steers the project within the Group. STOP has a bright future ahead...

- Objectives**
 - Zero waste discharged into the oceans
 - Increase in plastic recycling rates
 - Positive social and economic consequences in the areas of health, fishing and tourism.
- The steps**
 - March 2018: first partnership in Muncar, within the framework of a memorandum of understanding with the Indonesian government.
 - October 29 and 30, 2018: presentation of concrete progress made thanks to the STOP project during the "Our Ocean" conference in Bali (Indonesia).
 - 2018-2019: development of the project, launch of new partnerships with larger Indonesian cities.
- Founders & partners**
 - STOP was cofounded in 2017 by the company SYSTEMIQ and the plastics manufacturer Borealis. The latter provided two million euros to help fund the initiative. Since it was created, the STOP project has been supported by several partners, including Veolia, Sustainable Waste Indonesia, Bourge and mtm plastics GmbH.

EXPLAINER

Plastic is given a new lease of life in Dagenham

In the UK, HDPE* plastic milk bottles are now part of the circular economy. Veolia's recycling facility in Dagenham is primed to meet the goals of the UK Plastics Pact.

Since December 2017, when the BBC broadcast its "Blue Planet II" series featuring an episode on the damage plastics are causing to marine wildlife, responsible plastic use has become a priority issue for the public, retailers, and the British government. "This media attention has changed attitudes to plastics," states Richard Kirkman, Chief Technology & Innovation Officer for Veolia UK & Ireland. "Veolia was already ahead of the curve in terms of plastic solutions. For instance, we've been working with the dairy industry to find ways to turn used milk bottles back into new ones."

In April 2018, the UK Plastics Pact (UKPP, see infographic) was formed to tackle the scourge of plastic pollution. This collaborative initiative is laying the foundations for a circular economy for plastics. The UKPP brings together 40 major brands across the entire plastics value chain, along with UK government institutions and NGOs. Veolia is also a member and sits on the advisory committee. "The UK Plastics Pact is very important in encouraging plastic packaging

manufacturers to use more recycled content, but also ensuring they design their plastic products to be recyclable," explains Richard Kirkman.

In 2017, Veolia took over an unused plastic bottle recycling plant in Dagenham in East London. After some initial investment to get the facility up and running again with the addition of improved technology, it is now accepting 300 million milk bottles annually from across the UK, equivalent to all the milk consumed in London each year. The bottles are turned into a food-grade recycled HDPE product that is used to make new milk bottles and yoghurt pots.

"We have 14 material recycling facilities in the UK that separate plastics from other collected materials such as paper and cans," explains Richard Kirkman. "Our facility in Dagenham perfectly demonstrates Veolia's ability to produce circular plastic recycling solutions." Ambitious commitments have already been made by industry leaders to move toward products containing recycled plastic. If more companies follow in the future, then a real momentum can be achieved! ■

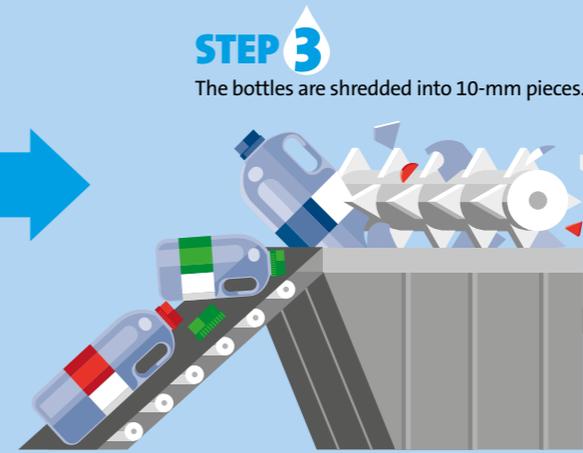
* HDPE: High-density polyethylene



STEP 1
High-quality sorting begins with the consumer, encouraging education about waste-sorting guidelines.



STEP 2
Collected and then compressed into bales, post-consumer HDPE milk bottles arrive at the facility in Dagenham from across the UK.



STEP 3
The bottles are shredded into 10-mm pieces.



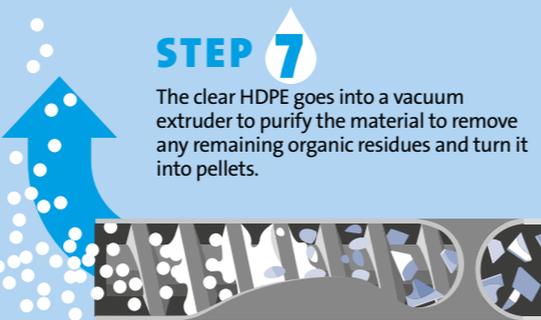
STEP 4
A dry wash takes place to remove bits of label using friction via a rotating drum.



STEP 9
Once processed, filled and packed, the bottles are once again ready for consumption in different points of sale.



STEP 8
The recycled clear HDPE is sent to big brand dairies to be made into milk bottles and yoghurt pots.

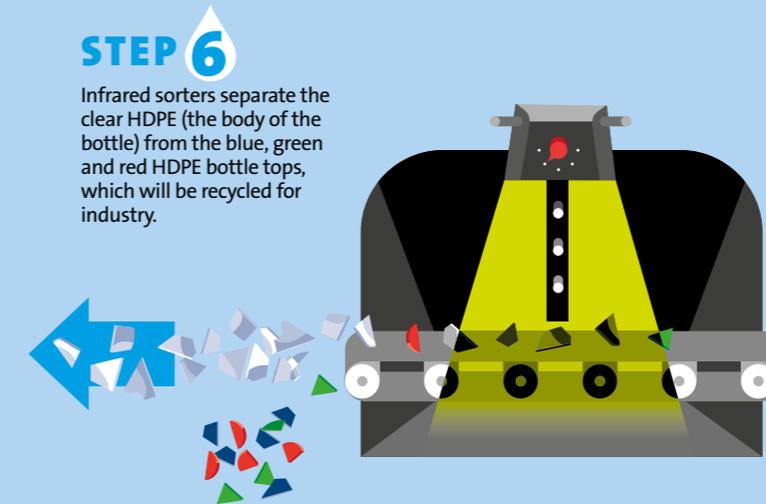


STEP 7
The clear HDPE goes into a vacuum extruder to purify the material to remove any remaining organic residues and turn it into pellets.



THE MILKY WAY IN 9 STEPS

With its three production lines, the Dagenham facility is able to recycle HDPE up to ten times.



STEP 6
Infrared sorters separate the clear HDPE (the body of the bottle) from the blue, green and red HDPE bottle tops, which will be recycled for industry.



STEP 5
A hot caustic wash uses detergent and water to clean the plastic.

300 million milk bottles arrive at the Dagenham facility each year.

10,000 metric tons of HDPE pellets are produced there to be made into new milk bottles.

3 vacuum extrusion lines are dedicated to HDPE production. 2 other lines will be used for PET production.

Approximately 25% of the plastics collected by Veolia from households are HDPE bottles.

The UK Plastics Pact aims to achieve three main objectives by 2025:

- 100% of plastic packaging shall be reusable, recyclable or compostable (eco-design);
- 70% of plastic packaging shall be effectively recycled or composted (repurposing);
- in the future, all plastic packaging produced shall contain 30% recycled content.



15/05

A Hall dedicated to research into plastic sorting and recycling

In Mantes-la-Ville, a few minutes from Limay Research Center, Veolia has owned a Research hall since 2016, equipped with state-of-the-art technologies for the sorting, conversion and recovery of plastic materials into secondary raw materials.

This modular and scalable research area has been designed to meet the Group's strategic concerns in terms of the circular economy. Following the remote-controlled sorting system I-Sort3R™ that

removes the need for operators to come into contact with plastic packaging waste, Veolia's Research & Innovation department is now developing smart automated sorting solutions. By testing sensors and cameras that can identify the different types of plastic and developing object recognition algorithms, the Group is looking to further improve sorting quality and automation. "The aim of the Hall is to design and study on an R&D scale tools for sorting and

converting a supply of waste. These tools incorporate robotics, artificial intelligence, digitization, sensor fusion, etc.," explains its director Patrick Legeas. "The idea is to design a logical sequence of actions, from the time the resource arrives at the site until it is transformed into secondary raw materials." In order to characterize these recycled raw materials as well as come up with new uses or designs, a laboratory and a reprocessing workshop — featuring a granulator, extruder

and injection molding machine — have been set up in the Hall with equipment that complies with the industrial standards of Veolia's manufacturing clients. "We dive to the heart of the profession of plastic manufacturer to understand their needs and provide them with a material that meets the required functions," explains Patrick Legeas. "In the laboratory, we identify the potential use that could be made of the new secondary raw material on an industrial scale."

The organization of the Hall

Veolia's researchers shaped and designed this 1,200-m² space themselves.

- A mechatronics area — combining mechanical, electronic and IT systems — equipped with two sorting lines to develop the automated systems of the future.
- A material analysis laboratory that specializes in converting plastic waste into secondary raw materials.
- A laboratory dedicated to research into ergonomics, health, and potentially sociology, to better adapt the operators' work.

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CHANGING TOGETHER

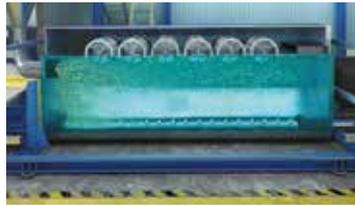
THE UNITED NATIONS CLIMATE CHANGE CONFERENCE MUST MEET A MAJOR CHALLENGE THIS YEAR: FINALIZING NEGOTIATIONS ON THE WORK PROGRAM FOR THE PARIS CLIMATE AGREEMENT, IN ORDER TO DEFINE PRECISE RULES FOR ITS APPLICATION IN 2020.



[HTTP://COP24.GOV.PL/](http://COP24.GOV.PL/)



NEW FILM



How and why, at a glance

Recycling plastic waste



You Tube
Veolia group
Channel