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Chemical Week

Circular approach

Assessing plastics prospects amid pressure to address waste challenge

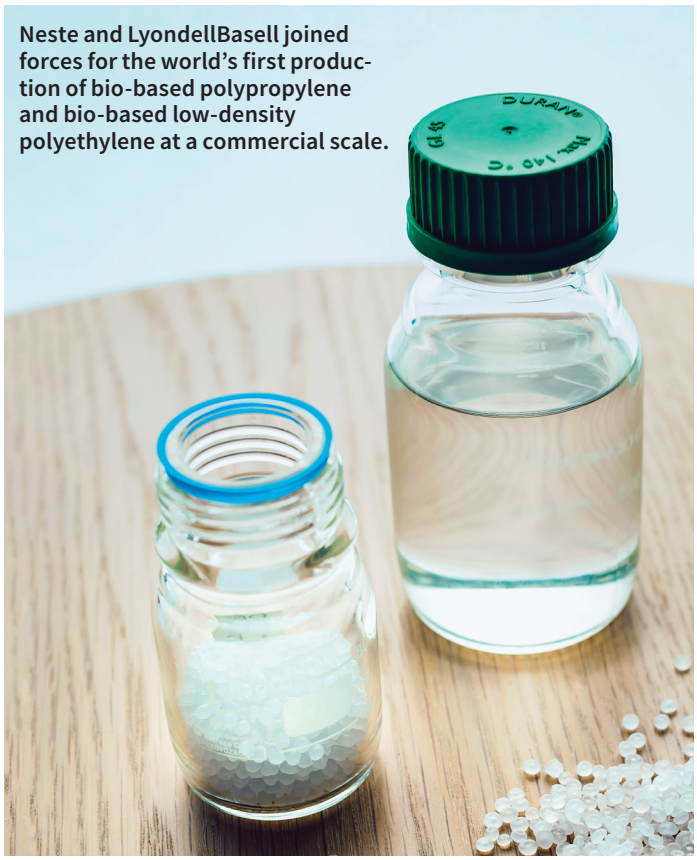
NESTE

Neste leads the way for **renewable and circular chemicals and plastics**

In addition to being the world's leading producer of renewable diesel from waste and residue raw materials, Neste is also a frontrunner in developing solutions for bio-based plastics and chemicals from renewable raw materials, and one of the world's firsts to explore ways to utilize liquefied plastic waste to replace crude oil in the production of fuels, chemicals, and new plastics. With its renewable and circular solutions, Neste aims to create a healthier planet for our children.

For more than ten years, Neste has focused on producing renewable fuels to replace fossil fuel use. It is nowadays the world's leading producer of renewable diesel and unique in that its renewable solutions are primarily based on waste and residue raw materials. Waste and residues account for 80% of the company's annual usage of renewable raw materials.

Neste's capability to purify and turn various low-quality wastes and residues into a wide range of high-quality products with its proprietary NEXBTL refining technology enables Neste to help its customers around the world to switch from fossil fuels to renewables and reduce greenhouse gas emissions by altogether approximately eight million tons CO_2eq annually. This equals the annual emissions of 3 million passenger cars or the carbon footprint of 1.2 million average EU citizens (Source: World Bank). This positive climate impact combined with the company's continuously improving sustainability performance in other areas, has helped Neste place third in the Corporate Knights 2019 Global 100 Most Sustainable Corporations list, marking the company's 13th appearance on the list – more appearances than any other energy company in the world.



Neste and LyondellBasell joined forces for the world's first production of bio-based polypropylene and bio-based low-density polyethylene at a commercial scale.

In order to contribute even more significantly to circular economy and global efforts to combat climate change, Neste is now focusing on providing renewable and circular solutions also to the aviation, polymers and chemicals sectors. Neste is a frontrunner in developing bio-based plastics and chemicals from renewable raw materials, and one of the world's firsts to explore ways to utilize liquefied plastic waste to replace crude oil in the production of fuels, chemicals, and new plastics.

Reducing crude oil dependence with renewable plastics and chemicals

Neste has developed a solution with which sustainability-oriented companies can start reducing their crude oil dependency and replacing conventional plastics and chemicals in various applications with renewable plastics and chemicals derived from waste and residues and sustainably-produced vegetable oils. Plastics produced from Neste's renewable hydrocarbons are of comparable quality to conventional plastics and can be used without limitations even in sensitive and demanding applications.

In June 2019, Neste and LyondellBasell jointly announced that the world's first parallel production of bio-based polypropylene and bio-based low-density polyethylene at a commercial scale had taken place. In the production process, the companies partly replaced fossil raw materials with Neste's renewable hydrocarbons to produce food-quality material. An independent third party tested the polymer products produced using carbon tracers and confirmed they contained over 30% renewable content. Neste's solution sets no limit, however, to the renewable content that the polymers could contain.

Chemical recycling – true circular solution for plastics

Over the past 60 to 70 years, annual global plastic production has increased exponentially. Statistics show that we currently produce more plastic per year than at any other time in history. Simultaneously, plastic waste has become a global challenge.

Despite the scale of the plastic waste problem, organizations like Neste are working towards solutions. Together with several partners, the company is developing chemical recycling of plastic waste with the aim of closing the circularity loop for plastics. This will help increase plastics recycling rate and reduce the need to use virgin fossil raw materials.

Aiming for capability to process annually more than one million tons of plastic waste by 2030

Though mechanical recycling is already prevalent in many countries, post-consumer plastic waste, particularly thin plastic films and

Neste's Renewable Polymers and Chemicals team develops both renewable and circular plastic solutions to reduce dependency on fossil resources and to enable more efficient recycling of plastic waste.

multilayer, colored plastics, has had little to no value in mechanical recycling and normally ends its life cycle at a landfill or in an incinerator.

Together with several partners, Neste is striving to complement the already existing mechanical recycling with chemical recycling, by developing value chains and technologies to collect and sort lower-value plastic waste to chemically or thermochemically process it to return to raw material stage. This liquefied plastic waste is material similar to crude oil, ready to be used in the refining and petrochemical industries.

Neste is exploring ways to utilize liquefied plastic waste in the production of fuels, chemicals, and new plastics. The company will conduct a commercial scale pilot to test the processing of liquefied waste plastic at its refinery already in the upcoming months, and by 2030, it aims to be capable of processing over one million tons of waste plastic annually. This is a significant amount considering that currently only three to four million tons of post-consumer plastic waste is actually recycled in Europe (Source: Plastics Europe, 2017).

Neste's ambition to give lower-value plastic waste a new life will contribute to developing new solutions to tackling the plastic waste problem, while also helping society to reduce its crude oil dependency. Chemical recycling can also provide a crucial component needed to meet the ambitious plastic waste related targets set by the EU to recycle 50% of plastic packaging by 2025, and 55% by 2030.

Neste's renewable and circular plastics solutions suitable even for sensitive applications

No matter whether new plastics are based on chemically-recycled plastic waste or produced from Neste's renewable hydrocarbons derived 100% from waste and residue oils and fats, these materials can be used without limitations even in sensitive and demanding applications (e.g. food contact, medical, toys, automotive). Replacing crude oil usage with these sustainable alternatives will reduce the need to use fossil oil. This will have a significant positive climate impact benefiting the entire planet.

Neste is driven by its purpose to create a healthier planet, and with the demand for plastic expected to have grown to four times its current size by 2050, its innovations could not come at a better time. ■

Neste in a nutshell

Neste is working towards creating a healthier planet for our children. Its business is focused on developing solutions for combating climate change and driving circular economy. The company is the world's largest producer of renewable diesel refined from waste and residues and is introducing its renewable solutions also to the aviation, as well as polymers and chemicals sectors. The company is developing ways to turn plastic waste into high-quality products and aims to become a significant solution provider for chemical recycling. In 2019, Neste placed 3rd on the Global 100 list of the most sustainable companies in the world.
Read more: neste.com

SONGWON

Supporting the plastics industry's **transition towards a more sustainable circular economy**

As the 2nd largest manufacturer of polymer stabilizers in the world, and a key global player in the specialty chemicals business, Songwon Industrial Co. Ltd., recognizes and embraces its responsibility towards the environment and society. Alongside other industry colleagues, SONGWON is committed to encouraging all players in the plastics value chain to shift from a linear to a circular economy and to seeking sustainable solutions that consider the entire lifecycle of plastics.

Olivier Keiser, Chief Sustainability Officer, Leader Procurement & International Supply, SONGWON Industrial Group

Chemical Week invited Olivier Keiser, SONGWON's 1st Corporate Sustainability Officer, to shed some light on SONGWON's sustainability strategy and how the organization is supporting the plastics industry to contribute to a more sustainable tomorrow, today.

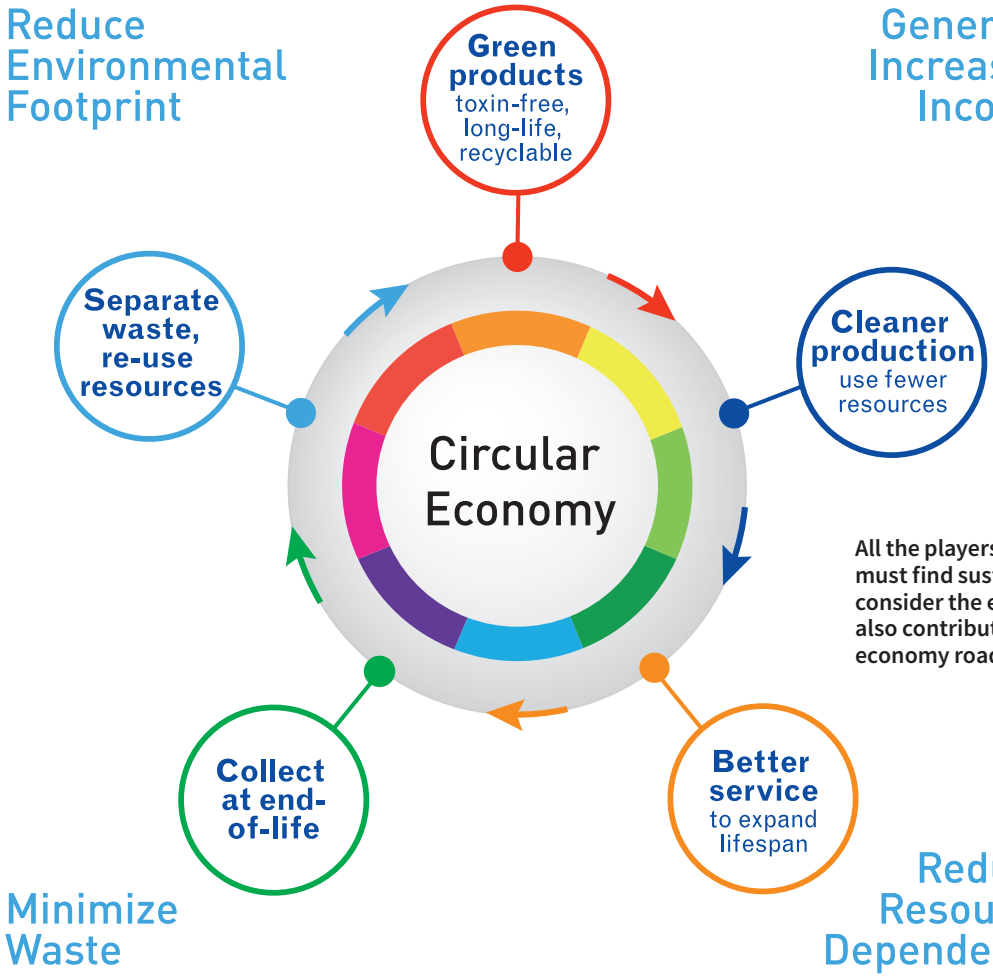
Question: Although the demand for plastics continues to rise, its detrimental impact on the environment is also increasing. Is there a future for plastics in the sustainable world of tomorrow?

Answer: Without a doubt! Plastics have changed the world and are instrumental to our modern lifestyles. They have become so integrated into all aspects of our daily lives that we often don't even realize that they are in almost everything around us. It's hard to imagine our world without them, and in fact it's virtually impossible to even go through one day avoiding plastic altogether. Due to their low-cost and incredibly versatile properties, plastics are the ideal material for many applications. It is the materials' convenience factor that has led to the dramatic global increase in plastic products over the past 70 years. Plastics are a valuable resource and banning them completely would not only be unachievable, it would actually be detrimental to mankind's existence.

Plastics provide us with a range of functionalities that cannot be easily or economically replaced by other materials, and items made of plastic have brought great benefits to society in terms of quality of life. By replacing metals in the components of manufactured goods, such as computers, car parts and refrigerators, plastics have positively contributed to making products more affordable, cost-efficient, lighter, safer, stronger and longer lasting. In packaging, plastics have overtaken paper, glass and cardboard, often offering higher protection and better preservation, as well as helping to reduce costs. Furthermore, plastics have played a major role in revolutionizing the medical industry by reducing the spread of dangerous infections, enabling donated blood to be collected in PVC bags instead of glass bottles which is safer and has increased the shelf life. Plastics are now the primary choice for such things as prostheses, hearing aids and high-tech machinery like MRI machines, not to mention that they have made slow release medicines possible. It's easy to forget that plastic materials have brought massive benefits to modern society.

Q. And what's behind its negative environmental image?

A. The real issue behind the global environmental debate is the uncontrolled and irresponsible way plastic is disposed of. To quote Erik Solheim, Executive Director of the UN Environment Program "Plastic isn't the problem. It's what we do with it." Preserving our planet and taking care of the environment is a non-negotiable, but when it comes to plastics, it is not just a black and white case of good or bad. We need to take a closer look at just how accurate our assumptions are, and whether the general perception of plastics being a highly critical modern problem is actually correct.



All the players in the plastic value chain must find sustainable solutions that consider the entire lifecycle of plastics and also contribute to developing a circular economy roadmap for plastics.

While it's obvious, for example that re-using a water bottle is a better choice for our planet than constantly buying plastic water bottles and throwing them away on a daily basis, it's still just one side of the story. We shouldn't ignore the fact that the environmental impact and cost of using plastics in certain consumer goods and packaging is nearly four times less than replacing plastics with alternative materials. For this reason, all players in the industry as well as governments should hold educated and solution-oriented discussions on the best alternatives between plastics and alternative materials from an environmental point of view. What is crucial is to focus our attention and efforts on the way we use and dispose of plastics and not just get entangled in the debate of whether or not they are good or bad.

Q. So, what kind of approach is needed?

A. Reducing plastics consumption in general, particularly single-use plastics, and reusing and recycling them whenever possible is one of the best solutions to the plastics problem. Policies banning single-use plastic products or making their recycling a requirement are a good starting point, but should not be the final and sole solution to addressing our plastic waste problem.

Although landfill mining has been done since the 1950s, more technologies need to be developed to address the millions of tons of plastic waste that still sits in landfills worldwide, and to turn these valuable used plastics into a multi-beneficial resource. To achieve this, it is essential that every player along the plastic value chain commits to ensuring that plastic doesn't become useless waste. In other words, plastics should continue to play a key role in our society, but plastic waste shouldn't.

For this to be possible, we need to reach farther than simply collecting it to recycle. This is of course important, but quite simply it isn't enough. All of us in the industry need to rethink what we put into the market and when we put it out there, we need to ensure that we gain the maximum use from it. Subsequent potential uses must be considered so that plastics design makes value preservation easy and enables reusability at a later stage. This means, for example, that OEMs address issues like using different plastics, or plastics and other materials, that make recycling complex or impossible. In addition, that polymer producers and additive experts like SONGWON develop additive package solutions that make it possible for plastics to endure the process and prevent degradation while in use, to ensure that they remain suitable for future recycling.

Tackling plastic pollution is a crucial task that must be resolved by all players involved – from the designers, manufacturers and retailers to the legislators and end-users. It also means seeking new materials, introducing innovations and implementing new business models while

(left to right) Christian Knappik, Key Account Manager / Business Unit Chemical Industry, RPC bpi nordfolien, Hwasik Jung, Ulsan Plant Manager, SONGWON Industrial Group & Cord Manegold, Global Business Manager Main AO's and Blends, SONGWON Industrial Group.

altering the "disposable-driven" lifestyles we've become accustomed to. For quite some time now, there have been numerous discussions in every corner of society and at all levels of business on the more efficient use of resources, waste elimination and circular economy. These are three of the major global challenges facing us today, and to ensure that future generations actually have a future; sustainable solutions must be developed quickly and implemented. At SONGWON, we want to use our influence and expertise, as a global company, to contribute to tackling these challenges. Alongside other players in the industry, we are committed to supporting the swift advancement of the circular economy in whatever way we can, including the way we develop, manufacture, use, recycle, recover or reuse plastic materials.

Q. In what way is SONGWON supporting the plastics industry make the transition to a circular economy?

A. As a global specialty chemicals leader, SONGWON recognizes the importance of its responsibility. We are deeply committed to reducing our impact on our surroundings, addressing local and global environmental challenges and striving to advance environmental sustainability. Consistent with our leadership position in the industry, we support the opinion that it's necessary for all players in the plastics value chain to contribute to the development of a circular economy roadmap for plastics, while also seeking sustainable solutions that take the entire lifecycle of plastics into consideration. How a circular economy approach benefits business and the environment is clear. Using materials more effectively means lower costs and less waste, new sources of value for customers and consumers, improved raw materials risk management and better supply chain performance.

At SONGWON, we have always looked beyond our organization and offered our expertise and experience to the plastics industry to support innovation and the search for new ways of recycling plastics more effectively. For example, by developing additives which contribute to further improving the quality of plastics for recycling, we can contribute to making the overall process more ecological, faster and more efficient. Additives and antioxidants are essential to the plastics value chain, in both virgin plastics and recycled plastic, regardless of whether chemical or mechanical recycling. In fact, without additives there will be no useful plastic materials. Furthermore, we aim to continuously improve our own performance by setting specific targets. At the same time, we are engaging closely and working with our business partners to develop more efficient processes for our industry and to launch sustainability-enhancing products and solutions to the market.

Q. What progress has SONGWON made so far?

A. We are already seeking to increase the contributions our products can make to help our customers develop more sustainable materials that are renewable or recyclable. Furthermore, we're doing our best to rethink the plastics waste challenge and making a closed loop for plastics an achievable goal. In order to succeed, we require the commitment all the way from the people who source our materials to our customers who not only care about their products first use but also to their entire lifespan. In our sustainability-driven era, meeting the ever-growing demand for recycled plastic materials is at the top of our priority list. SONGWON has been focusing its innovation efforts on developing solutions that help to maintain the value and properties of plastics. Take the automotive industry for example, our solutions support the development of stronger materials which require fewer resources, enable lighter weights, reduce emissions, extend the lifespan of plastics and subsequently reduce unnecessary waste. Using stabilizers interrupts plastics' natural degradation process through oxidation and leads to the creation of highly durable materials which can be processed at thermally high temperatures and can last for many years.

As a leading specialist in PP stabilization technology for recycling applications in the automotive industry, one of our additive solutions for improving the recyclability of plastics and making the process more ecological, faster and more efficient is our new stabilizer blend SONGXTEND® 2721, which was designed for use in automotive interior and under the hood parts e.g. battery cases. We will be launching this top-up stabilization system at K2019 and showcasing how it retains the quality level while re-stabilizing recycled-PP, improves long-term thermal stability (LTTS) performance and extends the service life depending on the recycle stream's quality. At K2019, we'll also be launching an entirely new family of flame-retardant synergists based on a proprietary technology designed to combine high performance with safety and sustainability. Another of our highlights at the K2019, will be our water-miscible antioxidant and light-stabilizer range developed to enable manufacturers to produce high-quality, durable and more sustainable coatings thanks to their excellent physical and technical properties.

Q. What has SONGWON achieved with its partnership approach?

A. The best way to tackle the big challenges facing the world is by working together with others. That's why we actively seek to join forces with other businesses and collaborate with partners. Contributing to plastics recycling is an important issue for SONGWON, its customers and the environment and has led us to seek out and enter into collaborations with various partners along the product value chain with an eye on the circular economy. A few months ago, we strengthened our long-standing partnership with Sabo S.p.A. They have recently launched the innovative light stabilizer system,

Items made of plastic have brought great benefits to society in terms of quality of life and provide a range of functionalities that cannot be easily or economically replaced by other materials.

SABO®STAB UV216 which provides greenhouse films with outstanding thermal and UV protection and a proven resistance to agrochemicals ensuring 2 or more lifetime years even in the presence of high concentrations of sulfur.

In addition to externally focused projects, we also look inside in a continual drive to improve and optimize processes. We seek to more efficiently source and use resources to reduce SONGWON's environmental impact and explore solutions to improve the recyclability of plastics. One of our most recent successes was our collaboration with the German innovative packaging specialists, RPC bpi nordfolien. By working together with them, we become one of the first chemical companies in the world to package its products in 20kg PE-bags made with 50% recycled PE which provide the same performance as virgin PE bags. Our target is to achieve 80% recycled PE while ensuring that the performance is not compromised in any way. Also, we are one of the first companies to be printing labels without ink using fiber laser marking technology for full label printing.

Q. What is planned going forward?

A. Throughout SONGWON's more than 50 years of history, we have learned to constantly prepare for the future and all the many changes it can bring. As our business is expanding around the world, so are our sustainability priorities and they drive our efforts to create value for the next generations. We consider it our duty to contribute something that will last, to act with environmental responsibility and to respect and preserve our world for the future. We've achieved a lot over the past few years, but there is still a lot more to do. This is a time of real change and there are many opportunities ahead for forward-thinking businesses to contribute to, and benefit from, the development of sustainable solutions and to a circular economy.

SONGWON's success has always come from listening to customers and transforming their needs into solutions that add value and helping them to overcome the challenges they face.

Our vision is to play our part in creating a better everyday life for people and to meet the needs of future generations. We fully embrace obligation to sustainability and through our pursuit of innovative technology and solutions we want to contribute to building a healthier, less wasteful and more ecologically sound tomorrow. ■