"Chemical Recycling Is Not yet Ready for Commercial Use"

Interview with Mercedes Alonso, Executive Board Member at Neste

Borealis, Clariant, Remondis, LyondellBasell – many of the big names in the plastics industry announced partnerships with Neste at, or in advance of, K 2019. The Finnish company is a sought-after partner in the industry. ***Kunststoffe*** spoke to Mercedes Alonso, Executive Vice President for Renewable Polymers and Chemicals, about what the partnerships mean and which chemical recycling technologies are most promising. In the interview, she also revealed why Neste purchases food residues for plastics production.

Neste, Espoos, Finland, is still a relative newcomer in the plastics industry. So far, it has concentrated on manufacturing gasoline, diesel, kerosene and heating oil from fossil and biological sources. But, since the middle of last year, it has also been active in the plastics industry, where it has attracted some attention. The company concluded high-profile collaborations with LyondellBasell, Borealis, Clariant, Remondis and Ravago in 2019. Neste controls its "Renewable Polymers and Chemicals" division from its German subsidiary, which it opened in Düsseldorf, Germany, in October 2019. ***Kunststoffe*** spoke to Mercedes Alonso, Executive Vice President for Renewable Polymers and Chemicals, about the company's future plans and the current state of play of chemical recycling.

Kunststoffe: *Neste has been heavily involved in chemical recycling for some time. Can you give us an overview?*
Mercedes Alonso: In chemical recycling, we take plastic wastes that cannot be mechanically recycled and liquefy them into hydrocarbons, which are then used for manufacturing plastics again. In this, we cooperate with different companies, who are also working on chemical recycling technologies. As a result, we want to combine these companies' expertise with our own in order to develop a commercially viable process as rapidly as possible.

Kunststoffe: *There are various chemical recycling processes in existence. What are you working on exactly?*
Alonso: We are not limiting ourselves to one technology, but testing various processes. At present, there are none on the market that are ready for commercial use. That is why there is no point in limiting ourselves to one or two processes.

On October 7, 2019, Neste opened its first subsidiary in Germany. From the office in Düsseldorf, Mercedes Alonso heads the company's German subsidiary, Neste Germany (© Neste)

Kunststoffe: *What processes do you consider particularly promising?*
Alonso: We have been working on chemical recycling for five years, and have analyzed a total of 50 different technologies. We consider six of them highly promising and can envisage also testing them with commercial amounts. Though which ones they are precisely, we don't want to disclose yet. We will release more details from the middle of this year.

Kunststoffe: *What plastics wastes are primarily involved?*
Alonso: We are principally working with plastic wastes that do not have much value in traditional mechanical re- »

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For manufacturing hydrocarbons from food waste, Neste uses waste oils and fats, from the food industry among others

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cycling, such as multi-layer packaging. Most polyolefins come into consideration as materials for this. Chemical recycling shows its strengths for multimaterial packaging in particular. They cannot usually be separated using mechanical processes, but can be easily chemically recycled.

Kunststoffe: *So you mainly deal with polyolefins?*

Alonso: Precisely. We investigated which materials produce the best results. That is the case with polyolefins. In addition, as I mentioned, they are often used in complex structures consisting of different materials, which cannot be separated using mechanical processes at present.

Kunststoffe: *Chemical recycling is usually presented as complementary, not as a competitor to mechanical recycling. Do you also see it that way?*

Alonso: Or course. There won't be only one process in the future. It isn't a question of whether mechanical or chemical recycling is the solution. There isn't just one solution. Instead, we need many methods to process the ever-growing mountain of plastics waste. It is also important to consume less plastic altogether. All these aspects play a role. If we also look at existing mechanical processes, they are already very highly optimized in certain areas. Chemical recycling is not necessary at all here. We should therefore concentrate on fields where it offers quite specific advantages.

Kunststoffe: *Where do you currently see the greatest difficulties with chemical recycling?*

Alonso: A major challenge at present is to build up the value chains. That means organizing the collection and separation of wastes, and then passing them on to the processors. Currently, not even 10 percent of plastics are recycled globally. So there is plenty of room for improvement. A profitable recycling system requires a constant and stable material stream. But this is lacking at present. We are therefore working with recycling companies such as Remondis and Ravago to test how and where such a stream can be set up. This is the condition for a functioning circular economy.

Kunststoffe: *With Remondis, you announced your intention to chemically recycle 200,000 metric tons of plastic waste per year. So you don't just have theoretical considerations but specific projects.*

Alonso: Exactly. We have plans for 200,000 metric tons. Access to raw materials at one end and chemical recycling processes at the other are closely interlinked. Remondis and Ravago will not just supply us with waste materials. We want to explore with them where chemical recycling is appropriate and how a functioning material stream can be set up, and then actually recycle the wastes.

Kunststoffe: *What does the demand side look like? Is there a particular interest in polyols from chemical recycling?*

Alonso: We are aware of a huge interest in renewable solutions. That applies both to manufacturers of branded goods and to polymer producers, since everyone is aware of the environmental problems. However, there are no large amounts of chemically recycled raw materials on the market yet. The first small volumes can be expected this year. I am certain that the demand will come as soon as relevant quantities are available.

Kunststoffe: *Chemical recycling is often met with a certain skepticism. For example, the EU does not recognize it for recycling quotas. Do you see that as a problem and do you expect it to change soon?*

Alonso: It is a problem, of course. Recognition would undoubtedly make many things easier. It could give a boost to recycling in general and speed up the development significantly. The law often acts as an important engine by either initiating changes or providing security by establishing a framework. We therefore work together with various associations and organizations to show that the different recycling methods each have their place. Each of them helps to reduce our dependency on petroleum and to stem global warming. With recycling, we are so still at such an early stage that we shouldn't rule out any method in advance.

Kunststoffe: *Besides chemical recycling, Neste is also working with bioplastics. You use waste fats and oils for this.*

Alonso: That's right. In our refineries, we can process around 15 different kinds of renewable raw materials, and we are continually expanding this portfolio. This includes vegetable oils as well as wastes and residues from different processes in the food industry. They can all be used for manufacturing bio-based plastics. With our NEXBTL technology, we convert them

into renewable hydrocarbons. We have already been using this process for a long time in the production of renewable diesel and kerosene. But it can also be used as a starting base for bioplastics. NEXBTL's strengths include the wide bandwidth of wastes and residues that we can use as starting materials.

Kunststoffe: *Where do these waste fats come from?*
Alonso: We work together with a global network of suppliers. For example, they collect waste cooking fat, used vegetable oil or oils and fats from food wastes, and supply them to us. We are one of the biggest purchasers of such wastes.

Kunststoffe: *Neste produces about 3 million metric tons of diesel from vegetable oils and food residues. How high is your capacity for bio-based hydrocarbons for plastics?*
Alonso: We only began producing them on an industrial scale last year. Therefore, the amounts are still fairly modest. I don't want to quote precise figures. We are not talking about millions of tons yet, but are moving in this direction.

> *"We analyzed about 50 recycling technologies. Six of them are highly promising."*
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> Mercedes Alonso

Kunststoffe: *Recently, you have entered into partnerships with Borealis, LyondellBasell and Clariant to produce bioplastics. What does this involve, exactly?*
Alonso: We supply bio-based feedstocks to all three companies. In the case of Borealis, for example, it involves the production of polypropylene. For this, we supply the company with 100 percent bio-based propane. With LyondellBasell, we performed a joint trial last year on producing bio-PE and bio-PP on a commercial scale. The quantity ran to several thousand tons.

Kunststoffe: *Are these long-term partnership or only one-off collaborations?*
Alonso: They are long-term projects planned to run for several years, not just short-term collaborations.

Kunststoffe: *What is your collaboration with Clariant like?*
Alonso: The collaboration with Clariant is particularly exciting, since it demonstrates that our bio-based materials are not only relevant for manufacturers of PE and PP, but can also be used one step further in the supply chain. Additives from Clariant are not mass products that are only used in large amounts for packaging or the like, but highly specialized chemicals for different applications. Our bio-based hydrocarbons are apparently also interesting for this. ■

The interview was conducted by Florian Streifinger, Editor.

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About the Interviewee

In September 2019, **Mercedes Alonso** took on the role of Executive Vice President for Renewable Polymers and Chemicals at Neste. At the same time, she became Managing Director of the newly founded German subsidiary, Neste Germany. Before joining the Finnish company, the Spanish-born manager was Marketing Director Advanced Polymer Solutions Europe at LyondellBasell. Before that, Alonso was Managing Director and Global Director Corporate Marketing at A. Schulman Inc. From 1993 to 2013 she worked for the US chemical company Dow, in various positions in sales, marketing and product management. Alonso studied chemistry at the University of Madrid and gained her masters there.