

PEF, the new kid on the block



By:
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The worlds-first international conference exclusively dedicated to PEF (polyethylene furanoate) and its precursor chemicals brought over 80 industry experts from 18 countries from all over the world to Düsseldorf, Germany. Over two days (Oct. 30+31) speakers and participants discussed the new up-and-comer on the horizon of biobased polymers. The grand opening of the Flagship plant of Diamond Sponsor Avantium just a week earlier heralded the next step on the PEF journey – finally, there will be substantial amounts of the material available to test its properties on applications and its behaviour on available PET machinery, which could be considered an older brother of PEF. However, not only in Europe things are moving for PEF, in China research and development of the new polymer is not lacking behind as Platinum Sponsor Zhongke Guosheng Technology demonstrated.

The conference consisted of 22 presentations split into 6 blocks including extensive Q&A sessions, as well as a panel discussion at the end of the first conference day. Audience participation during these sessions is often a good indication of both the quality of the presentations as well as the general interest in the overarching topics – and every single Q&A session was lively, some even kicked off discussions that had to be continued during the networking breaks.

One particular discussion in that regard was about “level playing fields” and legislation. The first block of the second day featured Silvia Maltagliati from the EU Commission (DG RTD) and, for better or worse, she was bombarded

with questions during the following panel discussion. One particular topic here was about EU regulation concerning the construction of new Plants. Multiple representatives of the industry lamented that the (incumbent) fossil industry has unfair advantages over the up-and-coming biobased industry. The argument, as far as I understood it, was that legislation to build plants was favouring the fossil industry as the current regulatory framework and restrictions are much stricter. Silvia countered that innovative systems are actually favoured in many regulatory frameworks, her argument, if I understood her correctly, was that the regulatory frameworks the conference participants were referring to are the same for both industries when it comes to building new plants. Arguing that these new regulations are unfair because already existing plants don't have to follow them (as they are often concerning the construction of these plants) is nonsensical. Yet, there are many regulations that are more lenient towards innovative technologies that are harsher for the incumbent industry.

Two different opinions and points of view seemed to clash here – on the one hand, innovative material producers feel stifled by many regulations which, in their opinion, lead to an uneven playing field, on the other hand, the EU Commission seems to believe that the way towards a level playing field is via market pull. The question here is, how to incentivise market pull for these materials, rather than a push of these materials via legislation. However, there definitely seem to be some issues with EU legislation when it comes to innovation, which Silvia admits herself saying that “innovations happen





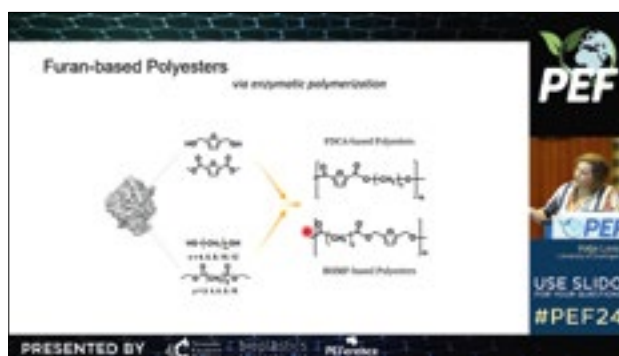
in Europe, but they don't stay in Europe and we are working on how to make Europe more attractive for investments in new enterprises."

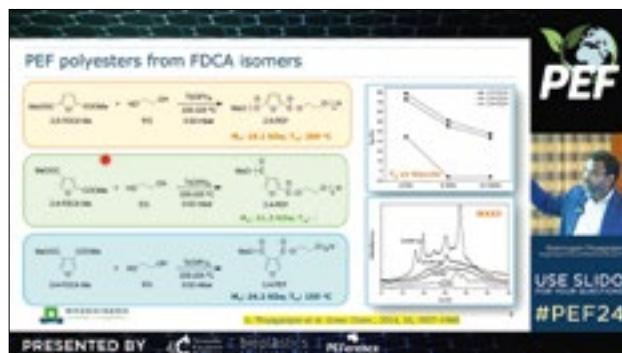
One point of discussion that came up was the difference between developing technologies for a new polymer (PEF) vs adapting existing (PET) technologies to the new polymer. Here Flavio Tollini (Sulzer Chemtech) pointed out that established systems are often highly specialised already and lack flexibility that is often necessary with a new material where changing parameters and fine-tuning might happen more frequently. Connected to the need for flexibility the conversation continued in the direction of "standardized polymer grades" for FDCA – here the flip side of flexibility surfaced, the variability that lies in the nature of different competing technologies to get FDCA. Here Tom van Aken (Avantium) commented that "it would be logical that at a certain point, the industry will have a common understanding of what *purified FDCA grade* means, but we are not at that point yet – because the qualities of the different technologies is not yet well understood." He pointed out that

once these technologies are working at scale these things should become clearer.

It is also interesting to see how communication about quality is approached by different players. When asked who has the better quality and better production cost between Sugar Energy and Zhongke Guosheng Technology, Bernhard Urwyler (representing the former) proudly proclaimed that "we are the best because we have the highest quality at the highest capacity – so we can deliver" while Susan Zhu (representing the latter) opted for a more diplomatic approach saying that she "does not believe there is a *best*, there will always be a *better one*, ultimately, the market will decide."

Of course, the question of price was raised, in specific if the Chinese producers expect the material prices to go down and become comparable to other bioplastics like PLA/PHAs. Susan pointed out that the price depends on many different factors, including the amount of material and the application it is used for, but they are confident that the price will go down as production volumes go up – price levels of PLA/PHAs 🇩🇪





should be possible. Bernard said that their price benchmark is PET rather than PLA as it is a more relevant comparison. He believes the price will eventually come down towards PET levels, saying that currently “PET is dirt cheap” and that one problem for PEF is high fructose prices.

Another point that was raised repeatedly was the differences between the Chinese and the European market. Bernard said that, from his perspective, Europe is in a leading position as legislation pushes companies to become more sustainable and establish *green products* in their portfolio – here both legislation and customers are pushing for/demanding these changes. Susan, on the other hand, pointed out that the main driver in China for PEF is the high bio-content, here policies and government guidance are trying to support companies willing to invest in these technologies. This very brief snapshot of the different markets might be summarised as a *carrot vs stick* approach – in the EU legislation *seems* to rely more on the stick while China prefers the carrot. However, that might be a gross oversimplification of very complex systems and legislative/policy approaches.

When talking about PEF it seems inevitable that many comparisons to PET will be made, and LCAs are, for better or worse, a way to assess different materials. When asked if it wouldn't make more sense to compare PET and PEF on a kg level rather than on a functional unit level Ángel Puente (nova Institute) replied, “Absolutely not – with a but.” He pointed out that “if a material has better properties you have to evaluate the core applications, you have to define the function, and you have to include all the properties – it would not be fair to compare PET and PEF on a purely kg by kg basis.” Yet, due to different prices per kg, these volume-based comparisons are often requested. Combining the LCA data comparing the materials on the level of functional units with the price per kg information makes informed decisions easier.

Another topic that was highly discussed was the use of enzymes during the production process, which is currently not done at scale, but according to Ortwin Ertl (Annikki) easily doable. He also pointed out that enzymes, due to their high selectivity, lead to very clean processes with no unwanted by-products. On the topic of enzymes Katja Loos (University of Groningen) also commented that while they *only* do what has already been done in other ways before – enzymes can usually also do it and “they often do it better.”

Notably absent from the conference were brand owners, even if many, such as Carlsberg, are already planning to use PEF in one capacity or another. One possible reason for this is one simple fact: they don't have anything to show yet – so everything they say could be considered speculation. Hopefully, this will change in the coming two years and in the second instalment of the PEF World Congress, planned for 2026 – will have more samples and examples of applications and products, preferably those actually on the market.

However, there were also many topics and discussions this review does not touch on. Such as discussions about different technological approaches, different fields of potential applications (from packaging to fibres), different end-of-life concerns – be it about PEF by itself or in combination with PET – and many more. In case this review made you hungry for more information you have two options:

1. Wait for the next PEF World Congress planned for 2026
2. Buy access to the recordings of the 1st PEF World Congress

The choice is yours – in any case, PEF is here to stay, and we stay curious about how it might change the plastic landscape in the future. ■

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