

# Bioplastics are developing successfully

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By-lined article by Harald Kaeb, Secretary General of European Bioplastics

*The development in the bioplastics market continues steadily despite the financial crisis and other challenges. The 4<sup>th</sup> European Bioplastics Conference, which recently took place in Berlin with a record number of 380 industry representatives, also provided a fresh blast of optimism.*

## Innovation on Track

Those who proclaimed the Internet revolution in 1998 and buried the bubble in 2003 will probably think today: Changes happen almost invisibly - evolutionary upheavals change society and industry, revolutionary events are an exception. Those who deal with new polymers in the plastics industry know: until a breakthrough in the market with its millions of tons as gauge, many years will pass by. According to an analysis by McKinsey, which Alexander Schwartz introduced at the 4th European Bioplastics Conference in Berlin this November, bioplastics like polylactic acid (PLA) are progressing according to schedule. The consulting company investigated how bioplastics fare during an early development phase in comparison to fossil-based plastics.

All innovations profit if the pioneer finds copiers. From a competitive point of view, this may not always be welcome, but with respect to dynamic and broad market development, it is practically unrestricted. New products often first leave their niche existence or emerge from the test phase once a second supplier enters the picture. Many users fear the risk of one-sided dependence. In addition, competition unleashes creative forces. Tasks and burdens are shared that otherwise solely rest on the shoulders of one manufacturer. For example, this concerns questions about the recycling of used products, labelling or others regarding the present legal framework or the desired promotion of new technologies and products.

## A greater bandwidth means more dynamic

Starch-based materials after all successfully conquered the first market niches, e.g. for biodegradable mulch foils or compostable bio-waste bags, because there were several suppliers of such products at an early stage. Today, Novamont and BioSphere are among the most successful pioneers in the bioplastics industry. At the conference, several PLA manufacturers now also introduced their innovations. The market leader and pioneer NatureWorks will soon have to deal with the PURAC-Sulzer-Synbra partnership in the field of foamed PLA products. In addition, Futerra, a joint venture of Galactic and Total Petrochemicals, as well as Pyramid Bioplastics will supply the market with thousands of tons of new PLA variants at the end of next year.

Parallel to the establishment of new capacities, a helpful 'system optimisation' can be achieved more easily: it starts with the provision of especially suited process and application aids by specialists, together with compounders offering customised solutions for specific applications. It is much easier to organise production waste recycling and provide the corresponding technology if the quantities are not incurred extremely thinned out. The same applies for products that may re-enter the economic cycle as potential post-consumer recyclates (PCR). This works well with PET in the meantime and makes a significant contribution to the economy and ecology. The same can happen for PLA in the future. Speakers and exhibitors at the conference showed that the

development is taking a successful course in many different areas. A growing number of companies dealing with special tasks in the added value chain and the rapidly growing number of products consisting of bioplastics are proof of this.

## **The boundaries between bio and fossil are blurred**

Those who think that the plastics industry will split into a "bio" and a "fossil camp" will probably be quite wrong. On the other hand, those who think that plastics could become much more sustainable by reverting more and more to renewable resources are right indeed. A significant example of the possibilities in this context is currently provided by one of the most famous brands in the world, Coca-Cola. Its 'Plant Bottle', of which two billion pieces are supposed to be produced next year for beverages, has a sugar share of up to 30%. The principle: take a polymer component which can be derived from renewable resources, to replace a fossil component. The multi-million ton chemical component ethylene can be obtained from bio-ethanol. This can be added to very different polymers as "bio-based element". Using the example of Coca-Cola, bio-based ethylene is chemically modified to ethylene glycol, a monomer and component of PET. Coca-Cola has already defined a future strategy for itself: increasing the share of renewable resources step by step. 100% is the ultimate goal, just like increased utilisation of non-food biomass and recycled materials. Making the first step and keeping a clear focus on your goal - that's the way to work in the world of bioplastics.

The plastics industry owes its success to an enormous degree of flexibility and the power of optimisation. No other material can even hope to keep up with the growth in the plastics market. One essential reason for this is that the components provided by chemistry are processed into an entire spectrum of polymers with the most varied functionality and optimum application properties. Now that fossil raw materials are becoming more and more expensive, and the dreaded climate change can only be combated by saving fossil carbon, the building blocks required for polymers can increasingly be derived from renewable raw materials. Whether bio-ethanol/-ethylene, lactic acid or succinic acid - this approach will not remain an idea, it is becoming reality. No less than four companies or alliances – BASF-CSM, Bioamber, DSM-Roquette and Mitsubishi Chemicals – announced plans to produce succinic acid from biomass using biotechnological fermentation methods. This C4 component is a suitable base product for numerous polymers and can be applied directly or chemically modified.

Other bioplastics companies like FKUR or Toray increasingly opt for compounding, meaning the deliberate mixing of different polymers and additives to generate new and improved application properties. This allows the production of mobile phones or vehicle parts, which would have been impossible with one polymer alone. In film processing, more and more companies combine different types of bioplastics with each other to produce better processing and barrier properties. One practical example: Novamont and Innovia Films cooperate to produce better packaging for sophisticated products from starch and cellulose-based biodegradable films.

Mixing bio-based with fossil monomers to yield 'new' polymers is a trend. The goal is, as numerous speakers and participants agreed: greater sustainability. This is not about completely eliminating fossil polymers or polymer components, which would also be illusory after all in the medium term. A 20% bio-based carbon share may represent a giant step in the right direction away from purely fossil materials. According to a recently published study by the University of Utrecht, it is theoretically possible to produce 90% of all polymers from renewable resources. The Brazilian company Braskem will write a new chapter in polymer history as the first world scale manufacturer of bio-based PE from sugar cane. Despite enormous investments and the financial crisis, the company is on course to start production in the coming year, as communicated at the conference.

## How to become more sustainable

Those who still think that they cannot afford more sustainability these days should have a closer look at the issue. Coca-Cola is not exactly known for wasting its resources on "green spleens", and nor is ALDI. The discounter, who has perhaps changed the shopping world more than any other retail chain in many European countries, is now also opting for compostable and bio-based carrier bags. No margin is sacrificed, and there are no subsidies. The supplier, Viktor GÜthoff & Partner, now sees good chances that other retail chains will follow this example. The Italian company UNICOOP Firenze also reported good results with compostable carrier bags made of Mater-Bi this year at the conference.

All innovators are familiar with the eternal discussion about costs and prices. However, it is still possible to "buy and sell" higher value materials if the product and the philosophy are coherent. Coca-Cola spokesman Cees van Dongen answered the question of a participant as to what extent the company would be willing to pay a surcharge for the more expensive bioplastics by saying that Coca-Cola could NOT afford to NOT offer such products as they are desired by more and more consumers. Apparently there is not much difference between novel flat screens and bioplastics: those convinced of the success in the market will invest.

Other users are still hesitant. One example stated at the conference is REWE. The company tested bio-based carrier bags prior to ALDI but was not able to decide on a permanent offer at first. Erika Mink of Tetra Pak knows why the company makes a clear commitment to using more renewable resources and already advertises this in widely aired TV spots. "Sustainability was always our guiding principle. We opt for sustainable forestry for the production of cellulose components used in our beverage packaging. We are looking for new bio-based plastics as a future alternative for the share of polymers in our packaging. Besides the sustainability of raw material resources, their recyclability is just as important to us so that we can use our raw materials as efficiently and as long as possible".

Many companies agree that the communication of environmental benefits must follow strict rules to avoid deception and disappointment. The instruments available to verify this, their strengths and weaknesses, and the factors that have to be observed in communication are of utmost relevance for the development of the industry. Life cycle assessment (LCA) may turn into a make-or-break for bioplastics companies, as European Bioplastics speaker Harald Kaeb pointed out. He urged the participants to engage themselves in the European Bioplastics Association to learn the methodology and communication of sustainability aspects. Thanks to the use of biomass, the bioplastics industry has an excellent "pole position". More recent LCA studies however show, that there is still much to do in this field.

A 'full-system approach' should be preferred and applied in LCA, say the experts. If a car becomes lighter thanks to plastics, it uses less energy throughout its service life. This effect is more important than the individual 'eco-balance' of the plastic itself. If more organic household waste is diverted from landfill because it is composted, a significant reduction of methane emissions is possible. If this is due to easy to handle compostable bio-waste bags, this secondary effect will more than outweigh the environmental burden stemming from the production of the biowaste bag.

A growing number of companies orient their strategies of action and product ranges based on environmental rating instruments and their results. Coca-Cola, ALDI and TetraPak are proof of this, but also less well-known companies. For example the film converter Alesco, who opts for bioplastics, records the carbon footprint of its bioplastics and completely compensates the CO<sub>2</sub> output. The aim is to reduce the carbon footprint completely to zero. Kaeb stated that this aim, which would be easier achievable by using renewable raw materials, would suit

the bioplastics industry extremely well. The risk however is that high expectations lead to excessive demands on behalf of the market or legislature. Isn't it ironic that green innovations are frequently challenged to analyse their environmental burden and prove their superiority whereas the market commodities are not? The development of bioplastics is still in the starting phase. The results of eco-balances may be strongly distorted by the low degree of optimisation and the often still very small number of producers. If questionable and partial results are taken out of their context and published, this may easily lead to a wrong image. Wrong handling may even turn eco-balances into innovation inhibitors. Despite all this: they are helpful to improve individual processes and help companies to focus on optimising their potential.

## What about the political dimension?

While the use of agricultural feedstocks for energy or biofuels production benefits from a strong political and legal framework, the material use is still practically without any support these days. It is an undisputed strength of the bioplastics industry that it is successfully advancing the marketing of its products in Europe despite partially obstructive framework conditions. It is also clear that positive regulations do not only improve the difficult competitive position, but can also help to remove obstacles, e.g. in the field of waste management and utilisation.

Peter Schintlmeister, Chairman of the ad-hoc Advisory Group for the EU Lead Market Initiative on Bio-based Products also confirmed in his speech: "The European Commission sees great potential in the market for bio-based products, which is still below its full performance at present. The lead markets initiative is designed to contribute to raising the potential and competitiveness of bio-based materials". Not just at a EU level, but also at member state level, innovative, bio-based products like bioplastics are increasingly moving into central focus. In Germany, the Biomass Action Plan For Industrial Uses also pursues similar aims; in France the environmental protection law "Grenelle de l'Environnement". Countries with a policy that is strongly focused on ecology like the Netherlands or Germany have already passed laws to this respect. There are discussions in the industry and in politics as to which measures would be desirable and which ones are not. "What helps us as an industry in the short term, and is undisputed, is the promotion of the transfer of information", summarises Kaeb. "We have to communicate our standards and labels." There is still a lack of knowledge on all levels when it comes to bioplastics.

## Time for Change

Almost everything points to the fact that bioplastics will continue the difficult yet successful path of all innovations. Most participants at the conference agreed with that. The industry, which is still young after all, profits from growing competition, new ideas and more players. It orients itself on sustainability aims, but should not be hindered by excessive short term expectations during its strive for optimisation. Public funding and a suitable legal framework are desirable, but the measures should not trigger negative side effects. Uncertainty and unawareness slow down market development. This is why information transfer between all involved target groups is key to success.

No one will deny to what extent the Internet has changed our individual lives and the economy. Information, advertising, business communication, our leisure time and shopping behaviour - all this is shaped "online", and increasingly lived or paid there as well. The process is more subdued as we might have thought at the beginning, but there is no stopping it anymore. Bioplastics will not revolutionise the world of materials in the short-term, but they have already started to change it.

## Curriculum Vitae:

Harald Kaeb is General Secretary of European Bioplastics, working as spokesman and political advisor. He studied chemistry at the University of Wuerzburg, Germany and obtained a PhD in 1991.

From 1992 to 1997 he was responsible for the evaluation and funding of projects at C.A.R.M.E.N. e.V., a non-profit association promoting the use of renewable raw materials in the Bavarian industry.

In the end of 1997 he founded *narocon*, a service provider for the bio-based products industry. Since 1993 Harald Kaeb is committed to the work of European Bioplastics, the representation of the bioplastics and biodegradable polymers industry in Europe. He was Chairman of the European Bioplastics Board from 1999 to 2009.

## Picture Proposals

### Pictures of Harald Kaeb



### Products



Coca-Cola Plant Bottle with a sugar share of up to 30%



The discounter ALDI offers compostable and bio-based shopping bags



Samsung Reclaim™ - 40% of the casing are made from bioplastics



Toyota Prius uses bioplastics for its car interior



Twinings' tea is wrapped in compostable film

## 4<sup>th</sup> European Bioplastics Conference



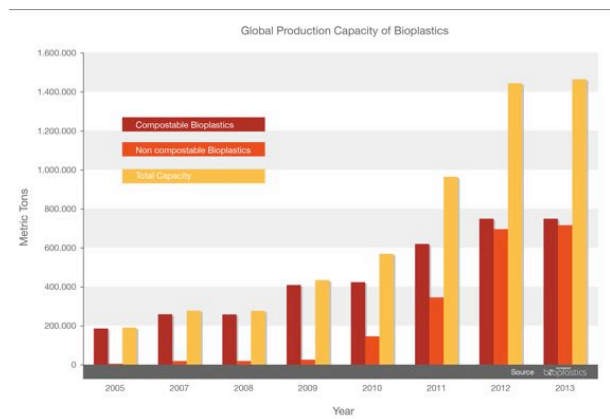
380 participants came to the 4<sup>th</sup> European Bioplastics Conference



Chairman of European Bioplastics Andy Sweetman welcomes the public



Future lab: Bioplastics: Panellists discussed the future of bioplastics. From left to right: Stefano Facco (Novamont), Cees van Dongen (Coca-Cola), Marko Schnarr (European Bioplastics), Rui Chammas (Braskem), Hans van der Pol (Purac), Hans-Josef Endres (University of Applied Science Hannover).



Development of Global Production Capacities of Bioplastics from 2005-2013

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