

Press release

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The state of the European bio-based economy is very mixed, the market is in a critical phase

Interview with Michael Carus, CEO of nova-Institute, on the development of the European bio-based economy and a shift towards a renewable carbon economy

Looking at the current state of the bio-based economy in Europe, one has to draw a mixed conclusion. Research and technology development continue to advance and some fields, like fine chemicals and cellulose fibres, are doing quite well. But actual implementation, especially in the chemical and plastics industries, proves to be difficult, in particular because a clear political commitment is missing. To replace fossil carbon in the entire petrochemical industry a new approach is needed. The bio-based economy must become part of an overarching renewable carbon strategy, in which it represents one crucial pillar.

Editor: Michael, to start us off: What is your general impression of the current state of the European bio-based economy?

Michael: Very mixed. Research and development are running at full speed, and biotechnology and chemical catalysts have continued to develop well in recent years. Despite low oil prices, the new technologies have never been closer to profitability than today. Pilot and demonstration plants can also be financed more easily than before. But implementation, especially in the chemical and plastics industries, is difficult. The political will for high-volume implementation is lacking, and in many European countries the focus is more on technology exports than on implementation at home.

Editor: And in which sectors are things going well?

Michael: Areas that are not in direct competition with petrochemicals. This is the area of fine chemicals, such as food ingredients, flavours, body care, cosmetics and pharmaceuticals. The new building blocks offer new functions and properties that petrochemistry cannot provide in this way. Such products are allowed to be a little more expensive – in such applications, consumers reward bio-based, natural products. The other successful area is cellulose fibres for textiles due to the high demand for biodegradable natural fibres to avoid microplastics – and cotton is not only environmentally problematic but also scarce and has little room for expansion. Cellulose fibres are the fastest growing textile fibre group with about 10% CAGR. Internally, we have taken these new developments into account by integrating a double session on fine chemicals for the first time at our major Bio-based Material Conference in May (www.bio-based-conference.com). We are also planning a large conference on cellulose fibres in February 2020.

Editor: And where is it going rather badly?

Michael: The rebirth of the bio-based economy in the 1980s had once begun to replace the entire petrochemical industry in the long term. Technologically, this would be possible today, but not without appropriate political flanking through quotas or taxes on fossil carbon. But politicians do not want to burn their fingers at chemistry: The chemical and plastics industries have considerable image problems and want to change little about their raw material base. At the same time, the use of food crops is politically taboo, even though starch and sugar crops are available at reasonable prices and do not endanger food safety. There are bottlenecks primarily in proteins. In Germany, good sugar beet locations are being phased out due to overproduction. Second generation sugar, on the other hand, will not get off the ground technologically or economically.

Looking back, it appears that the very strong research focus on biorefineries that produce fermentable sugars from lignocellulose on a large scale was a mistake. When new biorefineries are built in Northern Europe today, they mainly produce cellulose fibres (because of demand) or biofuels (because of subsidies). And we also see new concepts of small scale biorefineries.

Editor: And the biomass availability of the first generation is not a problem?

Michael: Of course, sustainable biomass will only be available to a limited extent in the future, despite all progress in efficiency and breeding, precision farming and digitalisation, without further endangering biodiversity. So, we will clearly not be able to cover today's consumption of petrochemical goods including fuels (with the expected growth rates) only by biomass. Both the supply and the demand side need to change: Mobility should quickly switch to electric and hydrogen engines, which will free up biomass. The same applies to the energy sector as a whole. This will allow enough biomass to be available over a long period of time for food, feed and parts of the chemical industry.

On top, there are now also other renewable carbon sources such as carbon capture and utilisation that will supplement the use of bio-based resources. These technologies can be used to produce fuels and chemicals using renewable energies. And that much more efficiently and on smaller areas than with biomass.

Editor: It would seem that the many roadmaps on the bio-based economy still paint a very positive picture of the future. What do you think about those kinds of initiatives?

Michael: That is true, but unfortunately, these roadmaps usually remain very general and are more of a research agenda than an implementation agenda. Concrete measures and instruments that would support a stronger market penetration are rare. Moreover, there are often considerable contradictions: while research and development are constantly developing and optimising new biodegradable plastics, the European plastics strategy then does not give them any credit in terms of contributing to the sustainable development. The market is currently in a critical phase: many companies have proactively invested in bio-based materials and products because they expected the legislator to take appropriate measures, but these are not yet coming. At the same time, criticism from NGOs rains down as soon as biomass is linked to land use. Now that policy is more focused on recycling, many companies are losing interest in bio-based. The fact that there are still success stories is due to individual brands that continue to rely on bio-based and to consumers who no longer want normal petroleum-based plastics.

Editor: Should we continue to rely on bio-based materials for a sustainable chemical future? What new strategies or alternatives do you see?

Michael: We should absolutely continue in this direction, because we need bio-based feedstocks to green the chemical industry. But we do need a new overall strategy. The bio-based economy must become part of an overarching renewable carbon strategy, in which it represents one important pillar.

Editor: What does that mean: “a renewable carbon strategy”?

Michael: Well, look at it this way: There is a clear and more or less consistent energy policy that aims to achieve a 100 % renewable energy system based on solar, wind, hydro and other forms of renewable energy. Apart from bioenergy, all of these deserve the term “decarbonisation”, which has become quite popular as a term for our future strategy. But there is no corresponding policy or strategy for the material sector, especially for the chemical and plastic industry (even though in the policy framework of the circular economy, “decarbonisation” is also mentioned for the material sector, which I don’t think is accurate or appropriate). The term decarbonisation is sheer nonsense for organic chemistry, which is based on carbon. It is used out of lack of knowledge and as a direct analogue to the energy field. We should NEVER use it in this context! But the term is not only nonsense, it is even risky because it avoids the question of the “right” carbon sources. And this is exactly what we have to provide. The chemical industry may only develop into a sustainable sector once it bids farewell to fossil raw materials such as crude oil, natural gas and coal for good and uses nothing but renewable carbon as a raw material in organic chemistry. The equivalent to decarbonisation in the energy sector is a transition to carbon from renewable sources in the chemical and plastics industries. It's the only way.

Editor: And what exactly would that entail?

Michael: Renewable carbon is a collective term that includes all carbon sources that avoid or substitute the utilisation of any additional fossil carbon from the geosphere. Renewable carbon can come from the atmosphere (through carbon capture and utilisation, CCU), biosphere (through biomass utilisation) or technosphere (through recycling or CCU) – but not from the geosphere. These are the only three sources of renewable carbon: Recycling, bio-based and CO₂-based.

All three carbon sources are essential for a complete transition to renewable carbon, and all of them should be similarly used by the industry and be supported by politics. We should avoid brother wars among the three with only one winner: Fossil carbon! To replace all the additional fossil carbon which would be extracted in the future, we need the smartest mix of all three renewable alternatives. We need a future materials policy – a policy on renewable carbon. Which of the renewable carbon options come into play should be decided by technology and market forces and not by policy. This depends on regional factors and concrete applications.

Editor: Sounds exciting, how is this new strategy accepted by industry and politics so far?

Michael: The strategy is slowly but surely spreading like a virus. It is always difficult to develop a cross-sector policy, especially as everyone sits in their lobby silos. And you have to accept that sometimes you have to share to win. In the meantime, we have been able to convince a number of companies and political forces that share our vision and are doing new persuasive work every day.

To make the topic understandable, we are planning a cartoon and a YouTube video this year. Everything will be published on our Renewable Carbon Platform: www.renewable-carbon.eu

About Michael Carus

Michael Carus (MSc) (Germany) physicist, founder and managing director of the nova-Institute, is working for over 20 years in the field of Bio- and CO₂-based Economy. The focus of his work are market analysis, techno-economic and ecological evaluation as well as the political and economic framework for bio-based processes and applications (“level playing field for industrial material use”).

Today, Michael Carus is considered to be one of the leading experts and market researchers in Europe on Bio- and CO₂-based Economy and especially the industrial material use of biomass. He is actively involved in building networks in the fields of agricultural and forestry resources, bio-based chemicals and materials (bio-based polymers, plastics and biocomposites) and industrial biotechnology and biorefinery. Mr. Carus is a member in many societies, associations and international organisations. Carus is consultant on policy in different countries in Europe, Asia and America.

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