Newsletter 01_2020

connecting partners
sharing information
gaining insights

Welcome to the first issue of the Newsletter BIO-PLASTICS EUROPE

This project has started and is gaining momentum. The constant exchange of information is crucial for the coming years. With this newsletter and through many other channels, we are bringing together all project participants to share results, successes and setbacks.

It is important for the BIO-PLASTICS EUROPE project that there is no "house opinion", but on the contrary each project partner contributes with his own words to the formation of opinion by all. That is why you will find four very different assessments from project partners in this newsletter, in addition to a short report from the kick-off meeting in Hamburg. There is room for the big picture as well as the small details - enjoy reading.

THIS ISSUE

BIO-PLASTICS EUROPE Kicks-off

By Dr. Jelena Barbir (Hamburg University of Applied Sciences, Germany)

The BIO-PLASTICS EUROPE project has been launched. On the 28th and 29th of October 2019, more than 100 players met in Hamburg for the big kick-off. Key objectives were identified, responsibilities were distributed among the partners, and time schedules were established. In the weeks to come, the final preparatory work will be completed, and the project will enter its implementation phase.

The topic of the project is "Sustainable solutions for bio-based plastics on land and at sea". The high number of participants in the kick-off meeting alone shows the relevance of the topic. Both scientific and private organizations see the great interest of stakeholders in bio-plastics. Therefore, the topic comes at exactly the right time with its launch in October 2019, and its duration until September 30th, 2023.

The project is funded by the research and innovation program, Horizon 2020, of the European Union under the funding number 860407. Twenty-two partners have joined forces in a strong consortium. Most of the partners are from the EU, with one partner from Malaysia. During the project period, the partners, together with their stakeholders and associated partners, will carry out studies and tests on innovative bioplastics and/or their exploitation, processing and use in order to achieve the main objective:

"The development of sustainable strategies and solutions for bio-based plastic products, as well as the development of approaches focused on circular innovation for the whole bio-plastics system. These may be deployed to support policy-making, innovation and technology transfer".

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At the kick-off in Hamburg, the framework for the project was defined: all partners and two EU officers met for the general assembly. The scope of the topic was defined based on presentations, so that all partners were on the same page. On the first day of the meeting, each of the eight work packages was introduced by the respective work package leaders. The technical topics led to many further discussions, just as current topics were discussed in small groups between the units. There was a lot of exchange between the partners, creating a strong network.

On the second day, external stakeholders with an interest in bioplastics also took part in the conference. This open kick-off meeting was organised in order to bring further new and interesting aspects from outside into the discussion.

Improving Plastic Management: a version of Circular Economy that works

By Mooreyameen Mohamad (Heng Hiap Industries Sdn Bhd, Malaysia)

The plastic industry faces the challenge that the attitude towards plastic is increasingly negative. But still plastic is often the most suitable material - also in terms of environmental compatibility. A circular economy can improve plastic management.

The signs are everywhere and it's not just the rejection of plastic. Egg cartons, and plastic bags are also out. This trend of material replacement by customers is obviously damaging to the plastic industry as their customer base shrinks. Nevertheless, plastic is still the most desired or necessary material.

In addition, governments are either banning single use plastic or thinking about introducing plastic tax. The UK will introduce a plastic tax in April 2020, while the EU will ban single use plastics by 2021. Many other jurisdictions are likely to follow. While plastic bags don't represent a large portion of the total amount of plastic used in society, the trend of banning plastic is likely to continue and spread.

Producers are expected to alleviate the plastic problem. Extended producer responsibility programs are already in place in many countries. However, it comes at significant cost. While rich countries may manage this, developing countries are likely to struggle. In response to these market trends, Heng Hiap Industries have spent significant amount of resources to develop a traceability program on our waste plastic collection supply chain. Customers have responded positively to the traceability program. The plastic manufacturers share our vision: the only way to manage plastic pollution and regain consumers trust is to recycle.

After all, plastic is not the enemy, but mismanaged disposal of plastic is. With the traceability program, we can demonstrate that by choosing recycled plastic, we directly reduce the amount of waste plastic in the environment.

The 4C programme is the HHI Plashaus version of the fabled circular economy: it is simple, collaborative and it works (Figure 1). In addition, HHI has joined with KIAN Furniture (Malaysian company based in China) to create the Louvre chair using Plashaus Ocean Plastic, which was exhibited in the 2019 Shanghai International Furniture Fair to great response (Figure 2).

We have also worked with Sime Darby Plantations to convert their used fertilizer bags into plastic resins. The resins were ultimately turned into plastic chairs. Each consumer product tells a story of recycling and the circular economy, and how collaboration between businesses and consumers can make a difference, instead of completely rejecting plastic.

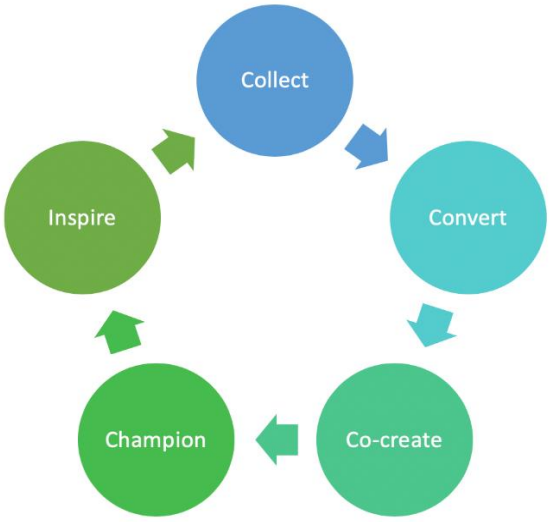

Figure 1: Heng Hiap Industries 4C Pro-

Figure 2: Louvre chair

New Era of Biodegradable Polymers and Biocomposites

By Ari Rosling and Marjo Ketonen (Arctic Biomaterials LTD)

Arctic Biomaterials LTD (ABM) developed sustainable alternatives to several oil-based technical plastics. In the project ABM will develop and test bio-plastics applicable in toys and cutleries.

In recent years, bio-based and biodegradable products have raised great interest. Arctic Biomaterials LTD (ABM) is a company producing bio-based and/or biodegradable compounds from renewable resources and bio composites reinforced with ABM's unique proprie-

tary degradable glass fibre. The proprietary bio erodible glass fibre compounding technology, increases the ABM bio-based composite materials heat resistance and mechanical properties to new levels, and opens a variety of possible application areas in fields where (semi)-durable technical plastics are being used.

Typical end products may range from semi-durable consumer goods, to products with shorter life-spans, which can either intentionally or unintentionally end up in nature. The product range is optimized to meet value-propositions such as high bio-based content, compostability and safety as food contact material. Arctic Biomaterials LTD is strongly committed to provide high-quality products and services that fulfil the requirements of our customers and comply with applicable regulations. Our quality management system is in accordance with ISO 13485 for medical product line and ISO 9001 for technical product line.

In the Horizon 2020 financed Bioplastic Europe-project ABM especially develops and tests new biodegradable, bio-plastics, and composites which are suitable and comply with regulations for applicability in toys and cutleries. The novel materials are further studied for their degradation in various habitats and recyclability by partners in the project. Furthermore, aspects of sustainability, circularity and economic feasibility are of high priority in ABM's product development. Life cycle assessment (LCA) is conducted early to evaluate the material selection, manufacturing process, and supply chain length environmental impact. The LCA used at ABM is based on principles and approaches outlined in ISO. The figure 3 depicts a comparison between the Global Warming Potential (GWP) of a traditional glass fibre, reinforced fossil-based polypropylene composite and a bio-based ABM glass fibre (GF) reinforced grade with similar or even superior properties.

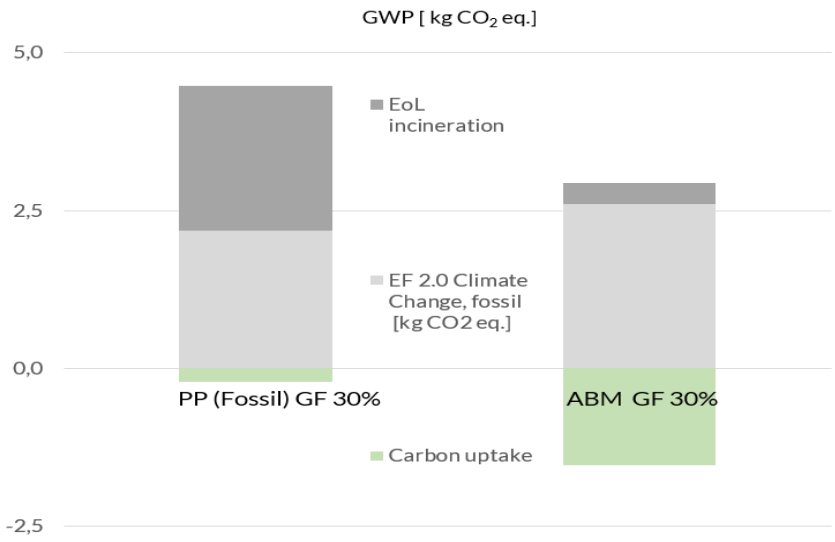

Figure 3: GWP for two GFRP materials, a fossil- and a bio-based ABM alternative (Environmental footprint v2 database, GaBi)

Testing New Materials - Degradability and Environmental Compatibility of Bioplastics in the Oceans

By Reinhard Saborowski, Lars Gutow, Lukas Miksch (Alfred Wegener Institute, Germany)

Marine organisms may help to gain insights on biodegradability of bioplastics and even act as indicators of their environmental compatibility.

The global plastic production is rising at an alarming rate, exceeding the capacity of our waste management systems to handle the concomitantly accumulating amounts of non-degradable synthetic debris. Meanwhile, we encounter plastic debris in almost every natural environment from the atmosphere down to the deepest ocean. Wildlife is suffering from plastic pollution because animals and plants simply cannot avoid contact with these contaminants, which are spreading too rapidly throughout habitats to allow for evolutionary adaptation.

Plastic debris has obvious detrimental effects. Ingested plastic items can injure or clog digestive organs leading to serious malnutrition. The fragmentation of plastic objects, produces countless microplastics, which are taken up by the smallest animals and propagated through food webs to top-consumers, including humans. When carried over extensive distances by ocean currents, floating plastic debris facilitates the spread of species, pathogens, and diseases.

To reduce the accumulation of plastics in the environment, bioplastics are being developed as an alternative to conventional synthetic polymers. Bioplastics are either biobased, biodegradable or both. Biodegradation of bioplastics is most efficient in industrial composting plants and may reduce the problem of long-term persistence of plastics in the environment. Unavoidably, bioplastic debris will also escape into the environment. Unfortunately, the biodegradability under natural conditions is as yet insufficiently investigated, especially the effects of bioplastics and their degradation products on animals and plants.

We are a team of marine biologists, including physiologists and ecologists. We are studying the diverse interactions of marine biota with plastic debris. Within the Bio-Plastics Europe project, we received funding from the European Horizon 2020 program to investigate whether marine organisms can contribute to the biodegradation of bio¬polymers. We will experimentally test the catalytic potential of digestive enzymes from North Sea species, to break down selected biopolymers (Figure 4).

Additionally, we will modify the environmental conditions in our experiments, such as temperature and salinity, in order to understand the interplay between biological and physical drivers of polymer degradation. Finally, we will consider marine or-

ganisms as indicators of environmental compatibility of bioplastics. Microscopic particles of bioplastics and degradation products thereof will be tested for their effects on the performance of organisms. This project will generate a deeper insight into the biodegradability of bioplastics and their environmental implications, to evaluate the usefulness of bioplastics as an alternative to conventional plastics.

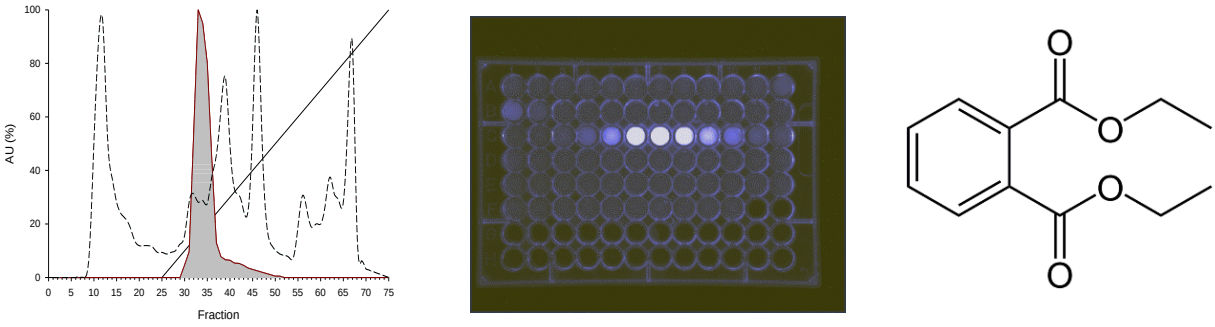

Photo: Alfred Wegener Institute

Figure 4: In vitro assay of bioplastic degrading enzymes

Bioplastic for Future – the Hunt for a Promising Material

By Katrin Weinhandl and Carina Frank (Austrian Centre of Industrial Biotechnology, Austria)

In Austria a team from Austrian Centre of Industrial Biotechnology (ACIB) is working on the development of a compostable or recyclable multilayered film material.

Even prior to the movie "Planet Plastic", humankind was aware of the huge problem of plastic waste and microplastics. Researchers and innovators are eager to face the challenge and to find sustainable solutions in this field. One of the most promising approaches in the fight against plastic floods is the development of bio-plastics.

Bio-plastic is defined in two ways: it means plastics derived from renewable resources, such as sweet corn or sugar cane on the one hand, and bio-degradable plastic compounds that are not necessarily derived from renewable resources on the other. The objective in Bio-Plastics Europe is to combine these two aspects and to develop innovative bio-based (non-fossil fuel sourced) products that can be recycled AND are biodegradable at the end of their lifetime. This will improve the environmental footprint of packaging while keeping the materials as resistant as petroleum-based polymers.

Some biopolymer compounds have become highly relevant for plastic

production, especially, polyhydroxybutyrate (PHB). PHB is a bio-derived and bio-degradable bioplastic compound, that is UV stable and able to withstand high temperatures, showing good resistance to moisture and providing a good barrier for aroma compounds. This makes PHB an ideal packaging material. For this reason, PHB and the entire superordinate group of polyhydroxyalkanoates (PHA) are the research target for the Bio-Plastic Europe partner ACIB, the Austrian Centre of Industrial Biotechnology. ACIB is specialized on biocatalytic and biotechnological processes and one of its research groups brings along a long-standing expertise in the design of functional polymer materials. Furthermore, ACIB has found a sustainable method to produce PHB by feeding a microorganism called Cupriavidus necator with greenhouse gas as the carbon source.

During the project, the ACIB research team will contribute its know-how for developing a multi-layered film material, which is compostable or recyclable, based on a defined mixture of bio-degradable polymers. More precisely, PHA will be blended with a compound called PHB/polyhydroxybutyrate-co-hydroxyvalerate. This is achieved by using a twin-screw extruder, which is a special device for connecting these two compounds. The addition of plasticizing additives can help vary the crystallinity and degradation of the final blends. A special focus will be laid on testing efficient biodegradability by applying selected depolymerases.

Subsequently, the developed material has to pass several tests in terms of functionality, compostability, stability or aroma permeability for example. At the end, the material has to meet the ambitious demands of a biodegradable, food packaging material.

Thank you for reading!

We hope that you have enjoyed our first edition of the newsletters and that you will follow us in the future!

If you still did not do it, please subscribe to our newsletter at:

www.bioplasticseurope.eu/newsletter

Sincerely yours,

The BIO-PLASTICS EUROPE Project Team

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BIOPLASTICS EUROPE project website: www.bioplasticseurope.eu