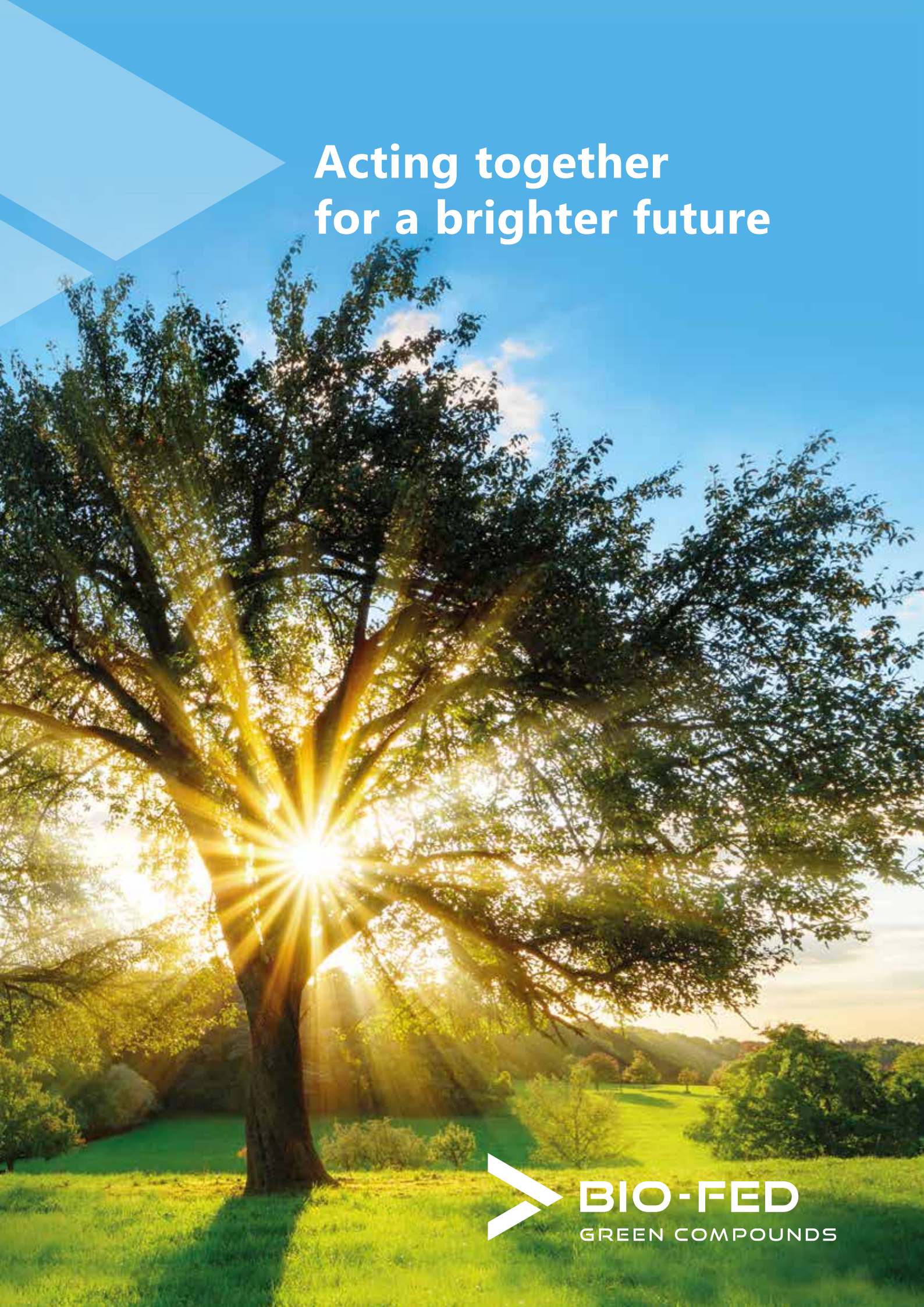
Acting together for a brighter future



BIO-FED
GREEN COMPOUNDS

Your added value through our global plastics expertise

BioCampus Cologne – one of Germany's largest biotech parks, Cologne.

BIO-FED was founded in October 2014. Since then, we have been producing and marketing biodegradable and/or biobased compounds under the brand name M·VERA®.

The portfolio was expanded with ISCC PLUS and REDcert² sustainable-certified M·BIOBASE® compounds made from biomass-balanced polypropylene.

Global market coverage of BIO-FED

With our competent team of plastics experts with many years of experience, we are at your side at our company headquarters at the BioCampus Cologne in Cologne – as well as on-site at your production facility if required. As professionells in the field of bioplastics, we offer you customised solutions for your applications – in addition, we have suitable biopolymer-based colour, black and additive masterbatches in our range as well as masterbatches based on biomass-balanced carrier materials.

BIO-FED is part of the international Feddersen Group, which is headquartered in Hamburg. Our compounds and masterbatches are produced within the Feddersen Group and at qualified partners. Our company name BIO-FED combines our activities in the bio area with being part of the Feddersen Group.

The Feddersen Group headquarters in Hamburg, Germany.

The Feddersen Group has its origins in K.D. Feddersen & Co., a trade firm for chemical products founded in 1949 by Hamburg merchant Karl-Detlef Feddersen. The divisions in the Group focus on distribution in chemicals and engineering products worldwide, representing renowned companies in the chemical, investment and consumer goods industries with their own branch offices in Europe and throughout the world. In addition to foreign trade, the alliance today is engaged in the worldwide distribution and production of plastics, the stainless steel trade and mechanical engineering.

Through our partnerships with other divisions in the Feddersen Group and our use of a global distribution network, we are able to offer you global service, providing you with added value. We operate four production sites on three continents with access to the major sales markets.

K.D. Feddersen Holding GmbH is the proprietor of the divisions in the Feddersen Group. Their sole shareholder, the non-profit K.D. Feddersen Foundation, operates an assisted-living facility in Hamburg. Our profits go primarily towards supporting the work of the foundation.

Our services at a glance

With over 50 years of experience in the plastics industry, we offer within our corporate alliance expert advice, customer-focused service and a sales and distribution operation performing to the highest standards, as well as:

- Expert knowledge in the area of bioplastics
- Research and development in our in-house laboratory
- Global raw materials procurement
- Broad portfolio of biodegradable and/or biobased as well as biomass-balanced compounds
- Expertise in global order processing and logistics
- Flexibility of a customer-focused compounder with state-of-the-art compounding
- International sales team and team of engineers
- Assistance with product development, material selection and processing
- Bioplastics trainings on-site at your facility

Sustainable M·VERA® products for our environment

Bioplastics are plastics which are biodegradable and/or produced based on renewable resources (biobased).

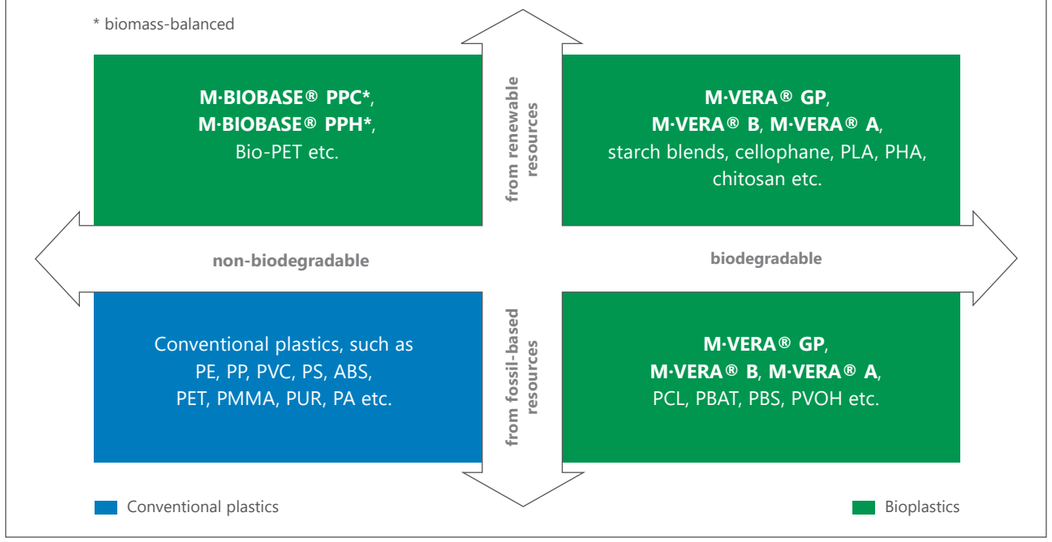
We distinguish between:
- Biobased and non-biodegradable
- Biobased and biodegradable
- Non-biobased and biodegradable

Depending on the chemical structure of a biodegradable plastic, it can degrade in various environments.

Biobased plastics can be manufactured on the basis of plant starch or sugar, for example. Production of such biobased plastics is not in competition with food production. According to European Bioplastics e.V., the area used for the production of bioplastics will be around 2.9 million hectares in 2026. This corresponds to approx. 0.058 % of the global agricultural area of approx. 5 billion hectares.

Bioplastics have properties similar to those of conventional fossil-based plastics and can be warehoused in a comparable manner. They are processed on commercially available plastics machines. Below you will find a chart showing a selection of conventional bioplastics. The coordinate system is sorted according to raw material source and degradability.

Bioplastics coordinate system

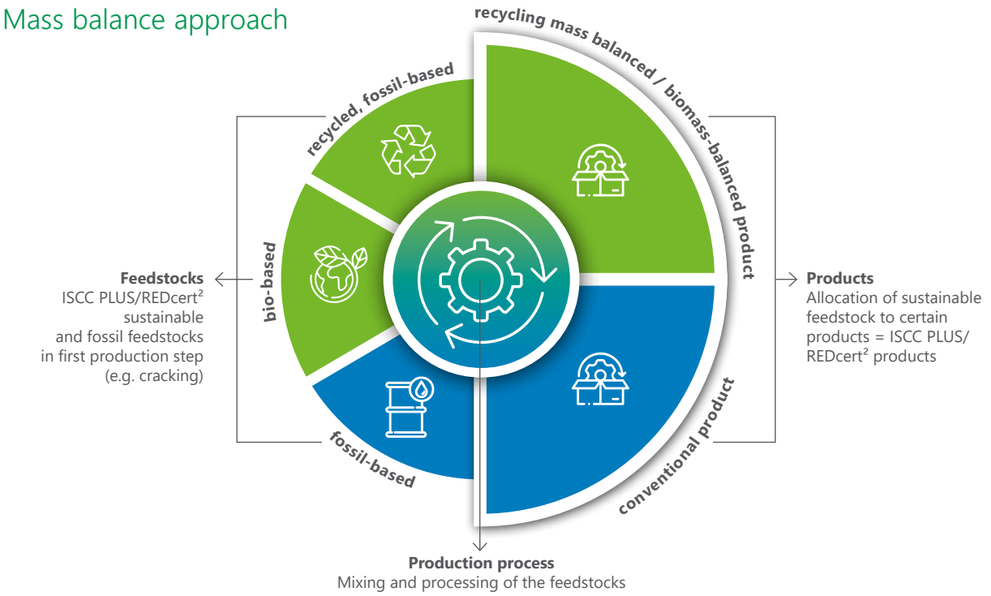


We are hearing more and more about biomass-balanced plastics. Since the value chain of products in the chemical industry is often very complex, the mass balance approach is used to be able to track the sustainable material flow in a simple way.

We use the allocation factor to show how much biomass and/or recycled material is allocated to the certified product. The allocation factor indicates the proportion of fossil resources that have been replaced by biomass and/or recyclate in the value chain of the material. It is given as a percentage (max. 100 %) and refers to the organic share of the product. The correctness of the allocation is confirmed by ISCC PLUS or REDcert² certification.

The principle behind this is similar to that of green electricity:
The consumer does not know whether the electricity from his socket is generated directly from renewable energies. However, the electricity provider is obliged to feed the corresponding amount into the power grid. Overall, this increases the amount of green electricity. Similarly, the use of sustainable materials is increasing in the chemical industry.

Mass balance approach



Some standards and certificates for bioplastics

No product is created to last forever. At some point, the question arises as to what will happen once it reaches the end of its life cycle. For bioplastics, there are various end-of-life scenarios. One of these is biological degradability in different environments, such as an industrial composting facility, in household compost, in the ground or in the waters.

Independent testing institutes are charged with measuring the degradability and/or biobased content and confirm this by awarding a certificate. This provides market transparency and serves as orientation for customers and consumers. Amongst the most important certification institutes in Europe are TÜV AUSTRIA (Belgium) and DIN CERTCO (Germany). In North America, it is the BPI institute. Materials which do not exceed the prescribed heavy metal limits and which biodegrade within a defined period of time under the conditions of industrial composting are given an “OK compost INDUSTRIAL” certificate according to EN 13432. This involves testing a specimen made from the material with a defined sample thickness. Finally, a plant growth test (ecotoxicity test) must be successfully completed. Many of our prodcuts are e.g. certified “OK compost INDUSTRIAL”, “OK compost HOME” or “OK biodegradable SOIL”.

We perform our own tests to verify the soil degradability of our materials.

Our contribution to the future

Bioplastics – the sustainable alternative

Bioplastics are already available in a broad, market-ready selection for a variety of applications. These are used to develop innovative, alternative solutions aimed at reducing dependency on fossil-based raw materials. The carbon footprint of biobased products is thus improved, due to the fact that the plant-based (biobased) raw materials have already removed CO_2 from the environment during their growth phase. Bioplastics also allow for additional methods of disposal and recycling, thereby lessening the burden on our existing waste systems and thus also the environment. The packaging industry is currently one of the largest users of bioplastics, but these materials provide interesting perspectives for many other applications and are attracting increasing interest.

The reasons for this are as follows:

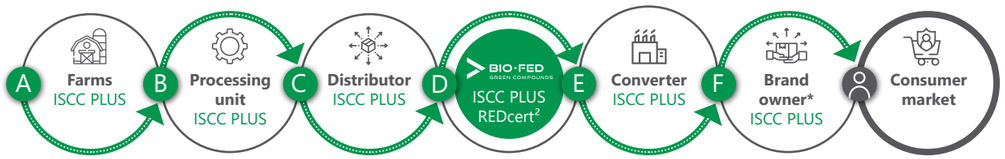
- Growing environmental awareness of society and a demand for sustainable, environmentally friendly products
- Legal requirements such as a ban on plastic carrier bags in a number of countries
- Biodegradability as additional uses such as flower pots which are planted along with the plant and then biodegrade in the soil
- Reduction of waste through the use of bioplastics

Sustainability certifications ISCC PLUS and REDcert²

ISCC PLUS and REDcert² are leading sustainability certification systems for biobased and recycled materials in the chemical industry (among others based on vegetable oil/fat waste or recyclate). By using sustainable material flows, BIO-FED contributes to the saving of fossil resources or to the promotion of the bioeconomy and circular economy.

ISCC PLUS and REDcert² certifications ensure the traceability of the sustainable material flow along the entire value chain. Every chain element up to the production of the final product is certified (chain-of-custody certification), allowing the product to be labelled as sustainably certified to the end consumer. Chain-of-custody certification guarantees that the raw material sources are certified sustainable. Certified waste streams are audited to ensure that they are not intentionally produced or contaminated to be considered waste. Certain sustainability requirements also apply to the agriculture of arable crops. Ecologically and socially sustainable production is thus guaranteed in accordance with the requirements of ISCC PLUS/REDcert².

Exemplary ISCC PLUS supply chain

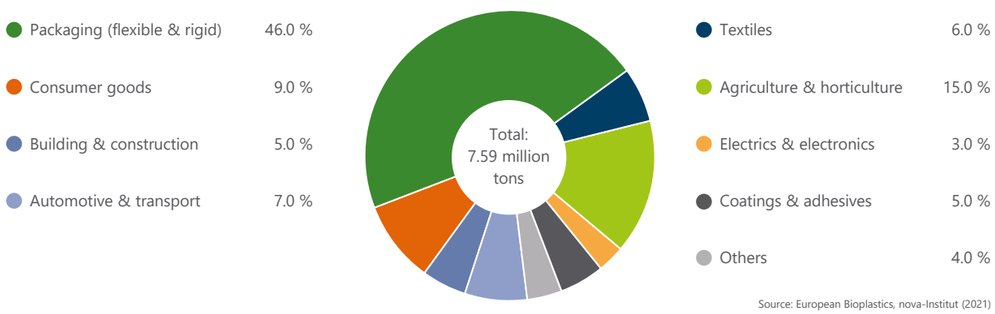


**In addition, there is the possibility for brand owners to buy a license from ISCC PLUS in order to be able to promote final ISCC PLUS products even without certification.*

Growth market for bioplastics

Currently, about 367 million tons of plastic are produced worldwide each year. According to European Bioplastics e.V., the share of bioplastics is presently less than one percent. However, the demand for bioplastics is steadily increasing, as they are already being used in numerous markets for more and more challenging products. The global production capacity of bioplastics is currently highest for the packaging industry and will remain so at 46 % in 2026. The share in agriculture and horticulture is expected to increase from 9 % to 15 %. It is assumed that the global production capacity for bioplastics will grow in the medium term from around 2.41 million tons in 2021 to around 7.59 million tons in 2026 (according to European Bioplastics e.V.).

Worldwide production capacities for bioplastics in 2026



Source: European Bioplastics, nova-Institut (2021)

Diversity in application

Our product portfolio

The M·VERA® product range consists of biodegradable and/or bio-based compounds. The portfolio was expanded with ISCC PLUS and REDcert² sustainable-certified M·BIOBASE® compounds made from biomass-balanced Polypropylen (PP).

Our products are already well-established in a number of applications and can be used with various processing methods. In addition, all of our compounds can be coloured individually.

M·VERA® compounds

- **M·VERA® A series**
  for agricultural films
- **M·VERA® B series**
  for bag applications
- **M·VERA® F series**
  for monofilament applications (e.g. 3D printing)
- **M·VERA® GP series**
  for general purpose applications (e.g. injection moulding, extrusion and thermoforming)
- **M·BIOBASE® PPC/PPH series**
  of biomass-balanced polypropylene compounds for durable applications (e.g. injection moulding, extrusion, fibre applications)

Possible film applications
- Shopping bags
- Fruit and vegetable bags
- Biowaste bags
- Agricultural films such as mulch film
- Food packaging

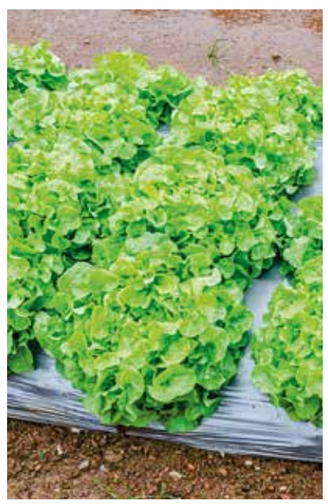
Possible injection moulding, extrusion and thermoforming applications
- Coffee capsules
- Reusable cutlery and dishes
- Food and cosmetics packaging
- Lids and plugs
- Agricultural applications such as flower pots, plant ties
- Toys
- Engineering applications

Masterbatches

AF-Eco® masterbatches (EN 13432 certified)
- Colour and carbon black masterbatches
- Additive masterbatches

AF-CirColor®, AF-CirCarbon® and AF-CirComplex® masterbatches
based on biomass-balanced carrier materials

We will be happy to assist you with materials selection and provide technical service and on-site support for machine and process parameter setup.



Customised masterbatches

Colour, carbon black and additive masterbatches

In close cooperation with AF-COLOR, we offer you a broad variety of masterbatches. The use of a biopolymer as a carrier material suitable for the application, for example PLA, PBAT, PCL or PP, minimises interactions with other components of the compound.

These masterbatches can be used for film, injection moulding, 3D printing, extrusion and thermoforming applications – as well as in combination with our M·VERA® and M·BIOBASE® biocompounds. Our masterbatches and the matching biocompounds can easily be processed with standard equipment and are characterised by an excellent dispersion quality. Furthermore, the masterbatches are free of heavy metals and phthalates.

Biodegradable AF-Eco® masterbatches

Due to their biodegradability, AF-Eco® masterbatches are especially suitable for the use in shopping bags, fruit and vegetable bags, mulch films, coffee capsules, reusable cutlery and dishes, food and cosmetics packaging, agricultural applications and much more.

The colouring of bioplastics is becoming increasingly important and is now done almost exclusively with the help of colour masterbatches, in which biopolymer-based carrier materials are paired with colour pigments. The colourants – certified "OK compost INDUSTRIAL" according to the European standard EN 13432 – are being dispersed in biodegradable carrier materials. The formulations of AF-Eco® masterbatches comply with the specifications of this standard, which also regulates the heavy metal content. Our standard portfolio already includes numerous colour shades. Of course, we can also realise your individual colour wishes. With our pool of certified colour pigments, we can realise almost any colour target – even effect colours with pearlescence. We will be happy to advise you in detail.

The AF-Eco® additive masterbatches are also made with biodegradable carrier materials which are paired with corresponding active ingredients. We offer, for example, functional masterbatches such as lubricant, anti-block and blowing agent masterbatches. We would be pleased to work with you to develop additive masterbatches, based on biodegradable carrier materials, that suit your individual requirements.

AF-CirColor®, AF-CirCarbon®, AF-CirComplex® masterbatches based on biomass-balanced carrier materials

BIO-FED has expanded its portfolio with ISCC PLUS and REDcert² sustainable certified M·BIOBASE® compounds made from biomass-balanced polypropylene (PP). These compounds have a reduced carbon footprint compared to conventional PP since the sources of raw materials for the PP are vegetable oil/fat waste, which is produced in various processes, e.g. in the food industry. Certification ensures traceability of the sustainable material flow along the entire value chain.

In addition to our M·BIOBASE® compounds made of biomass-balanced polypropylene, we offer you the matching ISCC PLUS and REDcert² certified masterbatches. Suitable for the field of application in the circular economy, these new colour masterbatches are named AF-CirColor® and AF-CirCarbon®. The portfolio is supplemented by the matching AF-CirComplex® additive masterbatches.

Research and innovative products

Our laboratory services

The aim of our research and development work is to incorporate trends and new ideas to best satisfy your needs. At BIO-FED, we combine the latest developments from the markets with decades-long production experience to create innovative solutions.

To provide you with high quality all times, we have expanded our laboratory capacities in recent years. By adding an additional laboratory area and acquiring a second blown film line for testing our M·VERA® film types, we are able to offer you extensive service and respond quickly to queries.

Several test methods for biocompounds are available from AF-COLOR, another member of the Feddersen Group, in Niederzissen and can also be used for quality testing as well as research and development.

We examine carefully all material properties in our in-house laboratory.

Testing M·VERA® film compounds on our blown film line.

Tested quality for your success

AKRO-PLASTIC GmbH as well as BIO-FED and AF-COLOR each have an Integrated Management System and are certified according to the following standards:

- DIN EN ISO 9001:2015 (Quality Management System)
- DIN EN ISO 50001:2018 (Energy Management System)
- BGRCI "Systematic Safety" and DIN EN ISO 45001:2018 (Occupational Safety and Health Management Systems)
- ISCC PLUS (Sustainability in the chemical sector (worldwide))
- REDcert² (Sustainability in the chemical sector (Europe))

Furthermore, AKRO-PLASTIC GmbH as well as BIO-FED and AF-COLOR are certified according to DIN EN ISO/IEC 27001:2013 (Information Security Management System) via the parent company K.D. Feddersen Holding GmbH.

BIO-FED
Member of the Feddersen Group

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