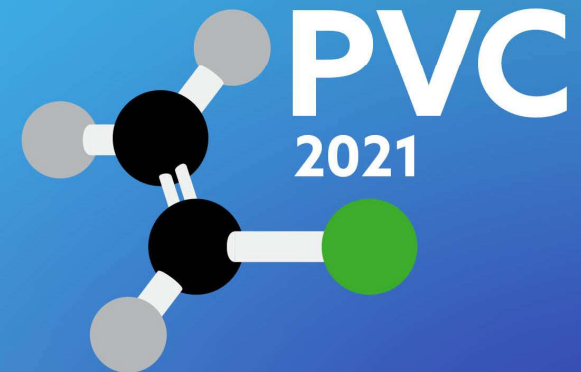


# New Plasticizers Based on Alternative Raw Materials



**Dr. Matthias Pfeiffer**

*Head of Technical Marketing Plasticizers Europe  
BASF SE*



# Drivers for plasticizer development

Performance



Regulatory



Sustainability



# BASF plasticizer portfolio Europe 2020

A broad range of products covering most of the applications and driven by *PERFORMANCE* and *REGULATION*

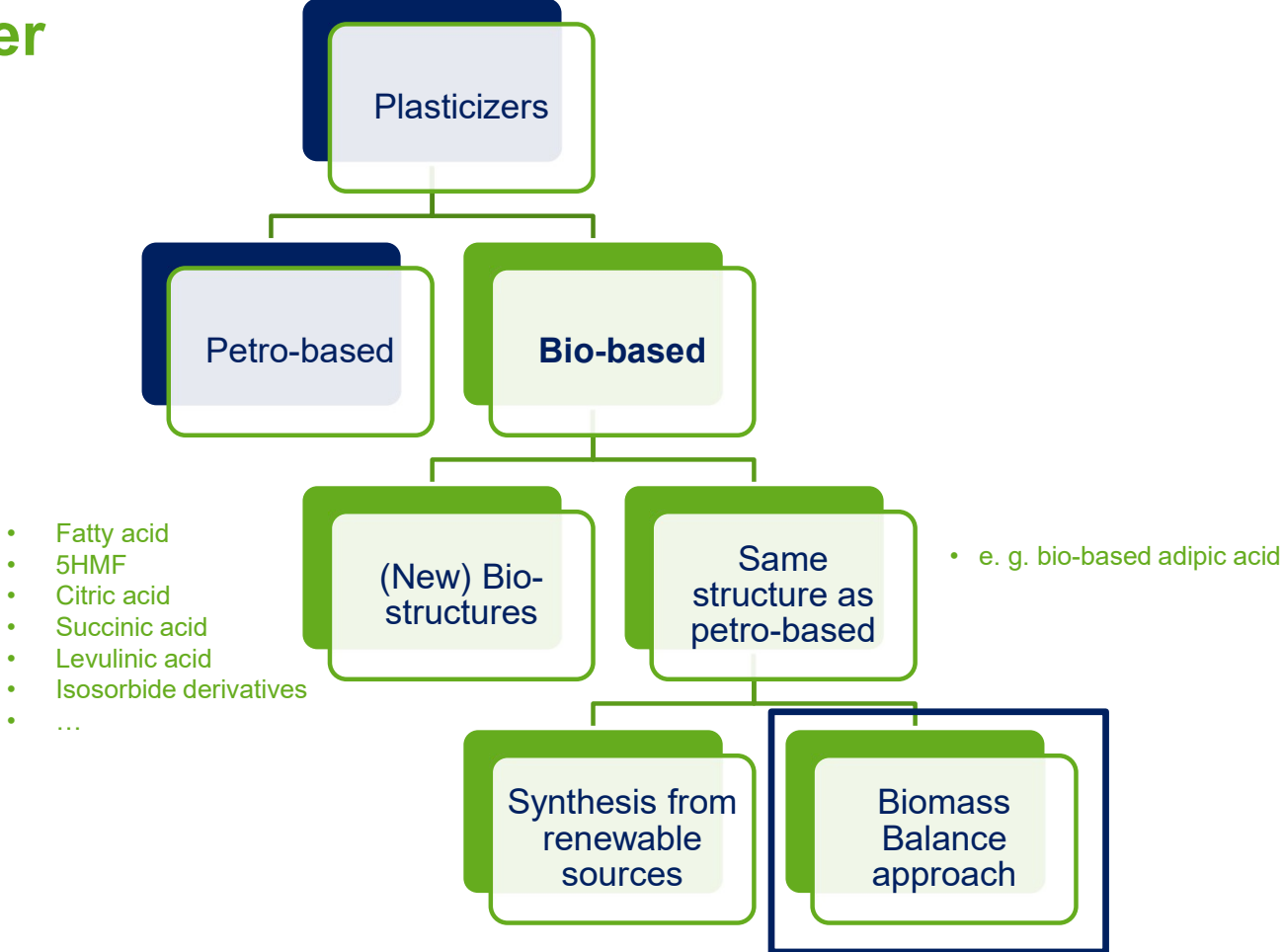
o-Phthalates	Cyclohexyl-dicarboxylates	Adipates	Poly-adipates
Palatino <sup>®</sup> N (DINP)  Palatino <sup>®</sup> 10-P (DPHP)	Hexamoll <sup>®</sup> DINCH	Plastomoll <sup>®</sup> DOA  Plastomoll <sup>®</sup> DNA	Palamoll <sup>®</sup> 632 638 646 652 654 656

Other types of plasticizers

- Terephthalates
- Trimellitates
- (Di)Benzoates
- Sebacates
- Phosphates
- ...
- ... **BIO / GREEN** ...



# Bio plasticizer



# Sustainability THE future driver



Our purpose:

We create  
chemistry for a  
sustainable future

- Be a leader in the area of sustainability and increase the role of sustainability in our business decisions.
- Decouple our CO<sub>2</sub> emissions from organic growth through a **Carbon Management** program.
- Invest in cutting-edge technologies to speed up the transition to a **Circular Economy**\*.

\* An overview about Circular Economy activities at BASF you can find here

<https://www.basf.com/global/en/who-we-are/sustainability/we-drive-sustainable-solutions/circular-economy.html>

# The Biomass Balance Approach

A groundbreaking way of deriving  
products from renewable raw materials

# BASF's Biomass Balance approach

- Requires **no reformulation** – identical product performance
- Saves fossil resources and **reduces greenhouse gas emissions**
- Drives the use of sustainable **renewable feedstock**



**Available** easily and fast for nearly all our products



# The Biomass Balance approach: Replacing fossil resources in the current Production Verbund

## Feedstock

Fossil



Renewable

Use of renewable feed-stock in very first steps of chemical production (e.g., steam cracker)

## BASF Production Verbund



Utilization of existing Production Verbund for all production steps

## Products

Conventional product



Biomass Balance product

Allocation of renewable feedstock to selected products



# Our solution: Certification and standardization



# The Biomass Balance approach: All the plasticizer characteristics you love + some more!

## Hexamoll® DINCH BMB

The non-phthalate plasticizer for applications with close human contact

- Meets technical requirements for a broad range of products
- Excellent toxicological profile
- Approved and certified worldwide for many applications



## Palatinol® 10-P BMB

BASF's industrial standard plasticizer

- Extraordinary weathering resistance and outstanding UV stability for outdoor applications
- Suitable for wire, cable, artificial leather, roofing membranes, pool liners



## Palatinol® N BMB

BASF's general purpose plasticizer

- General purpose plasticizer for all kind of industrial applications
- Good low temperature performance
- Low volatility




## Plastomoll® DOA BMB


BASF's specialty plasticizer

- Adipic acid based monomeric plasticizer
- Good low temperature properties
- Suitable for flexible PVC colorants, coatings and films for food contact (cling film)



 Sustainably sourced renewable feedstock



 Saving fossil resources & reducing CO<sub>2</sub> footprint



 Third party certified



 **BASF**  
We create chemistry

## ChemCycling™

From plastic waste to  
virgin-grade products

## Plastic waste is a major global challenge

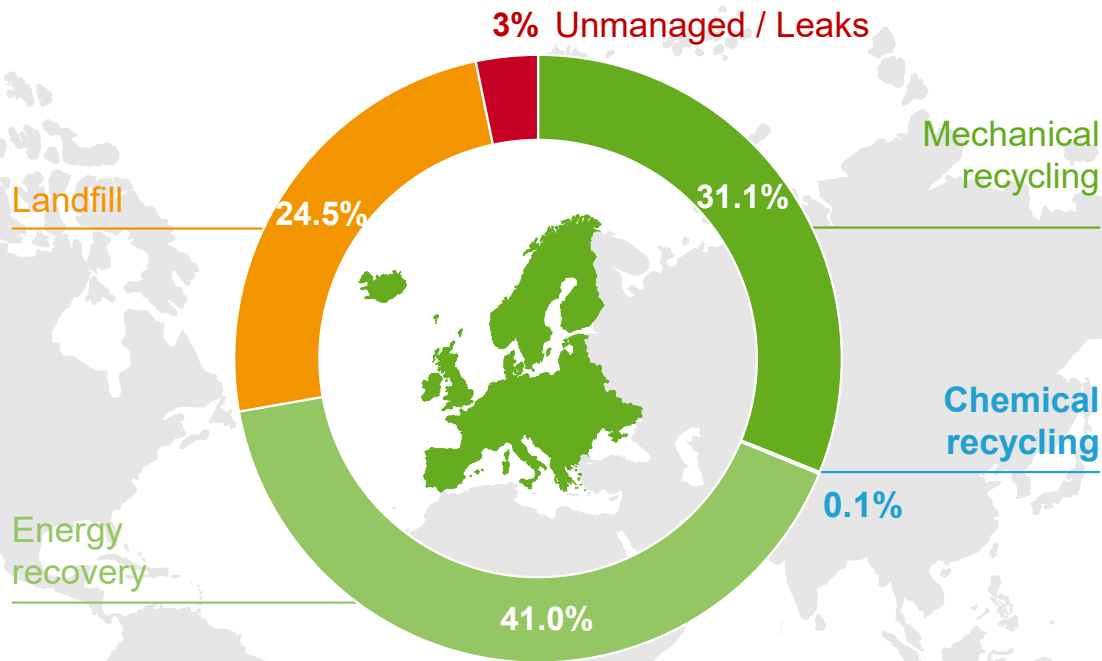
We must address end-of-life challenges to make full use of plastics' benefits



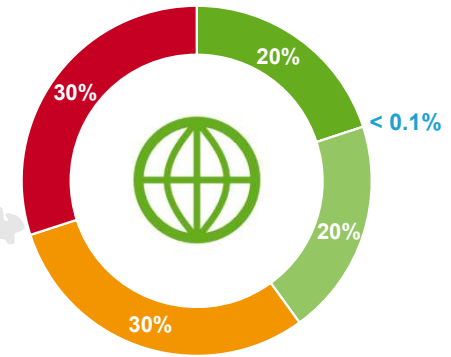
The society wants to stop that plastic waste is discarded in the environment. Functioning waste management systems and responsible consumer behavior regarding plastics are crucial to solving problems such as pollution from plastic litter.

# Today's recycling landscape for plastic waste

30 million metric tons of plastic waste generated in EU28+2 in 2018



Globally: 250 million metric tons

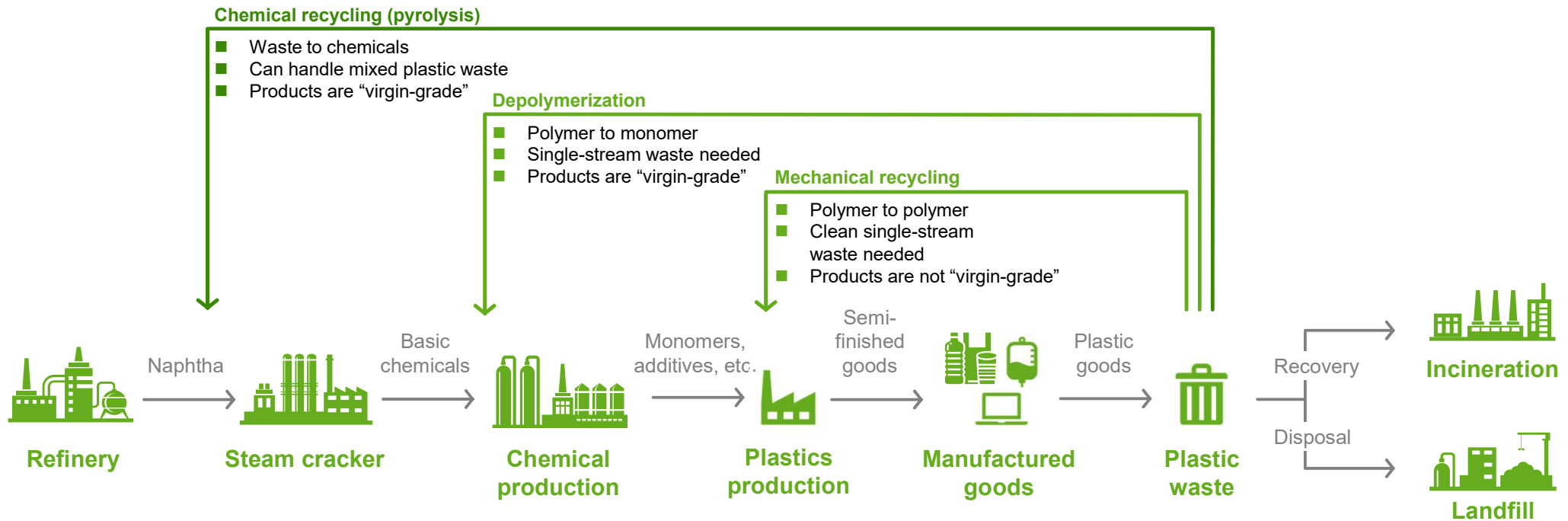


Only one third of all plastic waste is kept in the materials cycle in EU28+2.

Source: Conversio, "Circular Economy of Plastics 2018 EU28+2", September 2019 // Conversio, "Global Plastics Flow 2018", February 2020

# The role of chemical recycling in a circular economy

Different loops are necessary for a successful transition towards circularity



ChemCycling™ is **complementary** to mechanical recycling.

# BASF's ChemCycling™ project

## Breaking new ground in plastics waste recycling



# ChemCycling™ is a complementary approach to existing recycling methods

- We contribute to the recycling of **plastic waste for which no high value recycling processes are established yet**
- Examples of waste plastics which are difficult to recycle mechanically or which are incinerated include:
  - ▶ Mixed plastic waste streams
  - ▶ Plastics with adhering food residues
  - ▶ Multi-layer food packaging
  - ▶ Tires

With ChemCycling™ overall recycling rates of plastic waste will be increased





# Our solution: Certification and standardization

## Feedstock

Fossil



Recycled

## BASF Production Verbund



Ecoloop ensures the correct allocation of recycled resources in BASF's value chain. A switch to REDcert2 in analogy to BMB is currently under evaluation

## Products



Conventional



Allocated

# ChemCycling™:

All the plasticizer characteristics you love + some more!

## Hexamoll® DINCH – Ccycled™

The non-phthalate plasticizer for applications with close human contact

- Meets technical requirements for a broad range of products
- Excellent toxicological profile
- Approved and certified worldwide for many applications



Chemically recycled material as feedstock



Saving fossil resources & increasing plastic waste recycling



Third party certified

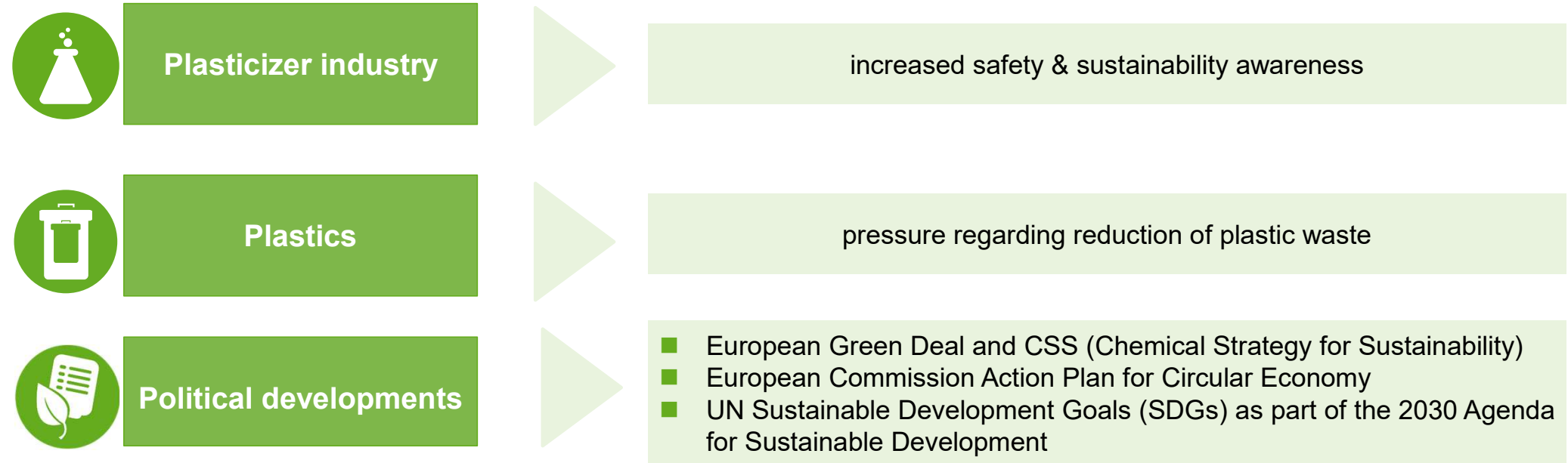


**□ · BASF**

We create chemistry

How *Biomass Balance* and  
*ChemCycling™* contribute to  
the manufacturing of more  
sustainable products

# Key trends in sustainability



**These developments can be addressed with our ChemCycling™ project and our Biomass Balance approach.**

# Both concepts compared

## Technical Approach / Tool

**Biomass Balance**

- Renewable feedstocks used
- Co-processing with primary fossil feedstock
- Allocation to products via biomass balance (3<sup>rd</sup> party certified according to REDcert<sup>2</sup>)

**ChemCycling™**

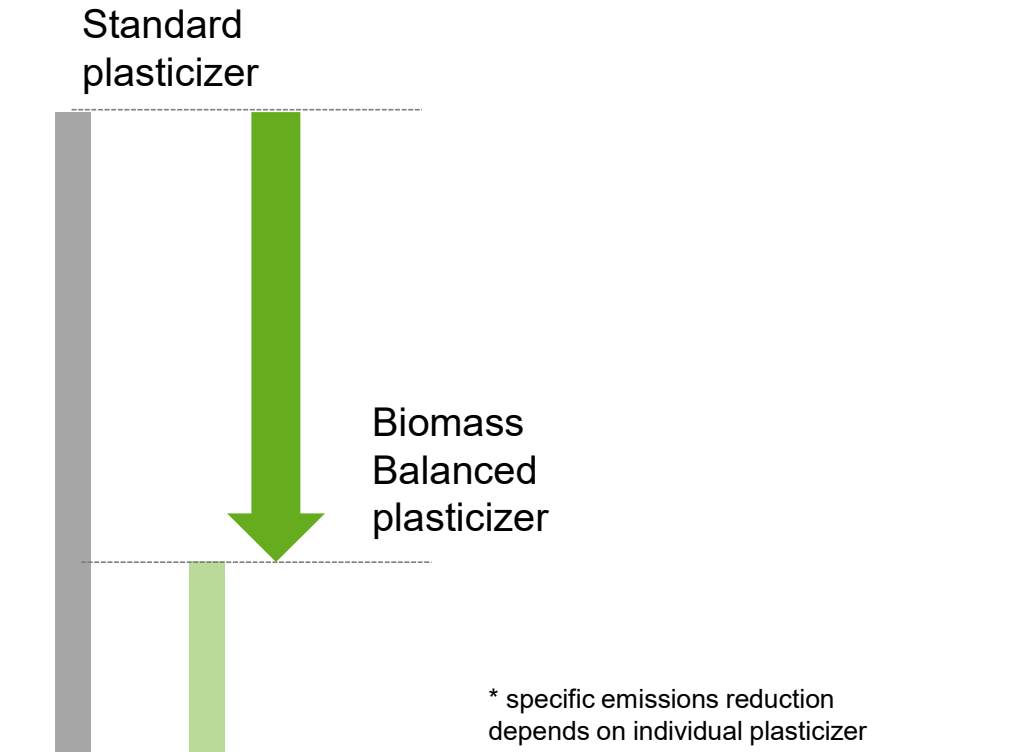
- Recycled feedstocks used
- Co-processing with primary fossil feedstock
- Allocation to products via mass balance (3<sup>rd</sup> party certified according to EcoLoop)

## ...for markets that seek....



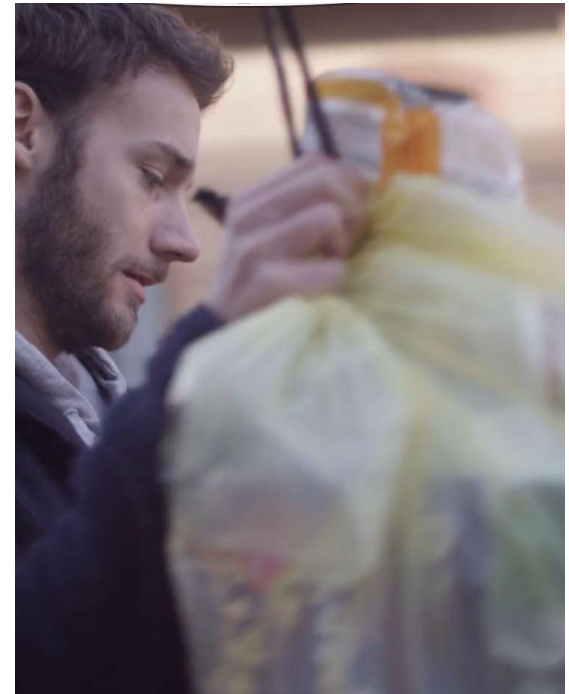
# Biomass Balanced plasticizers: Saving fossil resources and reducing CO<sub>2</sub> footprint

**Biomass Balanced plasticizers benefit from a CO<sub>2</sub> emissions reduction of more than 60%\***



## Chemical recycling is also attractive in terms of CO<sub>2</sub> emissions – the most discussed LCA indicator

- Pyrolysis of mixed plastic waste emits **50 percent less CO<sub>2</sub>** than incineration of mixed plastic waste
- CO<sub>2</sub> emissions are saved when manufacturing plastics based on pyrolysis oil (as secondary raw material under a mass balance approach) instead of naphtha (primary fossil raw material). The lower emissions result from avoiding the incineration of mixed plastic waste



# BASF plasticizer portfolio Europe 2021

Sustainability as THE driver for the portfolio development

o-Phthalates	Cyclohexyl-dicarboxylates	Adipates	Poly-adipates
Palatino <sup>®</sup> N (DINP) Palatino <sup>®</sup> 10-P (DPHP)	Hexamoll <sup>®</sup> DINCH	Plastomoll <sup>®</sup> DOA Plastomoll <sup>®</sup> DNA	Palamoll <sup>®</sup> 632 638 646 652 654 656
Palatino <sup>®</sup> N BMB Palatino <sup>®</sup> 10-P BMB	Hexamoll <sup>®</sup> DINCH BMB Hexamoll <sup>®</sup> DINCH Cycled <sup>™</sup>	Plastomoll <sup>®</sup> DOA BMB	



# Questions ... ?

Find all information bundled on our website

**Biomass Balance**

<https://www.basf.com/global/en/who-we-are/sustainability/we-drive-sustainable-solutions/circular-economy/mass-balance-approach/biomass-balance-bak-26-08-2020.html>

**ChemCycling**



### Turning plastic waste into new chemical products

Plastics do have proven benefits during their use phase – for example preservation of food from in packaging applications, lightweight construction of vehicles, and building insulation. Plastic waste, however, has become a major global challenge. Consequently, there is increasing regulatory pressure regarding recycling targets and recyclability on the one hand and strong commitments of our customers towards increasing the share of recycled material in their offerings on the other hand. Solving these challenges requires innovation.

### Related Links

- Learn more about Circular Economy at BASF
- Frequently asked questions about ChemCycling™
- Find out more about the Life-Cycle

## Video: ChemCycling – first prototypes



<https://www.basf.com/global/en/who-we-are/sustainability/we-drive-sustainable-solutions/circular-economy/mass-balance-approach/chemcycling.html>

**Plasticizer Portfolio**



### Plasticizer Product Portfolio

Thanks to the future oriented approach, BASF® is one of the leading manufacturers of plasticizers and manufactures a broad portfolio covering phthalates, such as Palatino® N DINCH and Palatino® 10-P (DHPs) as well as alternative plasticizers, such as Hexamol® DINCH, adipates and polymeric plasticizers. These are used in a variety of products.

### Hexamol® DINCH – Cycloled™

The trusted non-phthalate plasticizer for applications with close human contact

- Meets technical requirements for a broad range of products
- Excellent toxicological profile with low migration rate
- Approved and certified worldwide for many applications

### All the plasticizer characteristics you love + some more!

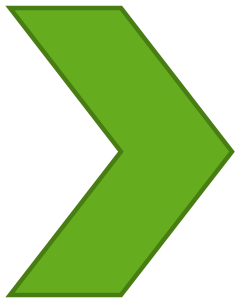
<b>Hexamol® DINCH BMB</b> The trusted non-phthalate plasticizer for applications with close human contact <ul style="list-style-type: none"> <li>Meets technical requirements for a broad range of products</li> <li>Excellent toxicological profile with low migration rate</li> <li>Approved and certified worldwide for many applications</li> </ul>	<b>Palatino® 10-P BMB</b> BASF's industrial standard plasticizer <ul style="list-style-type: none"> <li>Extraordinary weathering resistance for outdoor applications</li> <li>Outstanding UV stability</li> <li>Low color and low volatility</li> <li>Ideal for high temperature applications</li> <li>Complying with VCI German and US standards for wire and cable</li> <li>Suitable for new, cattle artificial leather, roofing membranes, pool films</li> </ul>	<b>Palatino® N BMB</b> BASF's general purpose plasticizer <ul style="list-style-type: none"> <li>Versatile with low viscosity</li> <li>Good low temperature performance</li> <li>Low volatility</li> <li>Suitable for films and coatings</li> </ul>	<b>Plastomol® DOA BMB</b> BASF's specialty plasticizer <ul style="list-style-type: none"> <li>Adipic acid based monomeric plasticizer</li> <li>Good low temperature properties</li> <li>Suitable for flexible PVC: colorants, coatings and films for food contact (e.g. film)</li> </ul>
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- + Sustainably sourced renewable feedstock
- + Saving fossil resources & reducing CO<sub>2</sub> footprint
- + Third party certified

<https://chemicals.basf.com/global/en/Petrochemicals/Plasticizers/europe/products.html>

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We create chemistry

## Or turn to us directly...



...to get more detailed information on

- LCA (Life Cycle Assessment)
- PCF (Product Carbon Footprint)
- Certification process
- etc.



# Thank You !

**Dr. Matthias Pfeiffer**

*Head of Technical Marketing Plasticizers Europe  
BASF SE*

